

An aerial photograph of a residential neighborhood. In the center, there is a large intersection with a prominent building that has a green roof. To the right of this intersection, a railway line with multiple tracks runs vertically. The surrounding area is filled with houses of various sizes, some with red roofs, and green spaces. The overall scene depicts a dense urban environment.

IRL-Report 9

ANITA GRAMS

PLAYING WITH DENSITY

The Compass for Inward Development as a Problem-Oriented Methodology for Densification in Small- and Medium-Sized Communes

IRL – Institute for Spatial
and Landscape Development
Chair of Spatial Development

ETH zürich

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*'Die Zukunft ist unvermeidlich. Wie also wollt ihr sie gestalten?
Man ist nicht realistisch, indem man keine Idee hat.'*

Max Frisch (1954)

Frisch Max (1954): Stiller. Frankfurt/M.: 249



47°16'60" N 7°42'39" E

Editor's Preface

In contrast to the simple expansion of settlement areas, common in past decades, the central minimum strategy for future spatial development is 'inward development before outward development,' which is intended to curb the nonsustainable usage of land in Switzerland. The densification of existing settlements constitutes an important element in this endeavor. The revision of the Swiss Spatial Planning Act, adopted in 2013 by a large majority of voters, serves to strengthen the implementation of this objective.

In view of the necessary transformation of the existing settlement stock, which also includes infrastructural buildings and facilities, the occurrence of conflicts will become denser because of the large number of actors and concerned persons involved, making the tasks to be solved ever more complex. Thus, true change in thought patterns is required. Since small- and medium-sized communes make up over 80% of all municipalities in Switzerland, and since planning tasks there are largely handled by the 'militia system' of governance (which refers to the particularly Swiss idea of readiness to volunteer to serve as a village councillor or part-time military officer), a series of central and sparsely researched questions, task areas, and solution approaches are emerging. As Anita Grams' doctoral supervisor, I closely accompanied her dissertation, on which this publication is based.

Following a careful clarification of the notion of density, Anita Grams develops and verifies her research hypotheses by noting numerous examples from the past and then focusing on the so-called Swiss Plateau Region as one of the central living spaces of modern Switzerland. According to her research, here lies the most extensive and prescribed zoned settlement area in all of Switzerland, presenting multiple coordination tasks, ranging from settlement, traffic, landscape, agriculture, and energy issues. The coordination role of spatial planning in this context must ensure that viable visions of spatial development that can be effective in the long-term are sought out by

means of appropriate initiatives in cooperation with the important and spatially relevant actors, including settlement components of relevance to densification. Densification necessarily includes quality and a sense of proportion, which can be realized only by constructing customized solutions on a location-specific basis – and often only on a regional scale. There are no panaceas for this. Rather, informal procedures and instruments play a central role, which is why Anita Grams has also intensively concerned herself with insights from organization theory and decision theory.

Her insights from quantitative and qualitative examinations show that substantial and already legally binding zoned reserves for approximately 1 million additional inhabitants are available in the Swiss Plateau, in largely well-developed locations. This allows a more precise definition of the strategy of inward development, the goal being to further develop living spaces in an incremental, spatially differentiated manner in a large number of locations using manageable measures over a long period of time. This book provides important fundamentals and illustrative examples of this strategy.

In 2017, Anita Grams' contribution received the Gerd Albers Award of the International Society of City and Regional Planners ISOCARP on occasion of the Annual World Congress in Portland/USA. In its laudation, the jury said the following: 'Although the cases focus on the Swiss landscape, the proposed solutions for combining informal planning instruments within the existing official planning framework are considered universal, and therefore of interest for both the planning scholars and practitioners.'

Zurich, September 2018

Prof. Dr. Bernd Scholl



47°17'9" N 7°42'40" E

Author's Preface

My motivation for embarking on this present task was rooted in my practical background. As an architect, my interest was increasingly being drawn to the phase preceding the actual building phase, which in turn led me to the question as to which processes must be initiated before actual construction begins in order to ensure a high spatial quality. I started engaging with the discipline of spatial planning and land use. At the same time, I found the issues related to the development prospects for the Swiss Plateau Region to be increasingly fascinating. This region, consisting mainly of small- and medium-sized communes, is organized according to the nonprofessional governance system and thus exemplifies a long-standing democratic form – one whose voice must be heard in the planning process.

But the decisive trigger for my in-depth studies of these research issues was the following statement made by Thomas Sieverts during a conference in 2009 in Zurich:

'[In urban development] there is a significant gap between what we teach, what we ourselves desire and what reality looks like. [...] In future, we must deal with a high degree of uncertainty and vagueness. This means that we must experiment to a much larger extent than hitherto. Certain situations of urban development simply must be tried. We must be open for various solutions. [...] This means raising awareness within the population.' [ETH ZÜRICH 2009]

The example of built density provides a representative way of illustrating this discrepancy between expert knowledge and lack of understanding or awareness in the social environment. Politicians and the general public are encouraged to adapt their respective attitudes toward space if they want to transform it. Again, according to Sieverts, this essentially boils down to an esthetic problem, a perception that creates responsibility toward space. Urban development is thus a political as well as a building activity:

'Urban development means working with heads just as much as with the drawing board.' [ETH ZÜRICH 2009]

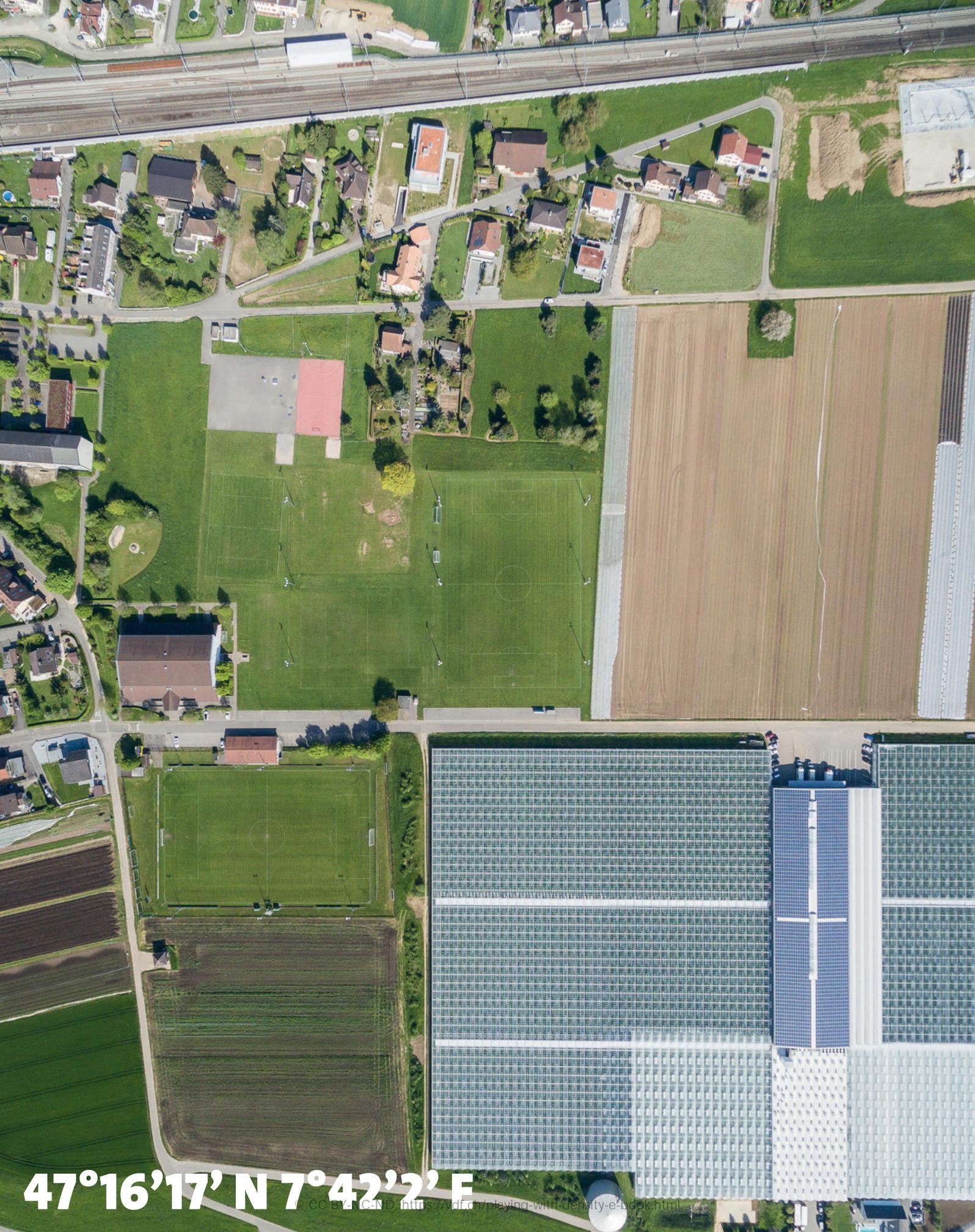
These statements sparked my interest in research questions relating to processes, procedures and informal instruments.

While I was working on this paper, on 3 March 2013, Swiss voters overwhelmingly accepted the revision of the Spatial Planning Act, creating a wider sphere of interest for spatial planning and garnering the attention of a broader audience. A spirit of optimism broke out among planners that future challenges could now be tackled on a sound legal basis. It added a social dimension to a rather academic question, which also corresponds to my personal view of the mission of research itself.

Spatial planning is the science of everyday life. Researchers must be able to imagine the daily routines of people 30 years in the future and use this as a basis for generating practical knowledge. I offer the following work as a contribution to the increase of such knowledge.

Zurich and Biel, September 2018

Dr. Anita Grams



47°16'17" N 7°42'2" E

Thanks

[...] wenn man mich fragte, welchen Affekt, welches Gefühlsverhältnis zu den Erscheinungen der Welt, der Kunst und des Lebens, ich für das schönste, glücklichste, förderlichste, unentbehrlichste halte, würde ich ohne Zögern antworten: Es ist die Bewunderung. Wie denn auch anders? Was wäre der Mensch, der Künstler gar, ohne Bewunderung, Enthusiasmus, Erfüllung, Hingegenheit an etwas, was nicht er selbst ist, was viel zu gross ist, um er selbst zu sein, aber was er als das Hochverwandte und mächtig Zusagende empfindet, dem näher zu kommen, das «mit Erkenntnis zu durchdringen» und sich ganz zu eigen zu machen ihn leidenschaftlich verlangt? Bewunderung [...] wäre ohne Geist [...], wenn sie nicht auch zu zweifeln, an ihrem Gegenstand zu leiden wüsste. Bewunderung ist demütig und stolz zugleich, stolz auf sich selbst; sie kennt die Eifersucht, die jugendlich herausfordernde Frage: «Was wisst denn ihr davon?» Sie ist das Reinste und Fruchtbare zugleich, der Aufblick und der Antrieb zum Wettstreit, sie lehrt den hohen Anspruch und ist das stärkste und erzieherisch strengste Stimulans zum eigenen geistigen Beitrag [...].'

Thomas Mann

Erika Mann (Hrsg.) (1963): *Wagner und unsere Zeit*. Frankfurt a.M.: 127

My thanks go out to all those people whose enthusiasm for their own research issues I admire. Their example supported and inspired me to proceed with my own work – and transform it into a PhD. Many people have contributed to this and deserve my special thanks.

First of all, I wish to thank Prof. Dr. Bernd Scholl of the Swiss Federal Institute of Technology in Zurich (ETHZ), the supervisor for this work, who both challenged and encouraged me in so many ways. I am particularly grateful for his enabling me to take part in the International Doctoral College 'Transformation of Cities and Landscapes.' Prof. Dr. Andreas

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My gratitude also goes to the experts from practice. I will always have fond recollections of the exchanges with Ole Damsgaard, Director of the Northern Periphery Programme of the European Union, who in Copenhagen (Denmark) acquainted me with the processes and approaches in Danish spatial planning. The discussion with Prof. Dr. Tejo Spit from the University of Utrecht regarding the situation in the Netherlands was also enlightening. These discussions helped me to better understand the specific situation of the Swiss Plateau Region. Bernard Staub, planning officer in the Canton of Solothurn, made himself available as interlocutor regarding the process development. I am also grateful to Dr. Daniel Kolb, planning officer of the canton Aargau, for his willingness to discuss my hypotheses regarding the Swiss Plateau Region. My thanks also to my fellow student from the MAS in Spatial Planning at the Swiss Federal Institute of Technology in Zurich (ETHZ), Barbara Wittmer, who provided clever insights from practice regarding spatial planning in the Canton of Solothurn.

I would like to express my heartfelt thanks to the students of the years 2013–2015 in the MAS in Spatial Planning at the ETHZ for their involvement in

the study project 'Mittelland Centre,' which provided me with an occasion for testing my hypotheses. My colleague at the chair – Karin Widler – supported me actively when devising the quantitative surveys as to the existing settlements in the Swiss Plateau Region. Thanks to the great care and untiring efforts of my colleague Stefan Flück, the findings could be translated technically and graphically; both deserve my special thanks. Karin Hollenstein, Reto Nebel, Silke Rendigs and Florian Stellmacher also carried me forward with their questions and suggestions.

And last but not least, I owe many thanks to the Swiss National Fund for the financial support for the research project 2011–2014.

My PhD would not have been possible without the support of my family – words here would never suffice to express my thanks.

Zurich and Biel, September 2018

Anita Grams

Summary

PLAYING WITH DENSITY

Inward Development as a Problem-Oriented Methodology for Densification in Small- and Medium-Sized Communes

The revised Spatial Planning Act that came into effect in Switzerland in 2014 and the minimum strategy of 'inward development before outward development' oblige communities to shift their spatial development to the most heavily constructed areas and to coordinate any extension of building zones beyond existing municipal boundaries. For many small- and medium-sized communes in Switzerland, this means changing their approach to spatial planning practice.

A significant element of inward urban development consists of densifying existing settlement areas. When dealing with densification, small- and medium-sized communes in particular are confronted with problems such as insufficient acceptance of such dense building typologies, obstacles to the mobilization of reserves secured by building regulations and a lack of novel thinking patterns in terms of inward development. This research project takes these issues as a starting point and culminates in the hypothesis that, although inward development could occur in the main settlement areas in Switzerland, the existing formal tools for spatial planning alone are inadequate to this task.

One very promising idea concerning inward development is a problem-oriented methodology combined with the implementing a normative approach to the problem-solving process. These foster working with hypotheses, such as test designs, already in an early planning phase. They provide the means for gaining insights by helping to concretely visualize an unsolved and difficult task. Action planning offers helpful guidance in establishing the clarification processes related to this task.

Clarifying spatially relevant problems means drawing up specifications at the local level. An assessment of the reserves in the main settlement areas of Switzerland indicates a theoretical capacity for accommodating roughly 0.5–1 million additional inhabitants, without need to adjust the formal instruments. Around two-thirds of the reserves of settlement areas as well as at least two-thirds of the reserves of floor areas may be found in residential zones of small- and medium-sized communes of fewer than 10,000 inhabitants, which additionally account for 93% of all administrative entities in the Swiss Plateau Region. Furthermore, it is estimated that half of the floor-area reserves in residential areas are located on already constructed but underused plots. In the main residential area of Switzerland, a systematic 'density denial' prevails in small- and medium-sized communes.

In order to boost inward development in the main residential areas of Switzerland, there is need for a revision of the formal instruments, particularly in the kind of communes mentioned. This necessitates increasing informal procedures beyond the communal boundaries during an early phase, which in turn will result in reforming local planning in small- and medium-sized communes. Informal procedures do not serve to negate the specific organizational form of small- and medium-sized communes – the militia system as a nonprofessional government – but rather should adapt to this principle. Creating a 'compass for inward development' combines existing knowledge in the militia system and constitutes an informal forerunner for the 'revision of local planning of the third generation' of small- and medium-sized communes.

The revised Spatial Planning Act, with its regulations for inward development and densification, will cause different challenges in the three major areas of Switzerland. Yet, driven by changes in demography, energy and finances, the initial problems will manifest themselves most markedly in the Swiss Plateau

Region. Politics and spatial planning must become oriented toward the initial problems of small- and medium-sized communes and their adaptation of the operational concepts of public transportation. Successful development of the existing ample reserves in small- and medium-sized communes through adequate strategies for the public transportation system could help to avoid problems of congestion in cities, while small- and medium-sized communes could be further developed. Thus, the concept of 'little in many places rather than too much in few places' would also have a positive impact on the national level and could initiate the necessary process of transformation in the main settlement areas of Switzerland from outer to inward development.

Kurzfassung

SPIELRÄUME FÜR DICHTER

Der Innenentwicklungskompass als problemorientierte Methode für Verdichtung in kleinen und mittleren Gemeinden

Mit dem in der Schweiz 2014 in Kraft getretenen revidierten Raumplanungsgesetz und der Mindeststrategie «Innenentwicklung vor Aussenentwicklung» sind die Gemeinden verpflichtet, ihre räumliche Entwicklung auf das weitgehend überbaute Gebiet zu lenken und die Bauzonendimensionierung über Gemeindegrenzen hinaus abzustimmen. Dies bedeutet für viele kleine und mittlere Gemeinden der Schweiz einen Denkmusterwechsel in der raumplanerischen Praxis.

Ein wesentliches Element der Innenentwicklung ist die bauliche Verdichtung bestehender Siedlungsgebiete. Insbesondere in kleinen und mittleren Gemeinden sieht sich Verdichtung jedoch mit Ausgangsproblemen wie mangelnder Akzeptanz dichter Bautypologien, Mobilisierungshindernisse von baurechtlich gesicherten Reserven und fehlenden Denkmustern für Innenentwicklung konfrontiert. Hier setzen die Forschungsfragen an und münden in der Hypothese, Innenentwicklung im Hauptsiedlungsraum der Schweiz sei möglich, die bestehenden formellen Instrumente der Raumplanung allein seien dafür jedoch nicht ausreichend.

Ein für die Innenentwicklung vielversprechendes Denkmuster ist die Problemorientierung sowie die Verwendung von normativen Ansätzen für den Problemlösungsprozess. Diese regen dazu an, in einer frühen Planungsphase mit Hypothesen zu arbeiten, beispielsweise in Form von Testentwürfen. Diese sind das Mittel für den Erkenntnisgewinn, weil sie helfen, eine noch ungelöste schwierige Aufgabe konkret zu veranschaulichen. Für die Gestaltung der damit verbundenen Klärungsprozesse bietet die Aktionsplanung hilfreiche Ansätze.

Ein Klärungsprozess für raumbedeutsame Probleme erfordert eine Konkretisierung auf lokaler Ebene. Eine Abschätzung der Reserven im Hauptsiedlungsraum der Schweiz zeigt, dass eine theoretische Kapazität für die Aufnahme von rund 0.5–1 Million zusätzlicher Einwohner vorhanden ist, ohne dass die formellen Instrumente angepasst werden müssten. Rund 2/3 der Siedlungsflächenreserven sowie mindestens 2/3 der Geschossflächenreserven in Wohnzonen liegen in kleinen und mittleren Gemeinden mit weniger als 10 000 Einwohnern, die zudem 93% aller administrativen Einheiten des Mittellands ausmachen. Ausserdem liegen in Wohnzonen schätzungsweise die Hälfte der Geschossflächenreserven auf bereits bebauten, jedoch unternutzten Parzellen. Im Hauptsiedlungsraum der Schweiz findet in kleinen und mittleren Gemeinden ein systematischer «Dichteverzicht» statt.

Um der Innenentwicklung im Hauptsiedlungsraum der Schweiz zum Durchbruch zu verhelfen, ist vor allem in diesen Gemeindekategorien eine Revision der formellen Instrumente nötig. Dazu sind informelle Verfahren in einer frühen Phase über Gemeindegrenzen hinweg nötig, die in der Konsequenz zu einer Reformation der Ortsplanung führen. Informelle Verfahren sollten dabei die spezifische Organisationsform der kleinen und mittleren Gemeinden – das Milizsystem – nicht negieren, sondern sich in dieses Prinzip einpassen. Ein «Innenentwicklungskompass» vereint das im Milizsystem vorhandene Wissen und bildet den informellen Vorlauf zur «Ortsplanungsrevision der Dritten Generation» in kleinen und mittleren Gemeinden.

Mit dem Inkrafttreten des revidierten Raumplanungsgesetzes mit seinen Bestimmungen zur Innenentwicklung und Verdichtung werden die drei Grossräume der Schweiz mit unterschiedlichen Herausforderungen konfrontiert. Angetrieben durch die Veränderungen im Bereich Demografie, Energie oder Finanzen werden sich die Ausgangsprobleme jedoch im Schweizer Mittelland am deutlichsten manifestie-

ren. Dies bedingt eine Hinwendung der Politik und Raumplanung zu den Ausgangsproblemen in kleinen und mittleren Gemeinden und die Anpassung der Betriebskonzepte des öffentlichen Verkehrs. Gelingt es, die in kleinen und mittleren Gemeinden zahlreich vorhandenen Reserven durch adaptierte Konzepte des öffentlichen Verkehrs zu erschliessen, können einerseits Probleme der Überlastung in Städten vermieden und andererseits die kleinen und mittleren Gemeinden massvoll weiterentwickelt werden. Damit entfaltet das Konzept «An vielen Orten wenig statt an wenigen Orten viel» auch auf nationaler Ebene seine Wirkung und könnte den nötigen Transformationsprozess im Hauptsiedlungsraum der Schweiz von der Aussen- zur Innenentwicklung einleiten.

Résumé

DES MARGES POUR JOUER AVEC DENSITÉ

La boussole du développement vers l'intérieur comme méthode orientée vers les problèmes pour densification dans les petites et moyennes communes

Depuis l'entrée en vigueur en 2014 de la loi fédérale sur l'aménagement du territoire révisée, fixant une stratégie minimale du «développement vers l'intérieur avant le développement vers l'extérieur», les communes se voient obligées de déployer leur développement spatial à l'intérieur du milieu bâti existant et de coordonner le dimensionnement de leurs zones à bâtir au-delà des frontières communales. Pour de nombreuses petites et moyennes communes suisses, il en résultera un changement de paradigme dans leur pratique d'aménagement du territoire.

La densification du milieu bâti existant représente un élément important du développement vers l'intérieur. Mais dans les petites et moyennes communes notamment, la densification se voit confrontée à de nombreux problèmes initiaux: un manque d'acceptation des typologies constructives denses, des obstacles à la mobilisation de réserves et des paradigmes manquants pour le développement vers l'intérieur. C'est là où interviennent les questions de recherche aboutissant à l'hypothèse suivante: un développement vers l'intérieur serait possible au Plateau suisse, mais les instruments formels disponibles de l'aménagement du territoire n'y suffisent pas.

Pour le développement vers l'intérieur, un paradigme prometteur est l'orientation vers les problèmes ainsi que l'utilisation d'approches normatives dans leur processus de résolution; ces approches incitent à se servir, déjà au cours d'une phase de planification précoce, d'hypothèses, notamment sous forme de projets tests, les instruments qui permettent l'acquisition de nouvelles connaissances en illustrant concrètement une tâche difficile non résolue. Et la planification des actions offre une approche utile aux processus de clarification associés.

Le processus de clarification des problèmes importants d'aménagement du territoire exige une concrétisation au niveau local. Une estimation des réserves des principales zones suisses d'habitat indique qu'il existe une capacité théorique permettant d'accueillir 0,5 à 1 million d'habitants supplémentaires sans devoir adapter les instruments formels. Environ deux tiers des réserves de surfaces susceptibles d'être disponibles à l'urbanisation ainsi qu'au moins deux tiers des réserves de surfaces dans des zones d'habitation se situent dans de petites et moyennes communes comptant moins de 10,000 habitants et représentant en outre 93% de toutes les unités administratives du Plateau suisse. Selon des estimations, la moitié des réserves de surfaces existant dans des zones d'habitation se trouverait sur des parcelles déjà bâties, mais sous-utilisées. Dans les petites et moyennes communes des principales zones suisses d'habitat, il est renoncé systématiquement à la densification.

Pour favoriser la percée du développement vers l'intérieur dans les principales zones suisses d'habitat, une révision des instruments formels est notamment nécessaire dans ces catégories de communes. Et cette révision nécessite dans une phase précoce et au-delà des frontières communales des procédures informelles dont il résultera en conséquence une modification de l'aménagement local de petites et moyennes communes. Il est important que ces procédures informelles ne refusent pas la forme d'organisation spécifique des petites et moyennes communes, à savoir le système de milice, mais qu'elles sachent s'adapter à ce principe. Une «boussole du développement vers l'intérieur» regroupe les connaissances existantes du système de milice en formant un précurseur informel à la «révision de l'aménagement local de troisième génération» des petites et moyennes communes.

L'entrée en vigueur de la loi fédérale sur l'aménagement du territoire révisée ainsi que ses modalités imposant un développement vers l'intérieur et une densification vont confronter les trois grands espaces suisses à différents défis. Les problèmes initiaux, renforcés par les changements démographiques, énergétiques ou financiers allant toutefois se manifester le plus nettement sur le Plateau suisse, la politique et l'aménagement du territoire devront se tourner vers les problèmes initiaux des petites et moyennes communes et les concepts d'exploitation des transports publics être adaptés en conséquence. L'exploitation des nombreuses réserves disponibles des petites et moyennes communes en adaptant les concepts des transports publics permettrait d'éviter d'une part les problèmes de la congestion urbaine et de contribuer d'autre part à un développement modéré de ce type de communes. Le concept «La densification en petit dans de nombreuses communes et non la densification intense dans peu de communes» déployant par-là son effet même au niveau national pourrait induire dans les principales zones suisses d'habitat le processus nécessaire de transformation du développement vers l'intérieur avant le développement vers l'extérieur.

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1 Starting point

The efficient and economic use of land has been part of the Swiss Federal Constitution since 1969, yet the settlement area consumption per capita continues unchecked. The aim of the partial revision of the first Spatial Planning Act that came into force in 1980 was to reinforce in particular the execution of the law. With the 2014 enactment, communes are now obliged to shift their spatial development onto the most heavily constructed areas and to coordinate this task among themselves as far as spatial planning is concerned. Simultaneously, in Switzerland the minimum strategy of 'inward development before outward development' is mandated by law at the federal level. The practical implementation in local planning for many small- and medium-sized communes amounts to a shift in thinking patterns.

Building densification of existing settlement areas can constitute an important element of inward development. Yet, in small- and medium-sized communes in particular, densification is confronted with initial factors such as insufficient acceptance of dense building typologies, obstacles in the mobilization of reserves secured by building regulations and a lack of novel thinking patterns in terms of inward development. This research project takes these issues as its starting point and culminates in the hypothesis that, although inward development in the main settlement areas in Switzerland may be possible, the existing formal tools for spatial planning alone are inadequate to help implement built densification in these areas.

1.1 Introduction

1.1.1 Facts and trends in spatial development in Switzerland

Since the 1950s, the industrial nations of Europe have oriented their spatial development toward the continuous expansion of new settlement areas in order to meet the increasing demands of social and economic growth. In Switzerland, too, economic growth and technological progress led to a more surface-intensive form of settlement: Between 1950 and 1990, the

constructed area in Switzerland more than doubled in size (HÄBERLI ET AL. 1991: 15), and in the roughly 20 years thereafter (1985–2009) the settlement area increased again by approximately 24% (BFS 2013a). In addition, two-thirds of today's existing buildings for residential use were constructed since 1946 (BFS 2013b). A dense transportation infrastructure facilitated such disperse settlement, especially in urban agglomerations. The disadvantages of such a surface-intensive development – compared to cultivated and natural landscapes – are rather obvious: On the one hand, such developments result in the loss of easily accessible local recreation areas and a shrinking basis for food production; on the other hand, it also leads to an increase in mobility and in the demand for yet more transportation infrastructure, which in turns entails a greater strain on the environment. Such uncoordinated development sometimes give the impression of spaces with exchangeable backdrops, devoid of any intrinsic identity – a deplorable state of affairs that is very hard to reverse. This process even accelerated in Switzerland during the last decade and is now commonly known as 'urban sprawl' (Zersiedlung) (SCHWICK ET AL. 2010: 21, SCHWICK ET AL. 2013). As early as 1933, the Swiss architect and politician Armin Meili denounced urban sprawl and demanded that spatial planning put a stop to the 'cancer of dispersed settlement in detached houses' (Verhüselung) and to the desecration of the landscape, calling instead for the preservation of 'the beauty of our homeland' and the forging of the future development of the country so as to 'best allow for the well-being of the individual' (MEILI 1933: 17 ff.). Experts were quick to support Meili's demand for 'the infrastructures of the cities, the laying out of agricultural land, as well as the traffic on land, over water and in the air to be cautiously adapted to developments and implemented.' There was a call for regional planning laws to coordinate the various claims made on the land (KOLL-SCHRETZENMAYR 2008: 20). However, only in 1969 did an article on spatial planning become incorporated into the Federal Constitution, to 'ensure the appropriate and economic use of the land and its properly ordered settlement'¹. The corresponding Spatial Planning Act came into force only in 1980. Yet now, approximately 30 years later, spatial

1 Art. 75 Federal Constitution.

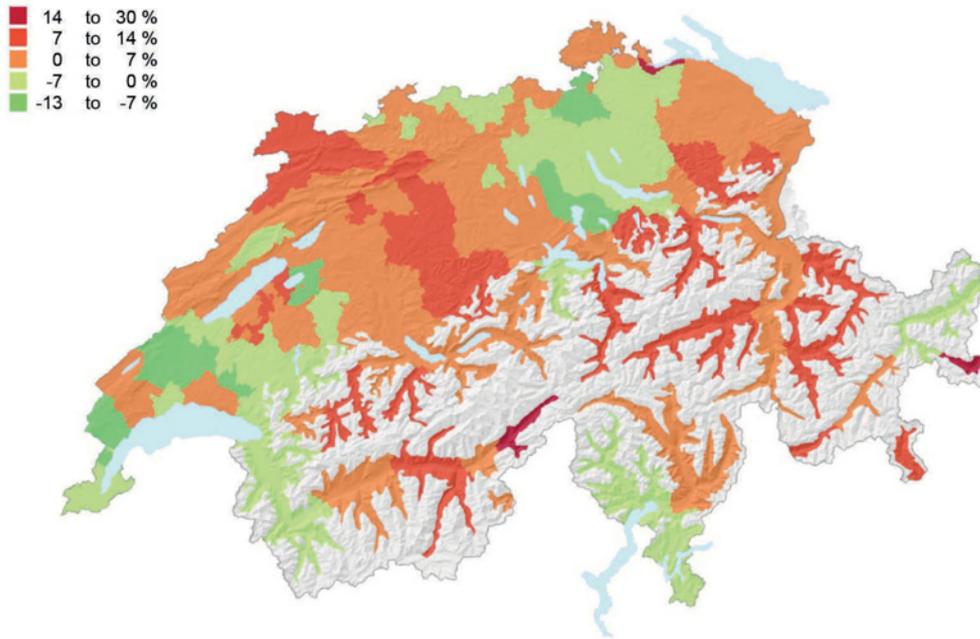


Figure 1: Change in settlement areas per person according to spatial planning regions between 1992/97 and 2004/2009 (in %) (source: ARE 2014: 14, edited)

development in Switzerland has been declared by the Federal Council as ‘unsustainable’ (BR 2012: 18), despite the fact that an international group of experts issued the warning years earlier that:

‘Urban sprawl with its consequences does not make sense either economically or ecologically, and it limits the scope of action of coming generations [...]. The settlement areas have essentially already been built. [...] Development must largely be managed on the basis of the transformation of existing built structures.’ (ARE 2006: 13 translation by the author).

Sporadic criticism of the concept of ‘urban sprawl’ by experts (HESSE/KALTENBRUNNER 2005: 16 ff., KOCH/SCHUMACHER 2012) clearly indicates the need for a more differentiated approach to spatial planning in order to meet future development with suitable measures. Taking the growth of demand for settlement areas per capita as well as the undesired effects resulting from disproportional settlement extensions at the edge of the mostly existing developments into consideration should prove more insightful. Accordingly, in its strategy for sustainable

development, the Swiss Federal Council postulates that a reference value for settlement area consumption should be stabilized at 400 m² per capita (BR 2012: 30). Yet, according to the land-use statistics of the federal government, nowadays this value already stands at roughly 407 m² per person (BFS 2013c: 10). It is also clear from the summary that most of the increase in settlement areas results from an increase in the size of building areas², at the expense of farmland. The regional discrepancies, however, are substantial: Urban cantons show significantly lower values, for example, the Canton of Basel-Stadt with a 138 m² settlement area consumption per capita, compared to high values in predominantly rural areas, such as the Canton of Jura, with 827 m² per person (BFS 2013c). A spatial representation from the Federal Office for Spatial Development (ARE 2014) shows the rapid increase of the settlement area consumption per capita over the past two decades, in particular in regions outside the metropolitan areas of Zurich and Geneva (fig. 1). The data furthermore show that the actual densification during roughly the last 10 years (ARE 2014: 17) occurred almost exclusively in communes of the type ‘belt of major centers’

2 Surface of building and surrounding plot of land (BFS 2013c).

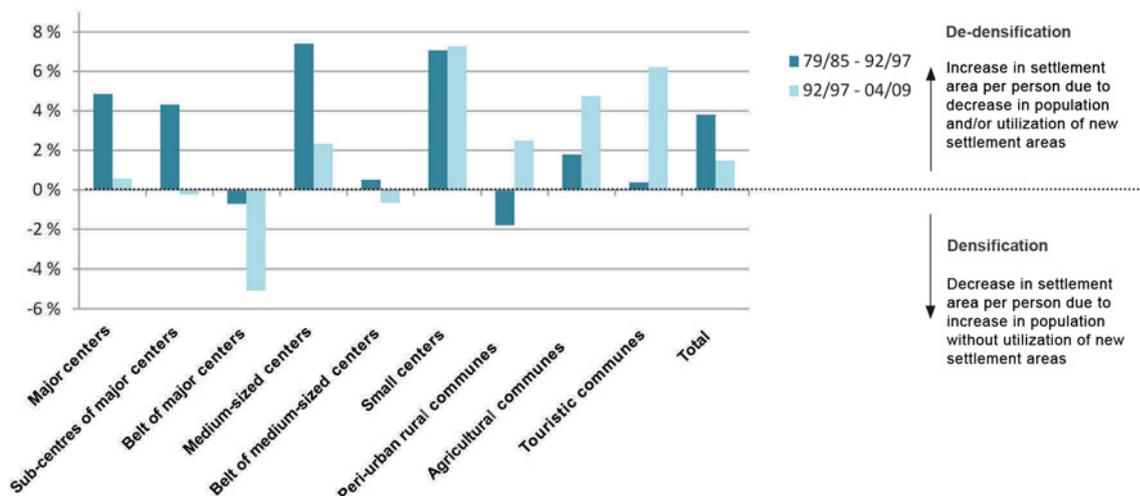


Figure 2: Development of settlement area consumption per person as per ARE types of communes (in %) (source: ARE 2014: 17, author's representation)

(fig.2). This can be attributed mainly to a growth in population without a corresponding mobilization of new settlement areas. This type of commune is even more conspicuous if, in addition to the population, the analysis includes the evolution of job numbers³.

All other types of communes show the opposite tendency: The settlement area consumption per person increases. This development, undesirable in terms of spatial planning, may be called 'de-densification.' In large cities like Geneva or Zurich, the trend toward de-densification recently abated somewhat but does not yet show negative values. Finally, the nationwide result shows a continuing increase in the average requirement for settlement areas per person, even though that rise has diminished over the past couple of years. The number of planning regions with a problematic development of economical land use increased by 50% (ARE 2014:22). Moreover, during the last 12 years there arose a significant contrast between the urban areas where the settlement area per capita has stabilized and urban areas⁴ where the settlement areas increased nearly twice as much as the population during the same time period (ARE 2014: 21). These trends indicate that there is current-

ly an above-average increase in the settlement area consumption per person in those regions where, according to the Swiss spatial concept, 'regions under settlement pressures' should be protected from further overdevelopment and land use should be contained (BR ET AL. 2012:46).

The growing consumption of individual settlement areas stems in particular from the fact that ever more living space⁵ is being allocated per person. While in 1990 this value corresponded to roughly 38m² per capita, up to 2012 it increased to approximately 45m² (BFS 2014a:3 ff.). Also, during the last 40 years, the proportion of single-family homes in the overall building stock in Switzerland has risen from 40% (1970) to roughly 58% (2012) (BFS 2014b:1). There was also a marked increase in new single-family houses throughout Switzerland during the past years, so that, in 2012, 63% of all new buildings for permanent housing were single-family houses (BFS 2014b:1).

The spread of new settlement areas together with an increasing consumption of settlement areas per capita has resulted in the complete disconnection

3 Full-time equivalents.

4 Urban cores and surrounding communities as well as isolated towns (ARE 2014:20).

5 Sum of the surfaces of all rooms: kitchen, kitchenette, bathroom, toilets, storerooms, hallways, verandas etc. of a flat. Without mansards, open balconies, and terraces as well as nonhabitable basement and attic spaces (BFS 2012a:62).

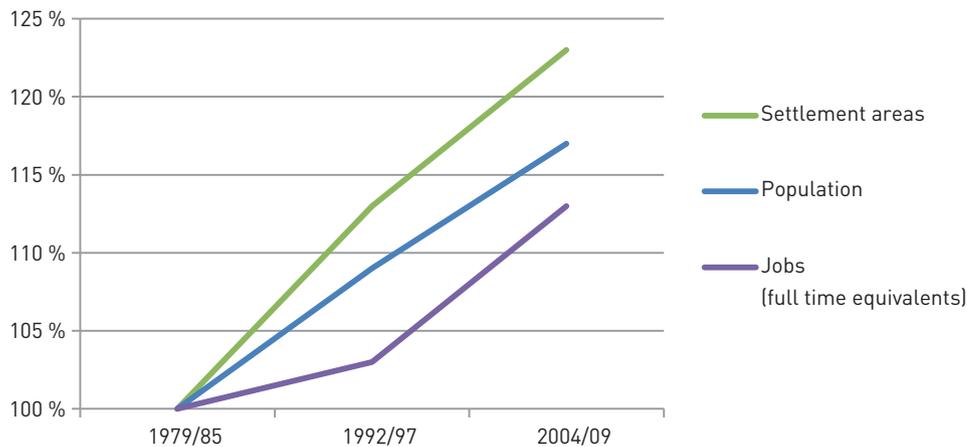


Figure 3: Development of settlement areas, population, and employment (source: ARE 2014: 5)

between population growth, settlement areas and job development (fig. 3). Over the past 30 years, the increase in settlement areas has greatly outpaced the increase in population and employment numbers (ARE 2014: 5).

Given these developments, the question arises whether this tendency will continue if unchecked, as further strong population growth is forecast for Switzerland in both the medium and long term (BFS 2015b), with the Federal Statistical Office assuming a population growth of 12% to 31% in all its scenarios. The permanent resident population of Switzerland is forecast to grow from nearly 8.4 million inhabitants at the end of 2015 to between 9.4 and 11.0 million inhabitants by 2045 (fig. 4). According to current trends, particularly during the next 10 years the Cantons of Fribourg, Vaud, Thurgau, Zug, Valais, Aargau, Geneva, and Schwyz will show the largest increase in population growth (BFS 2015b). Specifically, the Cantons of the Swiss Central Plateau, i.e., Vaud, Fribourg, Aargau and Thurgau, will see disproportionately strong growth. In contrast, peripheral, nontouristic regions such as those found in the Cantons of Jura or Grisons, will have the smallest growth rate. The projected growth for the Cantons of Aargau, Fribourg and Vaud will be due mainly to internal migration, whereas metropolitan areas will likely profit from international migration. Yet this development depends largely on national and international economic and political developments, with barely predictable consequences, the latest example being the federal

popular initiative ‘Against Mass Immigration,’ which was narrowly accepted by the voters in 2014⁶. This initiative demands a limit to the number of residence permits for foreigners in Switzerland through annual quantitative limitations and quotas. It remains to be seen to what extent this constitutional amendment will in fact influence the future evolution of the population in Switzerland. Yet it provides a fitting example for the fact that population forecasts generally must be treated with caution.

However, the trend toward increasing consumption of settlement areas without concurrent population growth is not limited to Switzerland. Rather, this phenomenon can be observed on a Europe-wide scale (BOCK ET AL. 2011:30f.). In contrast to neighboring countries such as Germany or Austria, which intend to reduce the areas for settlement consumption – Germany aims to reduce the daily growth of 87 ha (2010) to 30 ha by 2020 (BUNDESREGIERUNG 2012) – as described above, Switzerland has a ‘density aim’ that, besides the use of land, explicitly recognizes the importance of the demographic development. The sustainable development strategy of the Swiss Federal Council (BR 2012) seeks to stabilize the per capita settlement area to an average of 400 m² for the whole of Switzerland. The stipulation of a ‘population density target’ rather than an absolute ‘settlement area goal’ has quite obvious advantages should the demographic development stagnate or even decrease (SIEDENTOP 2011), in which case the settlement areas must be strictly limited and even returned to

6 Art. 12a FC.

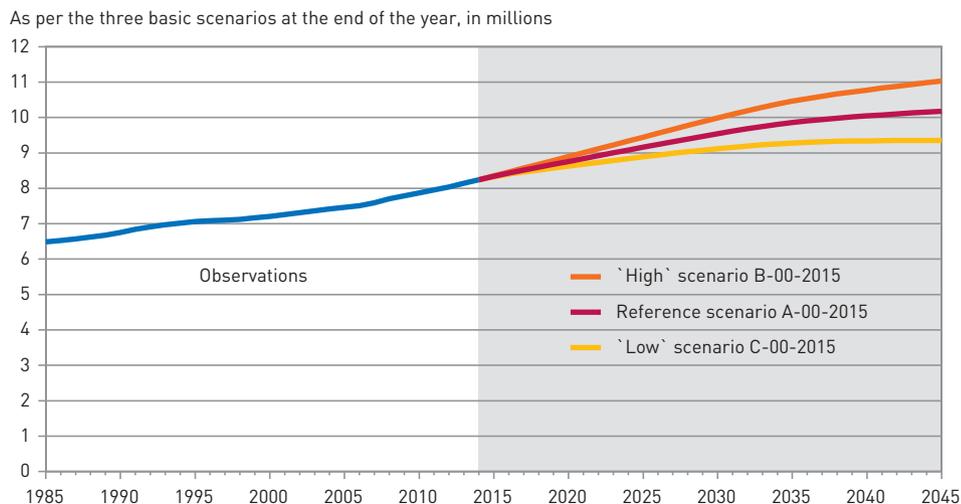


Figure 4: Future population development in Switzerland according to the three basic scenarios (source: BFS 2015c, edited)

their prior state. Should the population continue to grow, however, new demands for settlement areas may become possible while complying with the target value. If a community falls short of a target value, new residential areas may be necessary for new inhabitants. There is thus no incentive to accommodate the growing population within the existing settlement areas. Neither the demand for an absolute goal for settlement area target size nor the relative goal of reaching a population density target seem to provide promising options for inward development in case of a marked population growth.

Limiting the consumption of settlement areas in order to achieve sustainability goals constitutes a central task of spatial planning – not only in Switzerland. This is also shown by the research results for the limitation of settlement area demands and sustainable area management in Germany REFINA (BOCK ET AL. 2011). But the examples of developing (and emerging) countries prove this is a global task (JENKS ET AL. 1996). To be successful, according to Jenks, the discussion needs to move from theory to the tangible methodological knowledge necessary for determining how the goal of area reduction can be achieved in various countries within a reasonable timeframe (JENKS ET AL. 1996:343).

1.1.2 Current legal conditions for inward development

In order not to curtail the scope for action of future generations, limiting the consumption of settlement areas despite population growth is the logical choice for Switzerland. With its limited land available for settlement – because of its topography, only some 30% of the overall national territory can actually be populated (BRP/EJPD 1998:53) – and because its landscape is pivotal in shaping its identity, Switzerland needs to develop timely and appropriate strategies and take suitable efficient and effective measures to counteract any negative consequences of land-intensive settlement development. Means to supply the ever-increasing demand for space need to be sought in existing constructed areas. The minimum strategy for the spatial planning in Switzerland developed to achieve this goal, called ‘inward development before outward development,’ was announced over 20 years ago (BR 1996:594). Current federal strategy for sustainable development complies with the minimum precept of ‘inward development before outward development’ by striving to achieve space-saving building and establishing inward development as the goal for the whole of its territory:

‘Efforts should be made to achieve polycentric spatial development with settlements that are as compact and space-saving as possible, spread across the whole of Swiss territory. [...] Greater efforts must be made to ensure economical land use and

to encourage more inward settlement growth. [...] Steps must be taken to ensure the balanced development of the country's subspaces and to achieve a transportation system that meets the needs of business and the population while reducing the negative impact of transportation on people, the environment and the economy.' (BR 2012: 19)

The Spatial Strategy for Switzerland corresponds to this strategy and serves as frame of reference for the three levels of government as well as an aid for decision-making with respect to future spatial development (BR ET AL. 2012). In addition to encouraging polycentric spatial development and reinforcing cooperation in functional spaces, this strategy states that settlements should be limited and developed inwardly (BR ET AL. 2012: 43):

- Settlement development should be focused on the already built-up area in order to minimize land use.
- Compact settlements means decreasing the costs of operating the infrastructure.
- Inward settlement growth entails a higher utilization of existing settlement areas and the development of vacant lots and gaps between buildings, as well as restructuring and reutilizing settlement areas and fallow land. It remains to be determined whether a change in the designation of agricultural land to building land may be offset by redesignations in appropriate places.

Over the past few years, there have been increasing signs that the strategy of 'inward development before outward development' is becoming accepted as the minimum strategy by a large part of the population. Swiss voters overwhelmingly accepted the first partial revision of the Spatial Planning Act in the Spring of 2013. The reinforcement of the economical use of land as a nonrenewable resource and the strategic thrust toward inward development on a national level were thus enshrined in law (SCHWEIZERISCHE EIDGENOSSENSCHAFT 2014).

The enactment of the revised Spatial Planning Act in Spring 2014 thus made inner development an explicit obligation for all three levels of state. The act also

contains several statements on qualitative aspects (tab. 1): Settlements should be developed in a more compact manner while also ensuring an adequate quality of life; the spread of settlements should be contained though not against the needs of the population; the use of undeveloped and underused plots of land is encouraged in order to achieve the densification of existing stock. The cantonal structure plan is the most important tool for the implementation of the Spatial Planning Act since it demonstrates precisely how a high-quality inward development should be achieved and how existing housing stock should be renewed. A further result of the enactment of the revised Spatial Planning Act is the now shared responsibility of the federal government and the cantons for determining building zones. The overall extent of building zones within a canton and proof of 'future need' now must be coordinated across municipal borders and conform to a common strategy as specified in the structure plan. The choice of how to allocate building zones within a commune falls to the respective canton (UVEK 2014:3). Within 5 years, the cantons are called upon to adapt their structure plans to the new legal requirements and have them approved by the Federal Council. Until such time, the overall size of building areas lawfully zoned so far in a canton may not be increased.

In the wake of the Planning Act, numerous efforts were made at the canton level to anchor in law the minimum strategy 'inward development before outward development' in the form of 'building zones for a densified way of building.' Lucerne, for example, introduced an article 'Inward settlement development (Siedlungsentwicklung nach innen)'⁷ in its cantonal planning and zoning law, stating that, if appropriate, existing built structures should be densified and renewed. It is up to the communes to locate suitable spaces for the inward development of settlement and to indicate areas for dense construction 'where a higher building coverage ratio compared to zone-appropriate use is applied.' At the same time, it is necessary to agree on minimal structural usage for both new and replacement constructions⁸. The Canton of Glarus, too, lists zones of densification as overlaying zones in its planning and zoning law⁹. According

7 Art. 39 par. 1 'Planungs- und Baugesetz des Kantons Luzern' of 7 March 1989 (status per 1 January 2014).

8 Art. 39 par. 2-4 'Planungs- und Baugesetz des Kantons Luzern' of 7 March 1989 (status per 1 January 2014).

9 Art. 20 of 'Raumentwicklungs- und Baugesetz des Kantons Glarus' (voted on at the Landsgemeinde on 2 May 2010).

Topic	Content of the legislable text	Articles
Inward development	The federal government, the cantons, and the communes especially support the endeavors guiding settlement development inwardly and creating compact settlements with the aid of spatial planning measures, while taking into consideration the appropriate quality of housing.	Art. 1 par. 2, lit. a.bis
Densification	The settlements are to be designed according to the needs of the population and restricted in their expansion. Measures should, in particular, be taken for enhancing the use of pieces of fallow or underused land in building zones and the possibility of densifying the settlement area.	Art. 3 par. 3, lit. a.bis
Structural planning	The structure plan, in terms of settlement, specifies in particular how high-quality inward settlement development can be achieved and how settlement regeneration can be enhanced.	Art. 8a par. 1, lit. c and e
Dimensioning of building zones	The position and size of building zones are to be coordinated across communal boundaries. Land can be assigned anew to a building zone if it is expected to be required, developed, 4, lit. b and built on within 15 years, including in the case of consistent mobilization of inner land use reserves in existing building zones.	Art. 15 par. 3 and 4, lit. b

Table 1: Key articles for inward development and densification in the revised Spatial Planning Act 2014
(source: author's representation)

to the building regulations¹⁰, communes can designate 'renewal and densification zones' in their zoning plans within the building areas, provided that 'district renewal' as well as 'inward densification' are in the public interest and deserve being fostered. The draft for the new planning and zoning law of the Canton of St. Gallen provides for a novel creation of 'development zones'¹¹ that aim to 'allow high-quality structural densification on strategically located areas.' Accordingly, they should enable new projects on underused settlement areas. Within their legal framework, certain cantons allow setting a minimal usage in the municipal structure plans¹².

A systematic survey of selected cantons shows that, according to cantonal planners, the authorities have a range of instruments for establishing inward development (HANSELMANN 2013:41). However, there is still hardly any empirical evidence as to the effectiveness of the legal stipulations regarding minimum utilization and densification zones. It is expected that, by adapting the structure plans to the provisions of the revised Spatial Planning Act, by 2019 more options will be added to promote inward development in the framework of the guidance planning.

1.1.3 Overview of reserves for inward development

The comprehensive implementation of the minimum strategy 'inward development before outward development' can become reality only when sufficient alternatives to external development as well as real opportunities for inner renewal and transformation can be demonstrated. Directing spatial development toward the largely constructed area within previously developed building zones increases the importance of knowledge about areas that are locally being considered for inward development. Back in the early 1990s, the Swiss Association for National Planning published a practical guide to record usage reserves (VLP 1992), and subsequently an implementation guide for collecting, evaluating and mobilizing the use of reserves in largely overbuilt construction zones was issued by the Federal Government (BRP/EJPD 1996). In the late 1980s, the planners Hannes Wüest and Christian Gabathuler had investigated how to preserve the existing building stock. Contrary to the then often quoted demands for the use of undeveloped land reserves, they instead directed their attention to the possible development of reserves within existing settlements (WÜEST/GABATHULER 1989, WÜEST ET AL. 1990).

¹⁰ Art. 28 Building Code of the Canton of Glarus of 23 February 2011 (status per 1 July 2011).

¹¹ Art. 17 'Planungs- und Baugesetz (PBG) des Kantons St. Gallen' – report and draft from the Works Department of the Canton St. Gallen 15 May 2012.

¹² Cantons of Solothurn, Schaffhausen, Neuchâtel, Obwalden, Uri, Zug, and Zurich.

In addition to such general and quantitative overviews of eligible areas, it is essential to gather qualitative information about problems or opportunities for these areas. Our knowledge of possible obstacles to mobilization, time availabilities and their distribution within the construction zone are of great importance to a comprehensive implementation of inward development. Yet such problem-oriented overviews have not systematically been collected in Switzerland. Nor are they readily available in Germany and Austria, both of which share with Switzerland a comparable federally oriented planning system, including the corresponding distribution of tasks and competencies (NEBEL 2013:54). This formed the starting point for the initiative 'Raum+' ('Space+'), a research initiative of the ETH Zurich to assess the inward development of reserves (ETH ZÜRICH 2010:5), which essentially provides a method for creating and maintaining a comprehensive overview of existing reserves in the zone plans at the communal level. Since the overviews of the cantons and the communes are created collaboratively, the results form an objective basis for settlement-development-directed internal. The properties and opportunities of reserves become identifiable and quantifiable through the categorization of reserves in vacant sites, inward development potential, outside reserves and districts for infill development (tab.2). This categorization is an important basis for the coordination of specific measures through which inward development can be implemented on a case-by-case basis. In 2008, the Federal Office for Spatial Development summarized the different approaches to the survey of usage reserves in a concept study that deemed the problem orientation of the 'Raum+' method, with its bottom-up approach, to be particularly expedient for the collection of usage reserves (ARE 2008: 1). This method has the great advantage that a survey of actual available reserves, carried out with the help of communities, inspires the latter to act. Hence 'Raum+' provides a tool for achieving an action-oriented added value – which also allows regional queries since it is based on community-specific information.

An evaluation of the data¹³ gathered so far shows that significant settlement area reserves are available in Switzerland (WIDLER 2013, SCHOLL 2013). Each type of commune¹⁴ has between 11 and 40m² settlement area reserves per space-user for living and working in the legal building zones. In tourist communities, this value increases sharply to 82m² per space-user (fig.5, p.10). The proportion of inner reserves (reserves in largely developed areas) of the total settlement reserves is over 50%. The proportion is lower in rural areas than in urban areas, but in absolute terms is still higher. The average estimate of settlement space reserves per space-user in Switzerland currently lies at 20–30m². According to local authorities, in around 50% of all the reserves surveyed, there are no mobilization obstacles, i.e., these areas are theoretically available at short notice. The unwillingness of owners, contaminated sites as well as noise are the main reasons for a lack of availability of settlement area reserves. A country-wide (conservative) assessment of Switzerland also shows that the internal use of reserves corresponds to a population capacity of 0.7–1.9 million inhabitants (ETH ZÜRICH 2012:8). These reserves – subject to their mobilization – could accommodate the entire projected population growth of the high scenario of the Federal Council (BFS 2010) for a 15-year horizon of the structure plan. Individual studies, for example, from the Cantons of Zurich, Aargau and Basel-Land, also show that the degree of development – the ratio between officially approved and actually built floor areas – averages between about 60% and 65% (KANTON ZÜRICH 2009, KANTON AARGAU 2006, WIDLER 2010). The Federal Office for Spatial Development ARE also estimates the nationwide degree of development in Switzerland to be about 60% (ARE 2008).

The implementation of these reserves from the current planning law would be possible without any institutional need for action, though it must be assumed that only a fraction of these reserves is actually available for inward development. The reasons for the incomplete use of the legally available volumes and surfaces are complex and range from regulatory constraints, such as spacing requirements, building lines and usage limits regulated under private law, to

13 Surveyed cantons or regions (status per 2013): Basel-Landschaft, Schwyz, Uri, Ticino, Valais, Graubünden, St. Gallen, Thurgau, Schaffhausen, and Appenzell Innerrhoden.

14 According to the categories established by the Federal Office for Spatial Development (ARE).

<i>Categories</i>	<i>Area size</i>	<i>Building status</i>	<i>Location</i>	<i>Ascertained features</i>
<i>Inward development potentials</i>	<i>> 2,000 m²</i>	<i>built /unbuilt</i>	<i>within a largely built on area; in building zone</i>	<i>Land-use zones, building status, development and readiness for building, owner types and interests, demand, desired future use, planning status, mobilization obstacles, temporal availability</i>
<i>Vacant sites</i>	<i>200–2,000 m²</i>	<i>unbuilt</i>	<i>within /outside a largely built on area; in building zone</i>	<i>Land-use zones, owner types, and interests, demand, temporal availability</i>
<i>Outside reserves</i>	<i>> 2,000 m²</i>	<i>unbuilt</i>	<i>outside a largely built on area; in building zone</i>	<i>Land-use zones, development, and readiness for building, owner types and interests, demand, mobilization obstacles, temporal availability</i>
<i>Districts for infill development</i>	<i>quarters</i>	<i>built</i>	<i>in building zone</i>	<i>Age of development, building condition and type, ownership status and interests, willingness of commune, re-densification goal and type, planning horizon</i>

Table 2: Area categories and features as ascertained with Raum⁺ (source: author's representation)

qualitative considerations, such as securing private green spaces or views. Moreover, in Switzerland almost 90% of the approximately 1.5 million buildings are privately owned (BFS 2014c), and mobilization of theoretical reserves does not often enter into the focus of such owners' interest. A study in the city of Zurich showed that, despite developmental pressure, only around 55% of private property owners plan structural investments in the medium term, which would also include a densification of built houses (SREI 2013: 16). The main reason given for foregoing structural investments is that they had recently invested or that the buildings were new, precipitating a lack of need for new investments. Others are deterred by the cumbersome building permission procedures as well as the many requirements and regulations in connection with site development. This results in a great temporal and thus financial effort that – from the perspective of private property owners – seems out of proportion to any potential income generated by the measure (SREI 2013: 16).

Against this background, fully exhausting the inner reserves therefore seems hardly feasible in practice. It becomes ever clearer that future urban development cannot be limited to expansion within existing legislation; rather, the question of additional potential for inward development, yet to be identified and secured by suitable methods, must be discussed.

1.1.4 Building density as key size of inward development

The current trends sketched above, specifically applicable for Switzerland, mean the limitation of settlement area consumption is an urgent requirement for spatial planning if the adverse consequences of land-intensive growth are to be mitigated or even prevented. The stipulations in the revised Spatial Planning Act set the focus of settlement development on previously zoned construction zones and in particular on the already largely overconstructed areas. Accordingly, new building zones can be claimed only if the demand over the next 15 years can no longer be met with existing reserves. As indicated above, substantial reserves as defined by building law are available in the construction zones, which is actually tantamount to a 'zoning moratorium' in many communities.

The logical consequence of restricting residential development to already previously developed building zones in light of simultaneously continuing population growth and the rising consumption of floor area per capita is an increase in the building density within the existing settlement areas. Particularly structural densification is essential, because of the rising floor consumption per capita, if only to keep the population at the same level.

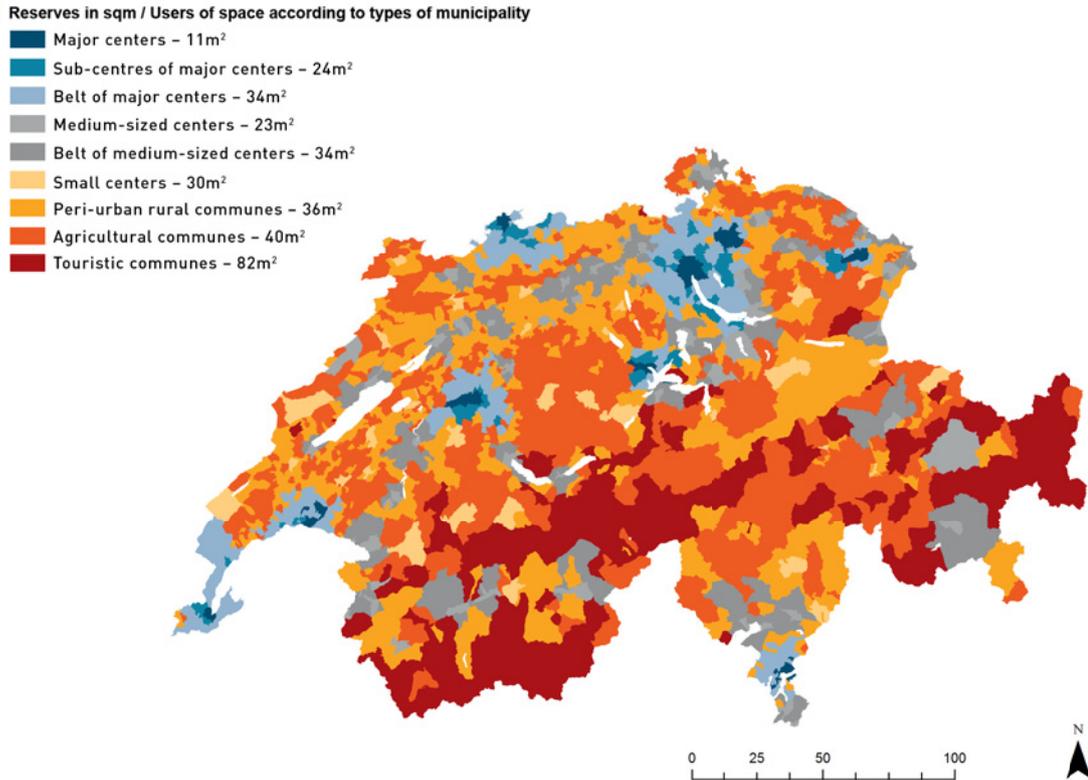


Figure 5: Estimation of reserves according to type of commune and per space user (source: WIDLER 2013: 10)

Regulation of building density was recognized as the central control instrument of formal planning already in the 1960s (ALBERS 1964, ROSKAMM 2011b). In Switzerland, in the 1970s, in the wake of the draft purpose article of the Spatial Planning Act, experts proposed the 'reasonable limitation of the settlement area adapted the country's future development' (ROTACH 1973:19) as well as, in regional planning mission statements, the prevention of the rising demand for settlement area per capita by controlling the type of settlement with a high degree of expansion and a 'reasonable' floor-area ratios (ETH ZÜRICH 1971:364). In the late 1990s, regulation of the building density as a key element of inward development resumed, particularly in discussions in the Anglo-Saxon world, through the propagation of the concept of 'compact city' as urban development oriented toward slow traffic, with high building density (JENKS ET AL. 1996, DIELEMAN/DIJST/SPIT 1999).

More recently, the notion of building density has triggered wide-ranging research interest within architecture (LAMPUGNANI ET AL. 2007, BERGHAUSER PONT/HAUPT 2010, EBERLE/FRANK 2012, EBERLE/TRÖGER 2015). Similarly, the history of density as a fluctuating concept came to be studied scientifically (ROSKAMM 2009, 2011a, 2011b). One could even speak of a 'return to density' (VIGANÒ 2012), which consciously ties in with the debate in the 1990s and declares the increase in building densities in existing buildings to be a 'political project' (HOFFMANN-AXTHELM 2012).

Planning experts from Switzerland, Austria, and Germany have been reaffirming for several years that, for economic reasons, building density also forms an important aspect of inward development (ECOPLAN 2000, SIR 2007, DANIELZYK ET AL. 2010, ARNDT ET AL. 2011, HORAK 2012). The savings that can be achieved by a dense form of settlement compared to dispersed development are considerable: The costs

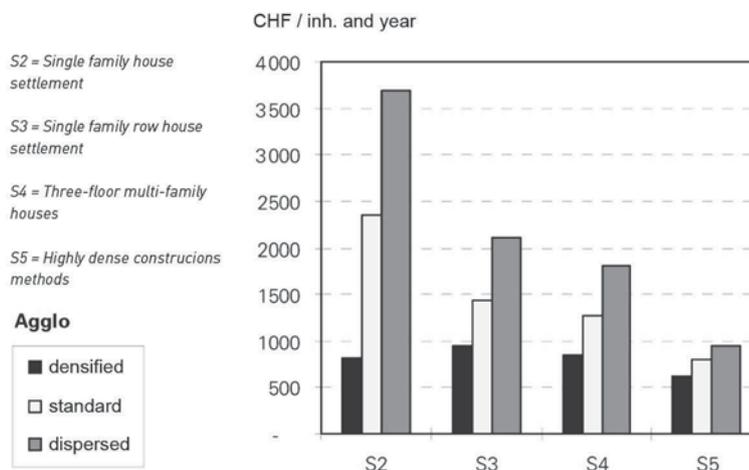


Figure 6: Long-term marginal costs of different settlement extensions in an agglomeration commune
 (source: ECOPLAN 2000: 131, edited)

per capita and year can differ by a factor of up to 3 (fig. 6). The decisive parameter is the capacity of existing infrastructure¹⁵ that can be shared during the development of existing built stock up to its maximum capacity. In particular, research on shrinking cities in Germany also shows that the effectiveness of technical infrastructures relates directly to built density and population density (WESTPHAL 2008, KOZIOL/WALTHER 2006, SCHILLER/SIEDENTOP 2005, KOZIOL 2004, HERZ ET AL. 2002). Below critical thresholds, de-densification processes cause additional costs for the individual customers (SIEDENTOP 2011).

Thus, bearing also financial aspects in mind, orienting settlement development toward the existing housing stock appears unavoidable in the long run. This becomes all the more significant if fewer long-term financial resources are allocated by the public sector for space planning. In Switzerland, particularly the demographic development shapes the long-term perspective for public funds, which also impacts spatial planning. The debt ratio is an indication of the financial sustainability of public finances (EFD 2012). In the medium term, the financial performance of the social security funds leads to an increase in debt at the federal level (fig. 7, p. 12). The same picture emerges for the cantons: They are demonstrating a

clear trend toward increasing debt in particular because of the dynamics in health and long-term care. According to estimates by the Federal Government Health, expenditures will also result in overspending in communities, yet should remain bearable thanks to sufficient surpluses. In the long run, the public sector, particularly the Confederation and the cantons, will therefore be hard pressed to maintain the current level of spending on spatial planning. It will presumably also become increasingly more difficult to win over a majority of future voters, of increasingly higher average age, to implement planning issues in the cantons and communes. And because of the usual lead times, the positive effects of any spending will be felt only over the long term. This forecast reinforces the urgent need to steer urban development into existing settlement areas; this is the only way to curb spending costs for construction and maintenance in the public sector, which in turn frees up funds for other future planning efforts.

Formal advance planning, however, can neither directly control populace opinion, nor prevent private demand for ever more space per capita. Its formal instruments only allow it to ensure an increase in the building density in appropriate locations. But even a moderate increase in building density can help to maintain or even increase the quality of the living

¹⁵ Wastewater disposal, water disposal, traffic, and power disposal.

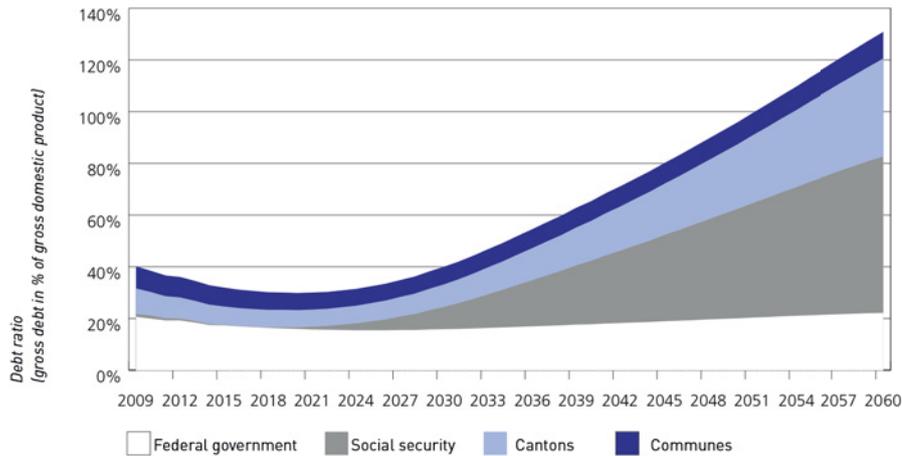


Figure 7: Increase in debt in the public financial budget until 2060 (source: EFD 2012:7, edited)

environment, despite the growing population in the existing settlement area. Building density is the essential component for economical land use – and in fact creates the conditions for multifunctional and thus traffic-reducing settlement structures (ARL 2005:311).

To some extent building density serves as the link between demographics and planning, between quantity and quality, and thus remains the key factor in inward development.

1.1.5 Paradigm shift in local planning

The enactment of the revised Spatial Planning Act 2014 shows that not only larger communes come under development pressure to consider the built stock as a necessary priority action for the economical use of land resources. Small- and medium-sized towns must also consider building within existing structures. The latter, however, are often more constrained in implementing available formal instruments. This was one of the key findings of the 2013 conference ‘Inward Development in Switzerland: Opportunities and Challenges’ at the ETH in Zurich (ETH ZÜRICH 2013a). Inward development has to date not really concentrated on the process of spatial planning in small- and medium-sized communes. Redeveloping existing constructed areas was unappealing because of the adequate and – compared to urban areas

– affordable reserves of building land. The scarcity or complete lack of knowledge about municipal land reserves in largely constructed areas, including the degree of development of their building zones, meant that local planning efforts focused on settlement expansion by means of rezoning. The surface area of rezonings was simply redimensioned via extrapolation based on the ‘average land consumption’ of recent years for the next 15 years – and most cantons could tolerate this procedure (BÜHLMANN 2013). The practice of hoarding building land – the conscious avoidance of the development of zoned, building land – is considered a common long-term investment approach, especially in rural areas. As a result, these areas may show up in possible surveys but are not available. The problem of hoarding building land is only reluctantly attacked because of the high esteem afforded property guarantees in Switzerland. In recent years, so the conference further, an increasingly negative attitude has taken root within the population toward the primacy of general growth in space development. The increasing skepticism of the public toward settlement expansion manifests itself, for example, in the rejection of spatial planning revisions at the communal level or in cantonal or national initiatives. Thus, in addition to the cantonal agricultural land initiative in the Canton of Zurich in 2012, the federal referendum ‘Schluss mit uferlosem Bau von Zweitwohnungen!’ (‘End boundless construction of secondary residences!’), which aimed to limit the number of second homes per commune to 20%, was

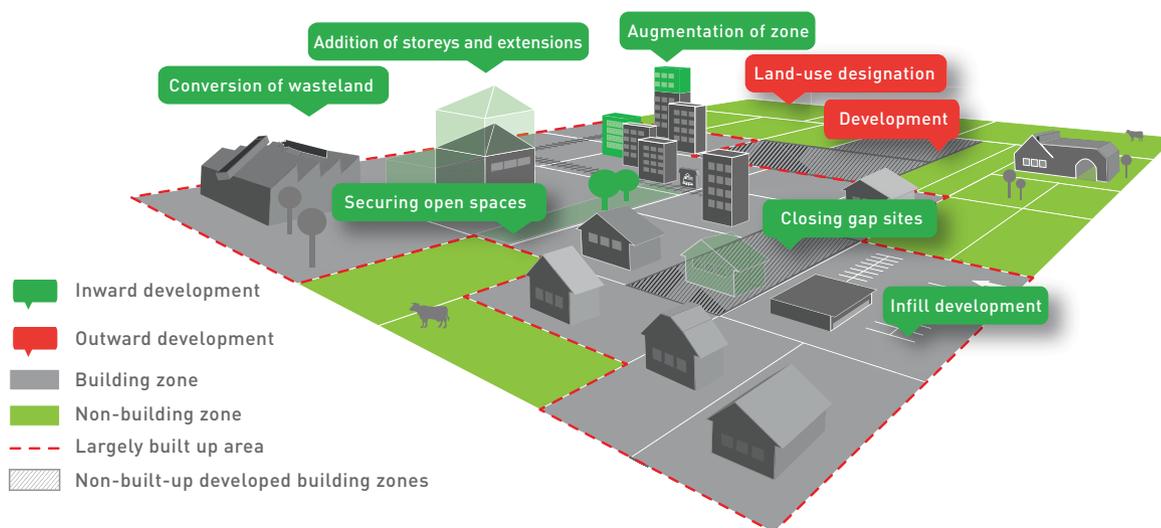


Figure 8: Schematic diagram of inward and outward development
(source: author's representation, based on ETH ZÜRICH 2012: 3)

accepted by 50.6% of the voters¹⁶. Furthermore, the referendum to revise the Spatial Planning Act in 2013 found broad favor particularly in rural cantons, with the exception of Valais¹⁷. Local authorities today acknowledge the sobering fact that the creation of new residential and working areas has failed to produce the anticipated tax revenue increases, but in many cases has rather caused disproportionate infrastructure costs. Furthermore, many small- and medium-sized communes in the Swiss Central Plateau have experienced a decline in their quality of public life stemming from the increasing individual motorized traffic in the city centers and its associated emissions. Thus, the framework for the creation of additional living and working spaces likewise deteriorates, retail businesses are forced to close down outlets, and the maintenance of properties within these problematic areas is neglected by the owners (BÜHLMANN 2013).

The correlation of this issue with increased outward development is recognized at the communal level. Nevertheless, particularly for authorities in small- and medium-sized communes, inward development

remains an extremely challenging task that can be initiated only in the rarest of cases by lay politicians in addition to daily business. Furthermore, it has become increasingly difficult for small- and medium-sized communes to adequately staff their executive functions with laypersons in part-time positions. The staff of communal planning departments, too, is professionally geared toward outward development: The work is organized to be applied to new settlement areas and the instruments tried and tested for just this purpose. However, the new tasks associated with the minimum strategy, 'inward development before outward development' will demand new expert skills from those involved which go well beyond the usual knowledge base and which cross the organizational, procedural, and administrative boundaries of individual communes. All of this constitutes more evidence for the fact that inward development demands a strategy formulated from existing reserves as well as the careful balancing of interests beyond communal boundaries. This amounts to a completely new understanding of planning in small- and medium-sized communes and the intensive questioning of the hitherto applicable approaches.

¹⁶ Federal Ordinance on Second Homes of 22 August 2012 (status per 14 November 2014), Art. 75b of the Federal Constitution.

¹⁷ Canton Glarus 66.6%, Fribourg 62.9%, Appenzell Ausserrhoden 66.0%, Jura 62.8%.

1.2 Definitions of Terms

Before identifying future problems and articulating research questions, key terms used in the present work, such as 'inward development,' reserves or density, are defined below.

1.2.1 Inward development and outward development

Inward development involves shifting spatial development to existing constructed areas, without resorting to cultivated land (ARL 2005:311). Inward development aims to initiate a positive change in the existing situation. Prioritizing inward development serves to stimulate the transformation of the built stock in order to increase the use of existing space. Recycling, intensifying, or replacing existing physical structures thus also constitute inward development and this should be combined with urban enhancements (ARL 2005:311).

In the present work, inward development means increasing the number of units for living and working within the zoned and largely constructed area while simultaneously improving public spaces¹⁸ and expanding technical and social infrastructures¹⁹. This includes ensuring that the intensification of built stock occurs primarily in places that are well served by public transportation. Necessary measures (fig. 8, p. 13) include the conversion of wasteland, structural postdensification by adding floors or extensions, adapting formal instruments by rezoning, protecting open spaces, filling vacant sites, or redeveloping plots after the demolition of built stock. The transition between inward and outward development is fluid, especially in peripheral areas, and must be defined with respect to the situational context. The reason lies in the demarcation of the largely constructed area: A building development bordering on an existing settlement with direct access to public transportation is still referred to in the present work as inward development, whereas the development of previously undeveloped but already zoned building land outside

a largely built-up area counts as outward development. New zonings outside largely built-up areas are invariably defined as outward development.

1.2.2 Reserves and potential

The central purpose of inward development is to increase the number of residential units, workplaces, and infrastructure in the already largely built-up area, while maintaining or increasing the quality of the existing living environment. Such intensification in use can occur within the framework of the current cantonal building and planning laws and the associated communal instruments for land-use planning in order to mobilize reserves by increasing the degree of development of the sites to their theoretical limits. The level of expansion is denoted by the ratio of actual achieved floor space to the maximum allowable floor area in accordance with the building regulations (fig. 9). Or suitable areas can be identified in accordance with land-use planning considerations for locally increasing the currently available volume or changing the use. Additional planning efforts are necessary for this should be feasible. These areas are referred to as 'potential' (GRAMS/NEBEL 2013:31).

The present work therefore distinguishes between 'reserves' and 'potentials.' Reserves are legally granted, but not yet materialized floor areas. Its meaning becomes clearer if we consider the French term 'réserve' for 'retained property' and the Latin root 'reservare' for 'reserve, retain' (WAHRIG 2009). Potentials, on the other hand, do not derive their legitimacy from the any existing local land-use planning, but rather are floor areas originating from a balance of interests prior to being set in planning law. This includes the exploration of additional floor space from a spatial-planning perspective. When focusing on inward development, it is important to distinguish between internal and external reserves and potentials (fig. 10, p. 16). The mobilization of external resources and potentials forms part of the outward development and is therefore excluded in the present study. By contrast, internal reserves and poten-

18 Green spaces, paved squares, street space, water environments but also public inner spaces such as railway station halls, passageways, etc.

19 Facilities for healthcare, police, fire brigade, civil defense, education, sport, culture, leisure, administration, transport, water, waste water, waste management, energy, and telecommunications.

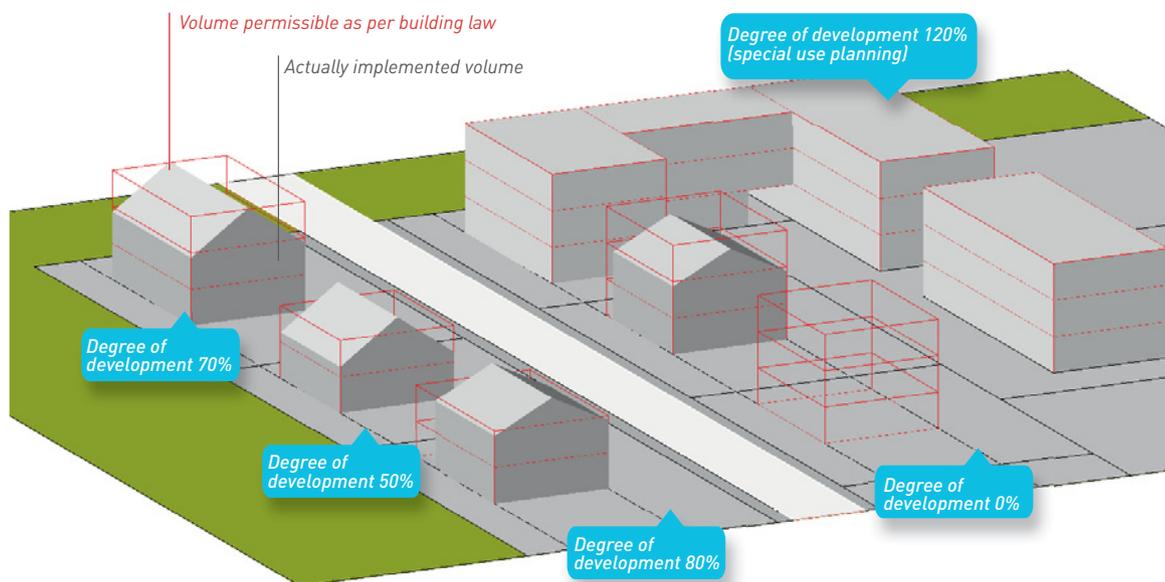


Figure 9: Schematic diagram of degree of development (source: author's representation)

tials may be found in the largely built-up areas and include the development of both completely undeveloped plots as well as the transformation of already built-up areas. While internal reserves are quantified in relation to landowners, the identification and mobilization of internal potential requires additional planning efforts. The latter are not based on the existing land-use planning, but must be explored using suitable methods within the framework of customized procedures. Once potentials have been secured in the appropriate formal instruments, they are then classified as reserves.

1.2.3 Density and densification

Varying definitions of 'density' can be found within different disciplines such as physics, mathematics, and urban planning, which may account for the rather vague use of this concept in practice. Density can generally be defined as the 'dense juxtaposition of similar beings or things in a space' (DUDEN 2014) and 'the quantity of people or things in a given area or space.' Here, we see the two necessary components in the use of this concept: similarity and spatial relationship. Density invariably involves the linking of several of the same entities – such as number of residential units, residents, or square meters of floor space – with a spatial reference size such as settlement area, district, or site.

The term originated in physics, where it quantifies the ratio of the mass of a substance to its volume. In 1687, Isaac Newton defined the term for the first time in the scientific literature as 'physical density' (ROSKAMM 2011a:9). In German, it is illuminating to look at the etymology of the word from the Indo-European that equates 'dicht' ('dense') with 'geronnen' ('clotted'), analogous to a substance changing its aggregate state from liquid to solid. Furthermore, the German terms 'Enge' ('confinedness') and 'Nähe' ('closeness') are seen as synonymous with the term 'Dichte' ('density') (WAHRIG 1980). This illustrates that the term has both positive and negative associations. Throughout history, the definition of the term density has meandered across many disciplines in various guises. Whereas until the mid-20th century the term evoked in urban development inadequate housing hygiene and social tensions, today its values – at least in specialist circles – tend to be positive, and the term is used 'synonymously with urban diversity, vitality, richness of experience' and 'for the urban per se' (SPIEGEL 2000: 39). In his fundamental text, the German planner Nikolai Roskamm classified the concept of density from the perspective of different disciplines and described the semantic change in detail throughout history (ROSKAMM 2011a).

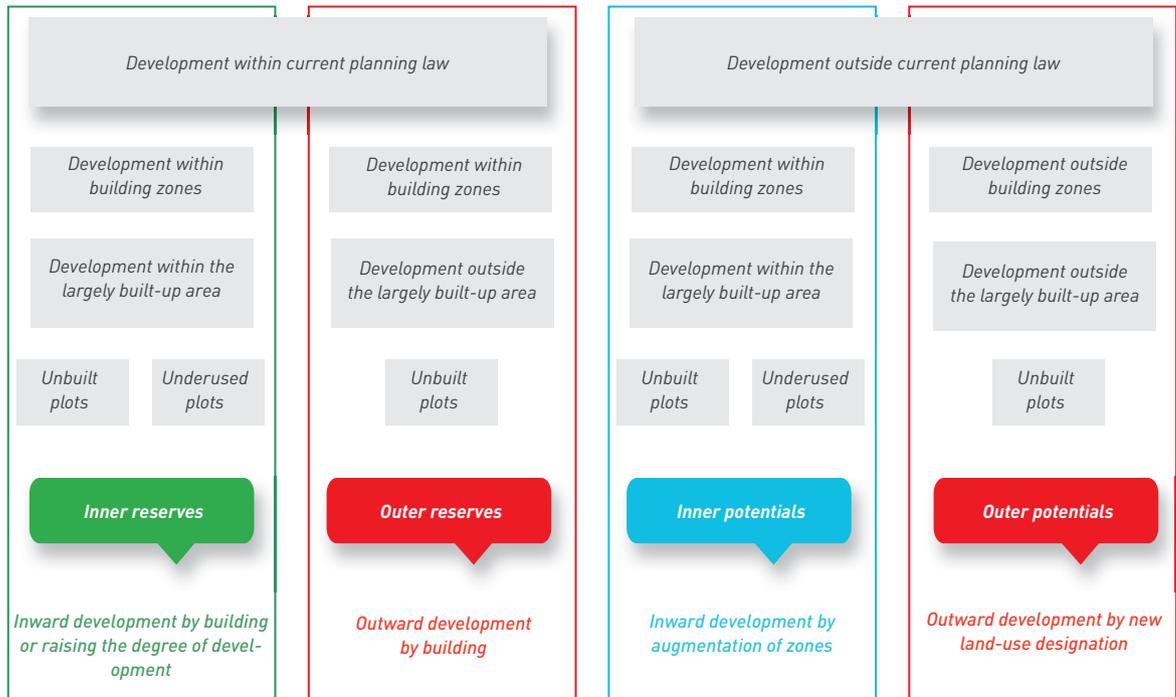


Figure 10: Principal possibilities of settlement development within the Swiss planning system
 (source: author's representation, based on GRAMS/NEBEL 2013)

The statements in the present work are informed by an understanding of spatial planning as an action-oriented discipline²⁰. Therefore, my concept of density is oriented toward definitions essential to Swiss spatial planning practice (tab.3). Even if the different notions of density terms are all quantifiable, there need not necessarily be a correlation between them. Thus, for example, a high population density does not necessarily equal a high building density; a high social density may not be deduced from a high employment rate. This nonbinding interaction was discussed in detail by the German architect and planner Thomas Sieverts (SIEVERTS 1997: 40 ff.). The population density may decrease despite increasing structural density if the consumption for living space per capita increases (STADT ZÜRICH 2012: 30, 42, 56, 72). Simultaneously, Sieverts points out that building densifications are 'worth it' only up to certain location-specific thresholds; beyond that, they no longer contribute to an increase in development quality (SIEVERTS 1997: 41).

In development planning, a quantification of population density at the regional level usually makes sense only in rough statistical comparisons (fig. 11, p. 18). In expansion public-transportation projects, projections of population development, and existing reserves, it may serve as a basis for a discussion of possible strategies (SCHOLL ET AL. 2012). But differences in the characteristics of spaces at a district or site level are far too great, which severely limits the usefulness of this value at the local level of town districts.

Building density, which primarily expresses the relationship between floor area and building area, lies at the core of the present work. Yet, to enable a subtler discussion, it is also necessary to differentiate between the legally allowable building density and the actual building density. In municipal land-use plans, permissible building density is quantified by a dimensionless density ratio (floor-area ratio) and defined as the maximum floor area per attributable plot surface. What may be included in the floor area and what is counted as site area are specified in the cantonal

20 See page 35.

Term	Definition and area of application	Quantification for spatial planning
<i>Job density</i>	<i>Number of jobs (full-time equivalent) per unit area</i>	<i>Jobs per hectare</i>
<i>Outward density or outer population density</i>	<i>Number for the ascertainment of the actual housing and living conditions (SPIEGEL 2000: 42)</i>	<i>Number of inhabitants per hectare of residential land</i>
<i>Building density</i>	<i>Built or permissible floor areas or volumes per unit plot area (plot or quarter)</i>	<i>Floor area ratio, gross floor area ratio, building coverage ratio, building mass ratio</i>
<i>Occupancy density or inner density</i>	<i>Measure for the estimation of housing quality on account of the use intensity of a residential unit (SPIEGEL 2000: 41)</i>	<i>Number of inhabitants per residential unit or residential space</i>
<i>Employment density</i>	<i>Absolute number of employed persons per unit plot area (esp. per quarter)</i>	<i>Employed persons per hectare</i>
<i>Population density</i>	<i>Number of permanent residents per unit area</i>	<i>Inhabitants per hectare</i>
<i>Use density</i>	<i>Number of persons (inhabitants and employed persons) using the building zone of a commune or quarter</i>	<i>Space-user per hectare of building zone</i>
<i>Ecological density</i>	<i>Time and monetary value required for overcoming space (HAUSSER-MANN 2007: 24)</i>	–
<i>Space user density</i>	<i>Inhabitants and employed persons per unit area, independent of the building zone (cf. use density)</i>	<i>Space-user per hectare</i>
<i>Regulative density or regulatory density</i>	<i>Number of rules valid in a specific space. The higher the use density and heterogeneity of society, the higher is the regulatory density (HÄUSSERMANN 2007: 24)</i>	–
<i>Social density or interaction density</i>	<i>Number of interactions within a specific population group, independent of a spatial boundary (HÄUSSERMANN 2007: 25) Quantity and quality of the possible social contacts per settlement unit (SIEVERTS 1997: 40)</i>	–
<i>Settlement density</i>	<i>cf. Space user density</i>	–
<i>Spatial-visual density</i>	<i>Degree of experienceable constructional-spatial cohesion (SIEVERTS 1997: 40)</i>	–
<i>Residential density</i>	<i>Number for ascertaining the actual housing and living conditions (SPIEGEL 2000: 41)</i>	<i>Inhabitants per hectare of residential land</i>
<i>Dwelling density</i>	<i>Number for ascertaining the actual housing and living conditions (SPIEGEL 2000: 41)</i>	<i>Number of dwelling units per hectare</i>

Table 3: Density-related terms and their quantification (source: author's representation)

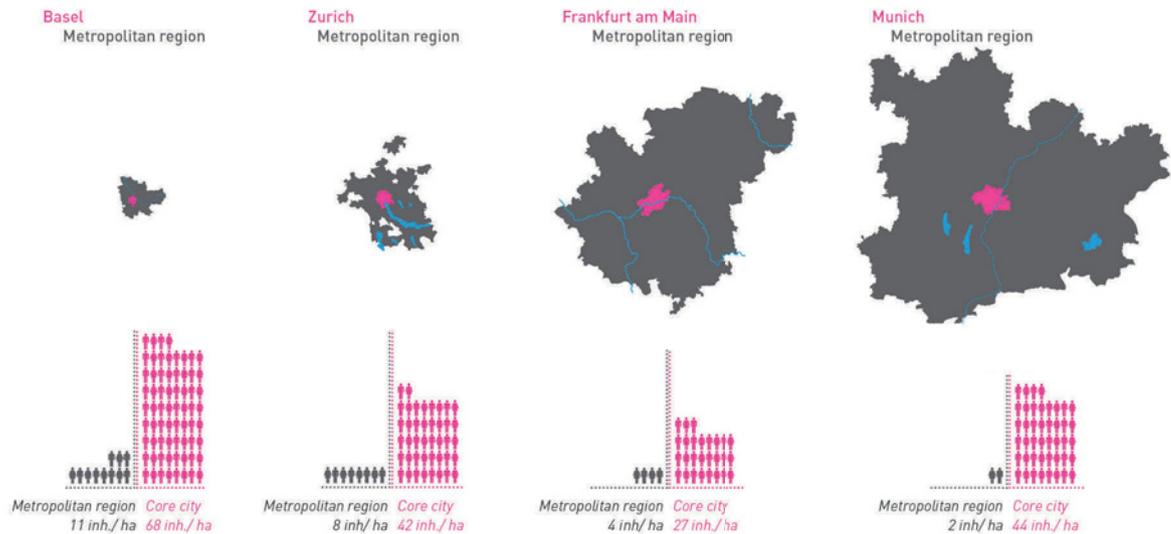


Figure 11: Population densities of the core cities and metropolitan regions of Basel, Zurich, Frankfurt am Main, and Munich (source: SCHOLL ET AL. 2012: 90, edited)

planning and building regulations. In contrast, the actual building density expresses the effective use of a site and is understood as the ratio of the actually built floor area to the applicable plot area. The difference between the permissible building density and the actual building density is denoted by the degree of development, expressed as a percentage.

Finally, densification applies to the increase in the building density, the number of residential units per unit area, or the population density. Its goal is to achieve a higher use density, thus permitting a higher social density. This, however, does not (yet) include the integrated development of accompanying infrastructure or public spaces. Densification should therefore not be equated with inward development, though it clearly does constitute a key component of inward development.

1.2.4 Quantification of building density

A clear definition of a density value is necessary if we are to compare building density in larger interrelated areas and to conduct an objective discussion. The permissible building density in Switzerland is regulated in the municipal zoning plans, and its method of measurement is defined in cantonal building and

planning laws. The definition of what constitutes 'high' or 'low' constructional densities depends on the situation and cannot be broadly expressed. Formally, it is based on the range of the density values set out in municipal land-use plans – usually as floor-area ratio. In Switzerland, 'low' structural densities for residential areas have a utilization factor below 0.3, whereas 'high' structural density values have a utilization factor above 0.6 (fig.12). There is a notable, so-called 'density jump,' an increase in permitted building density, from the two-story W2 zone to the three-story W3 zone. Adding a single further permitted floor leads to a disproportionate increase in the floor-area ratio, because of a change of typology from single- to multiple-family homes. This effect can also be observed in population density: While around 50 inhabitants per hectare live in two-story residential zones, this figure doubles in three-story residential zones (METRON 2011:3).

In Austria, density numbers are set in the country's building codes, and their definition varies only slightly in the individual Austrian provinces. The density numbers are defined for residential and mixed zones – and occasionally for work zones – and are established in development plans, which are adopted by the communes as a regulation and approved by the supervisory authority of the country. In Austrian building regulations, building density is expressed

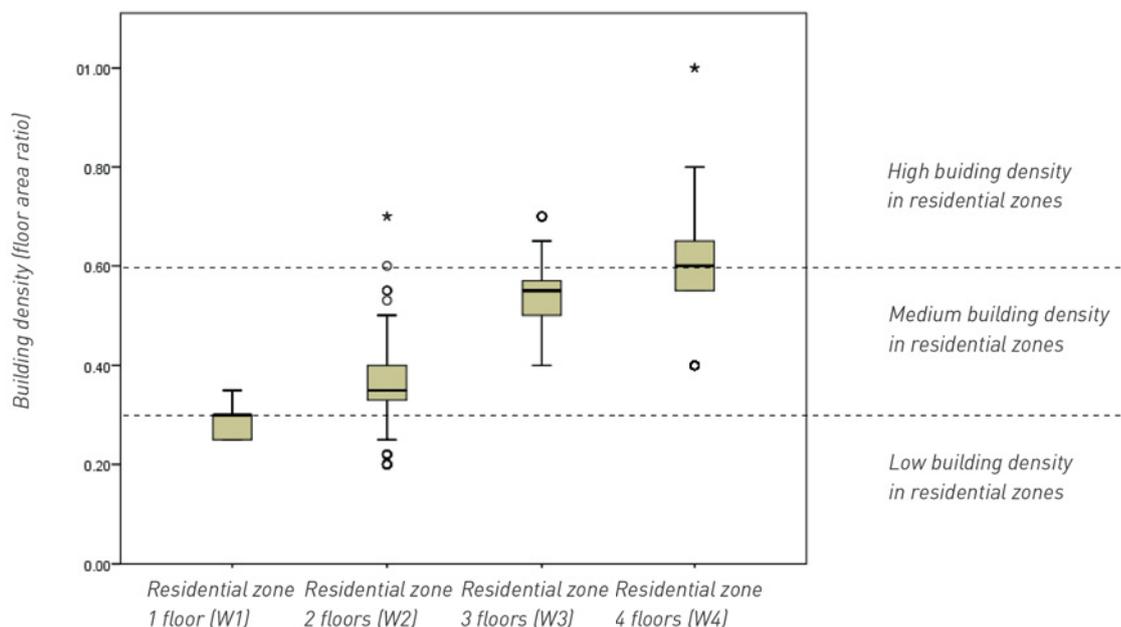


Figure 12: Permissible building densities in the residential zones of the Canton of Lucerne 2013

(source: author's representation, data: © Raumdatenpool Kanton Luzern [2013])

using the coverage ratio, the floor-space index, and the cubic index (tab. 4, p. 20). In addition, the open-space index describes the ratio of nonsealed surfaces to the total floor space. Germany uses the following density terms: coverage ratio, floor-space index, and cubic index, which are defined in nationwide regulations on the structural use of land (Federal Land Use Ordinance) and set down in the municipal zoning plans. It is interesting to note that, in the countries mentioned, the density figures are set as upper limits. As early as 1962, the floor area figure in the Land Use Ordinance became part of federal legislation in Germany (ROSKAMM 2011b:6). The density rules in Germany specify the upper limit, the quantification of which was based on a 'reasonable maximum degree' for population density. The debate that occurred during the 1950s postulated a 'tolerable' limit of 500 inhabitants per hectare. Multiplying that value by the value for the per capita living space utilization at that time (20 m²/person) result in the ratio of 1.0, which was subsequently declared to be the upper limit for building density in general residential areas (ALBERS 1964). The 1969 revision of the Land Use

Ordinance raised this threshold slightly from 1.0 to 1.2, and to this day this value constitutes the upper limit of building density in general residential areas in Germany (ROSKAMM 2011b:6). In Switzerland, no scientific studies have compared Roskamm's historical considerations of the emergence of the system of building density.

While the floor-space index in Austria and Germany clearly express the permitted building density, in Switzerland at least five different measurements of density are used, which furthermore vary widely in the manner of measurement from canton to canton. There is 'a terrible muddle of concepts, amounting to almost a Babylonian language confusion,' according to the Federal councilor in charge during the deliberation in parliament²¹. For example, in the 26 Cantons of Switzerland the height of a building is defined 26 different ways. There are also significant differences in the way density values, such as floor-area ratio, gross floor-area ratio, building coverage ratio, and green area ratio, are measured. This makes it considerably more difficult to compare building density

21 Reply of the Federal Council to the National Council regarding motions 08.3523 and 08.3524 on 22.09.2010.

<i>Density indicator</i>	<i>Definition</i>	<i>Application</i>
<i>Floor area ratio</i>	<i>Ratio of the sum of all gross floor areas to the applicable plot area</i>	<i>CH</i>
<i>Gross floor area ratio</i>	<i>Ratio of the sum of all above-ground and below-ground floor areas to the applicable plot area</i>	<i>CH</i>
<i>Cubic content ratio</i>	<i>Ratio of the building volume above the relevant terrain to the applicable plot area</i>	<i>CH</i>
<i>Building coverage ratio</i>	<i>Ratio of the applicable building area to the applicable plot area</i>	<i>CH</i>
<i>Green area ratio</i>	<i>Ratio of the applicable green area to the applicable plot area</i>	<i>CH</i>
<i>Coverage ratio</i>	<i>Ratio of the permissible building area to the plot area</i>	<i>A, D</i>
<i>Floor space index</i>	<i>Ratio of the permissible total floor area of all full storeys to the plot area</i>	<i>A, D</i>
<i>Cubic index</i>	<i>Permissible building volume [m³] per m² of plot area</i>	<i>A, D</i>
<i>Open space index</i>	<i>Ratio of open spaces of a plot to the total floor area</i>	<i>A</i>

Table 4: Density indicators and their definition in Germany, Austria, and Switzerland (source: author's representation)

across cantonal borders. The Federal government suggested that building concepts be harmonized throughout Switzerland (proposed 'Federal Act on the Harmonization of Building Concepts')²². But this would necessitate a constitutional amendment, since, according to the federalist allocation of rights and duties, the cantons are presently solely responsible for matters concerning construction. During parliamentary deliberations in 2011, the proposal was rejected because it was felt to be disproportionate, so that regulation of building concepts, including density figures, remains within the power of the cantons. The debate in both houses of parliament clearly brought to light how sensitive the area of construction law continues to be, and that the very act of building is an expression of a regional peculiarity, a feature to be preserved. In Switzerland, a nationwide, uniform method of measuring building density like that found in Austria and Germany does not seem to be on the political wish list – a conscious respect for regional autonomy is encouraged.

Nevertheless, the cantons have recognized how important the harmonization of the most important and most frequently used building concepts is and also how materially justified the concerns of the Federal Council are²³. Based on an Inter-Cantonal Agreement on the Harmonization of Building Concepts, an alternative to the failed 'Federal Act on the Harmonization

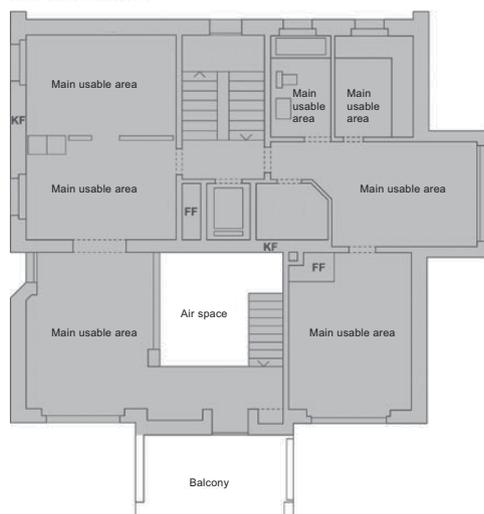
of Building Concepts' was proposed to include around 30 modes of measurement for building concepts such as utilization, number of floors, or limit distances to be voluntarily unified in the planning and building regulations of the Cantons, without affecting the cantonal building laws. By 2015, half of all Swiss cantons have joined the Concordat²⁴ and thus committed themselves to unifying building concepts and modes of measurement in their planning and construction law by the end of 2015. The standards 416, 421, and 423 of the Swiss Engineer- and Architect Association (SIA) dictate the new modes of measurement; the cantons determine the period for implementation in the municipal land-use plans, which is best accomplished as part of an overall revision of land-use planning. The member cantons are thus striving for 'harmonization while respecting autonomy' (BPUK ET AL. 2007).

It is symptomatic of the discussion of density that the cantons decided to exempt precisely the concept of 'floor-area ratio' from their harmonization efforts. The term is 'assigned a special meaning in literature and jurisprudence,' so that the definition of structural density is 'therefore of great political significance' (BPUK 2009). The floor-area ratio defined specifically for each canton allows the exemption of certain floor areas from the overall figure, enabling them to build over and above the density volume established in

22 Motion 8.3523 of 25.09.2008.

23 Reply of the Federal Council to the Council of States regarding motions 08.3523 and 08.3524.

24 AG, BE, BL, FR, GR, LU, NE OW, SH, SO, SZ TG, UR, ZG.

Floor plan 1st floor:

Section:

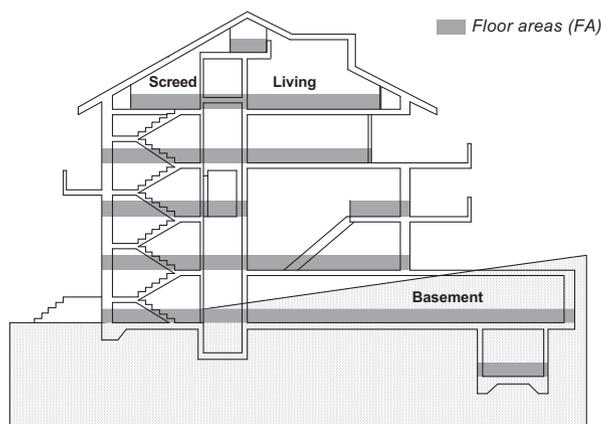


Figure 13: The gross floor area ratio as quantification of building density in Switzerland

(source: IOHB 2010: Appendix 2, edited)

land-use planning, ‘sometimes with the intention of privileging these areas’ (IOHB 2013: 19). For example, in the Canton of Aargau, common areas in multifamily houses and housing estates are not included in the floor-area ratio, nor are the washer and dryer rooms associated with apartments²⁵. Communes are also allowed to provide a utilization bonus for enclosed balconies, seating areas, and conservatories – if these building components lie outside the thermal envelope and lack all heating installations²⁶. In the Canton of Zurich, in turn, the ‘ancillary rooms used for comfort or workplace design’ can be declared by decree as not factorable²⁷. Such canton-specific exceptions cause ‘differences between the actual built situation on a site and the designated floor-area ratio’ (IOHB 2013: 19), which in turn leads to problems during building inspections. Today, it is up to the member cantons to declare whether they wish to continue defining the building density using the floor-area ratio on a canton-by-canton basis or whether they accept the pragmatic and unified definition of the gross floor area figure (fig. 13). The latter would greatly facilitate the comparability across cantonal and communal

borders, since it comprises all surface and underground floor areas including the inner function and traffic areas, preventing canton-specific exceptions.

This reflects the far-reaching significance of the political aspect of density. It would almost appear that cantons feel their autonomy could be curtailed, and they might have to give up privileges, if they had to relinquish traditional definitions of building density. Any possible transition of the definition of density from the today’s floor-area ratio to the new gross floor-area ratio will likely trigger heated discussions in the communities.

From the perspective of action- and problem-oriented spatial planning, the harmonization of the mode of measurement of the density factors and the uniform definition of other important measurement modes beyond cantonal borders is sensible and desirable. The Austrian and German measuring method using the floor-space index for building density is transparent and allows density comparisons across administrative borders.

25 § 32 para. 2 Building Regulations Aargau BauV-AG.

26 § 32 para. 3 Building Regulations Aargau BauV-AG.

27 § 255 para. 3 Building Regulations Zurich PBG-ZH.

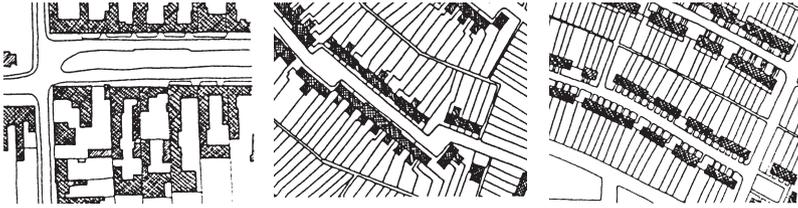
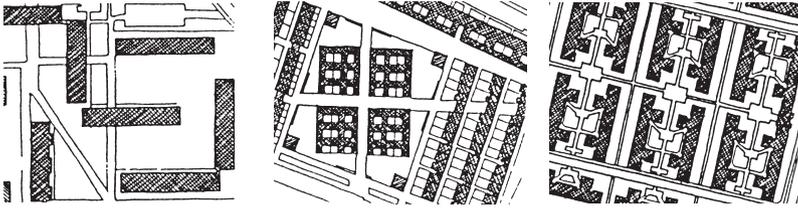
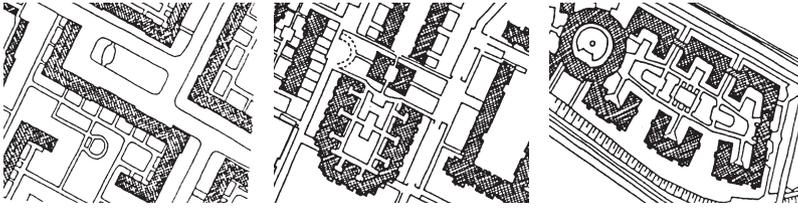
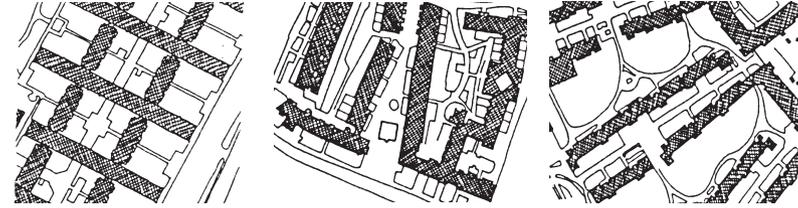
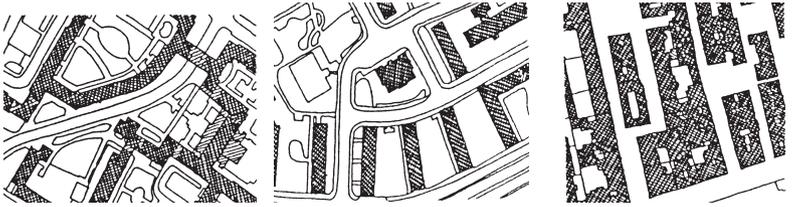
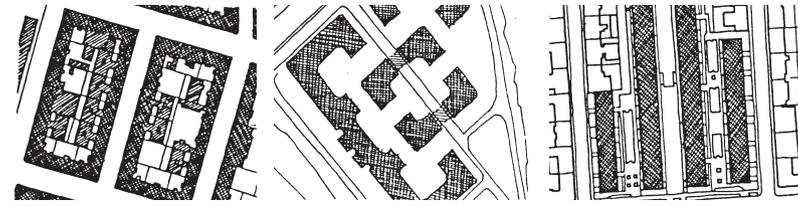
Typology			Quantification
			<p>Floor area density 0.3-0.4 1-2 floors Interplay of buildings and planting, grouping around courtyard, topographical stagger</p>
			<p>Floor area density 0.5-0.7 2-3 floors Linear blocks, differentiation of front and rear side (street-facing side /garden-facing side), side-gabled</p>
			<p>Floor area density 0.6-1.0 3-4 floors Linear blocks, courtyard formation, height stagger, grid-shaped arrangement</p>
			<p>Floor area density 0.7-1.1 4-6 floors Dissolved perimeter block, height stagger, staggered building lines, integration of squares, design of long-range visual links</p>
			<p>Floor area density 1.2-1.6 5-6 floors Differentiated perimeter block, accessibility provided by gate situations, visual axes</p>
			<p>Floor area density 2.0-2.5 6-7 floors Compartmentalized perimeter block, linear blocks or meander, bent or staggered building lines, individual dominating buildings</p>
			<p>Floor area density 2.5-3.2 4-8 floors Perimeter block or linear blocks, accessibility provided by gate situations, differentiation of the street space, projecting upper floors</p>

Table 5: Floor area density, floors, and typology using examples from the city of Vienna
[source: VOIGT 1993: 182, author's representation]

The measure for building density – or the allowed density ratio – consequently determines which construction and typology are characteristic of a zone. The question of which density values can be achieved by which typologies is of crucial importance for inward development. Typology connects the concrete structural shape with the underlying instruments, and both aspects define the scope for unfolding densification. A compilation (tab. 5) showing different typologies and their associated floor-space density may serve as a guide for further discussion. In contrast to the theoretical value of the floor-area ratio, the floor-space density shows the ratio of the actually achieved floor space relative to plot size (VOIGT 1993: 66). This compilation demonstrates that high building densities can be achieved with typologies such as perimeter block, row housing, or meander. At the same time, the absolute numbers can clearly not be directly compared: A 6-story, small-scale block border can have similar density as a 4-story terraced house. In the examples of low floor-area density, an important characteristic is the relationship to the outdoor space such as courtyards, gardens, or squares. Here, too, there are several typologies to choose from in order to achieve a specific density value. Thus, the physical structure of the space can be described to some extent and indicates that the building density, an essential feature of development structures, influences the basic spatial organization (VOIGT 1993: 60).

By engaging with ways to quantify structural density we have demonstrated that 'dense' or 'not dense' must be redetermined in every context. Density has different meanings in different locations; its essence must be negotiated in relation to the respective spatial, temporal, and legal background. What constitutes 'proper' density values varies not only according to the observed spatial types and uses, but also according to the prevalent social objectives. This makes it even more obvious that an exclusive quantitative discussion focused solely on density values with respect to the nationwide implementation of inward development is insufficient. A qualitative discussion, using concrete examples, first needs to establish what density values and types are appropriate and desirable before trying to establish density rates in the formal instruments. Equally obvious, for inward development to prevail, is that there should not simply be an overall increase in the permitted building densities throughout the commune.

1.3 Description of problem and research topics

The focus of the description of the problem lies on small- and medium-sized communes. As the conference 'Inward Development in Switzerland' in 2013 clearly demonstrated, it is from these communities that questions typically arise in connection with the implementation of the minimum strategy 'inward development before outward development' (ETH ZÜRICH 2013a). After considering many aspects of the problem, I propose three topics for discussion in the present work.

1.3.1 Lack of acceptance of high building density

Building density plays a key role in the discussion about the densification of existing built stock. Residential use lies at the center of the debate because this market is most sensitive to any value-reducing effects produced in the restructuring of built environment. In Switzerland – particularly in the small- and medium-sized communes – living in high building densities and the associated typologies thereof is not a preferred option. Rather, the debates continue unabatedly about floor-area ratios, which are considered extremely low by international standards (LAM-PUGNANI ET AL 2007: 60–76). Sieverts adds that, in democratically governed societies, very high structural densities are becoming ever more difficult to enforce (SIEVERTS 1997: 45).

Although there is a broad consensus between professionals and the public on the general issue of inward development, the concept of density provokes fear and insecurity among a large proportion of the population. This manifests itself, among others things, in the objections of legitimate landowners during the planning approval procedure. A study of the grounds for appeal (fig. 14, p. 24) against inward development projects in the Canton of Basel-Landschaft, for example, reveals that – in addition to fearing more traffic – most objections concern a reduction in property value because of high structural density (FISCHER, 2011: 37). More than one-fifth of the objections relate to concerns about blending into the surroundings, including objections that building density would allegedly be too high. For example, compliance is

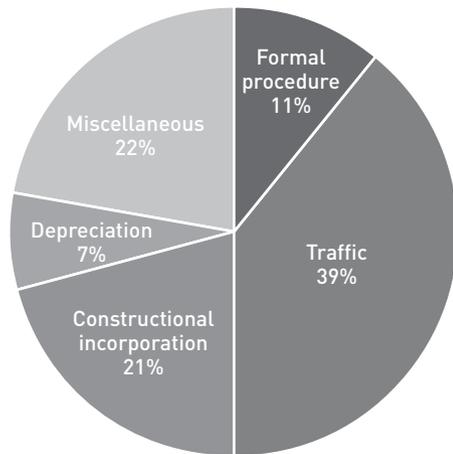


Figure 14: Categorization of grounds for objection against inward development projects in the Canton of Basel-Landschaft 2011 (source: author's representation, based on FISCHER 2011)

denied with reference to the general purpose clause of the Spatial Planning and Building Act²⁸, in particular where blending into the surroundings is deemed inadequate, building typology is criticized, architecture historical values are not being sufficiently taken into account, or the roof landscape jeopardizes the appearance of the townscape. A significant increase in utilization in district planning always carries at least a hint of speculation. Other objections relate to deficient building safety issues: unacceptable building height, façade height, building length, improper setback distances, insufficient outside space areas, and fear of shadows being cast by the new construction project onto neighboring sites. It is typical of inward development projects that most objections relate to traffic planning. Some examples: demands to keep the number of parking spaces to a minimum, reservations about technical urbanization, fear of increased traffic in the neighborhood and hence a reduction in the quality of life and an increase in the threat to the pedestrian safety. Some 11% of the objections alleged formal defects, such as the lack of coordination with superordinate plans (doubts about plan consistency), missing elements in the building permit application, or calls for an expansion of the perimeter of environmental impact assessments in larger proj-

ects. Fears regarding the devaluation of neighboring properties because of an inward development project are voiced in approximately 7% of appeals. More precisely, the objectors fear restrictions to their potential use and thus a devaluation of their property. More diverse reasons illustrate a lack of acceptance of inward development projects, expressing objections because of possible construction noise and pollutant emissions from construction equipment, compounded by fears of a long construction period. Furthermore, there is fear of noise emission affecting local residents caused by dumps or playing children.

This compilation shows that larger projects created by special land-use planning may also face objections from outside the circle of directly affected residents. One may assume that development of built-up areas leads to an increase in the number of appeals, hence prolonging the building permit procedure and in the end resulting in a higher financial burden to the landowners.

Results from the conference 'Inward Development in Switzerland' (ETH ZÜRICH 2013a) reveal further aspects of the problem of acceptance. Acceptance of high structural density and less area consumption per

28 The Spatial Planning and Building Law of the canton Basel-Landschaft ('Raumplanungs- und Baugesetz RBG') of 8 January 1998 states in Art. 37: 'District plans serve to achieve the rational use as well as the development of a cohesive area of the construction zone surfaces which agrees architecturally and with the existing infrastructure, and which has been adapted to the environment and oriented toward the housing needs of the population.'

person increases when these are compensated for by additional services. The loss of living space or private external space must be offset by providing enhanced means of using the environment, including quick and easy access to everyday goods, to green spaces and social infrastructure, or enhanced services within the building (laundry, post office, cleaning services, etc.). The rural population often tends to be skeptical or even dismissive of inward development, particularly densification. They want to 'live in the village not in the city.' In the assemblies of small and mid-sized communes, important political decisions are often voted on by a show of hands, making it possible for individual players with specific self-interests (landowners, investors, neighbors) to make themselves heard above other voters and thus influence the voting result in the short term.

Essentially, it comes down to the fear of private landowners that the community could lose its identity because of too great an increase in structural densities. Incipient changes to familiar surroundings and a lack of knowledge about possible modifications trigger fears that can result in rejecting any planning proposals at the ballot box.

A study of the Canton of Zurich on the density acceptance, carried out in 2013–2014 within the territory of the canton (KANTON ZÜRICH 2014), confirmed the exceptional status of this acceptance problem in communities designated in the Spatial Development Program of the Canton of Zurich as having a scope for action as a 'cultural landscape' or a 'landscape under pressure.' This applies particularly to small- and medium-sized communes:

- In rural areas, basic acceptance of high-density construction is lower than in urban areas with denser building structures.
- Districts with small multifamily houses and three-story constructions harbor the greatest reservations about high-density construction.
- Both tenants and owners in less densely built neighborhoods with multifamily houses show less acceptance than those in neighborhoods of greater density.
- Owners aged 25 and over object more strongly to high-density building than do younger tenants.
- Elderly people in rural areas generally tend to respond negatively to high-density construction.

- The acceptance of high-density construction increases in both communal categories if accompanied by an expansion of public transportation.
- Inward development should meet the need for additional shopping opportunities in both communal categories.
- With regard to standards of living, the need for secured privacy and larger living spaces is voiced.
- Densification should be combined with the development and redesigning of main throughroads.

Overall, expecting from high-density building to produce an expansion of public transportation in 'landscapes under pressure' as well as in 'cultural landscapes' contravenes the specifications of the Spatial Development Concept of the Canton of Zurich (KANTON ZÜRICH 2014: 46). In addition, it is acknowledged that inward development plans should be pursued on a scale that transcends individual districts:

'The acceptance of high density development is highest if qualities are preserved, deficiencies are corrected, and added values are created.' (KANTON ZÜRICH 2014: 6, translation by author).

Overall, inward development is more costly, conflict-laden, conflictual, and protracted than outward development. It takes more expertise and specialists, and may be expected to create an increasing number of objections by local residents. These factors increase the risk of rejection of planning projects at the ballot box or at community meetings. The possibility increases that, after several years of processing planning applications as well as incurring planning costs that are high for small- and medium-sized communities, local spatial planning could in the end be rejected.

The above observations show that the discussion surrounding density and densification require great differentiation. This demands of planners great communication skills to explain the concepts in plain terms, as otherwise voters in small- and medium-sized communities will obstinately insist on equating 'density' with 'confined' and, in light of the above-described problems, reject inward development.

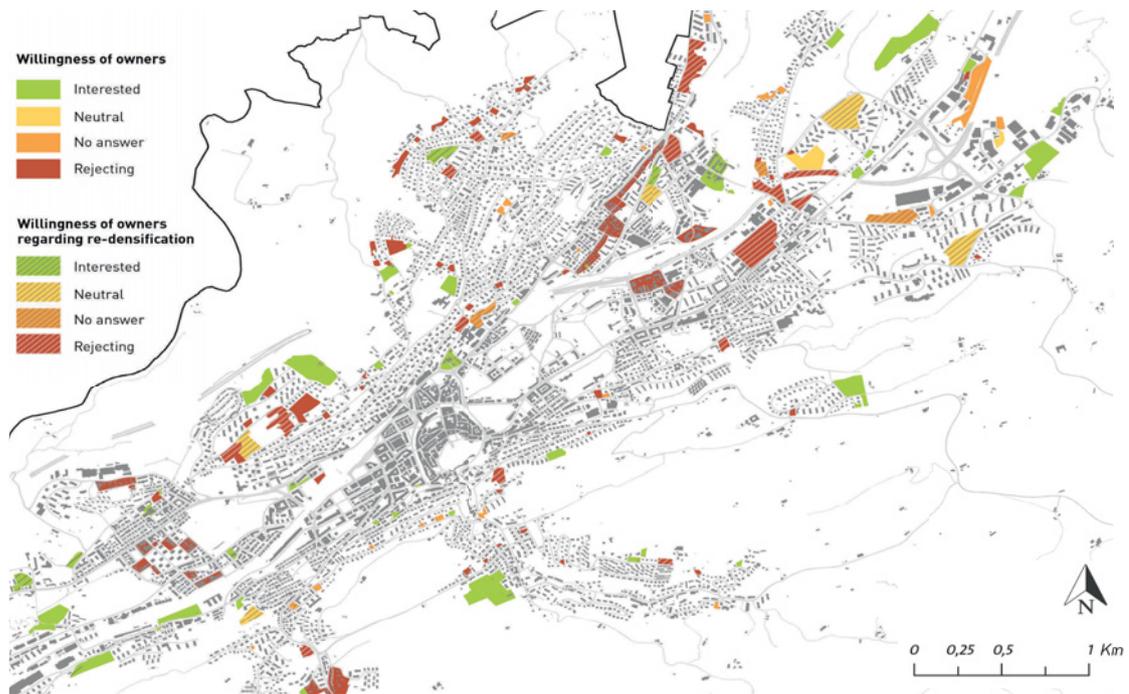


Figure 15: Willingness of owners to mobilize reserves in the city of St. Gallen 2013 (excerpt)
 (source: ETH ZÜRICH 2013e:14, edited)

1.3.2 Obstacles to mobilization in existing built stock

In order to ensure that inward development becomes the norm, it is of paramount importance that any reserves identified can in fact be mobilized. Yet, as the surveys from 'Raum+' show, many circumstances concerning sites or their immediate surroundings can aggravate or even prevent development, so-called mobilization obstacles (ETH ZÜRICH 2014a:20). The reasons for incomplete use or nondevelopment are manifold, ranging from protected (landmarked) buildings, plot geometry, topography, contamination, natural hazards, noise pollution, application conflicts as well as distance requirements in relation to water, power lines, or forest lines. This includes sites that are simply not ready for development. However, by far the largest obstacle to mobilization lies in the unwillingness of landowners to sell or develop, or to their inability to make stable decisions, for example, because of a fractious community of heirs (see the surveys from the rural Cantons of Appenzell Innerrhoden and Schaffhausen, ETH ZÜRICH 2014a:20/

ETH ZÜRICH 2013b:22). In the Canton of St. Gallen, the proportion of blocked surfaces because of the owners' lack of interest actually increased since the last survey in 2011 (KANTON ST. GALLEN 2014:18).

In order to effectively use resources, authorities must have problem-oriented surveys at their disposal indicating the availability of areas in the short, medium or long term. However, only very few communities have such overviews based on a local or regional area management. The city of St. Gallen reviewed the possibility of municipal land management and in this context assessed the availability of identified settlement area reserves (ETH ZÜRICH 2013a). It turns out, however, that the largest land reserves that could be mobilized lay at the urban fringe and would thus have constituted outward development (fig. 15). If inward development is to prevail over external development in the long run, it is all the more important that efforts be undertaken to mobilize the inner reserves of settlements as possible alternatives to developing 'greenfields' and building 'at the edge.'

<i>Research questions</i>	
1	<i>Which areas are suitable for increasing the building density and which ones are to be spared in favor of the next generation?</i>
2	<i>What scopes are available for raising building density?</i>
3	<i>How are procedures in small- and medium-sized communes to be designed for the objective of increasing building densities in locations suitable for this purpose?</i>

Table 6: Research questions (source: author's representation)

1.3.3 Lack of thought patterns for inward development

To date, the problem of acquiring new land in small- and medium-sized communes was 'solved' in most cases by further spreading settlement onto near areas. Hence, approaches and the available formal tools and processes such as the municipal land-use planning were predominantly aligned to this practice. Inward methods of development, such as conversions or postdensification, still often face higher regulatory hurdles and thus longer planning processes and construction times, all of which ultimately culminate in higher expenses for the land owner. In the worst case, for reasons of opportunism and time pressure, outward development is given priority. Especially in small- and medium-sized communes whose resources are based on a militia system²⁹, it is very important to align the coordination problems to the existing resources, as the quality of spatial planning activities depends largely on the capacity and expertise of the relevant persons responsible for spatial-impact problems to carry out these activities appropriately themselves (MAURER, 1995:20).

Detailed strategies for guiding the development of existing built environment are needed to make inward development operational, again particularly at the community level. The aim there is to define the framework for residential development, derived from specific circumstances, and to formulate a strategy for future spatial development. It no longer suffices to merely comply with technical and functional requirements. Rather, when prioritizing inward before outward development, one must first change the thought patterns that have been applied over many years and since become obsolete.

²⁹ See page 70.

³⁰ See table 1, p. 7.

1.3.4 Research questions

The implementation of inward development turns out to be particularly difficult in small- and medium-sized communes. Existing residents often struggle to accept building densities, there are often obstacles to mobilizing reserves, and obsolescent modes of thinking preclude the adaptation of the legal instruments to the changed law. At the same time, these are the communes where the majority of the reserves for settlement areas should be found as well as the greatest challenges to limited financial and human resources.

Clearly, small- and medium-sized communities must lie at the core of the research questions.

The first research question is aimed squarely at the existing characteristics of areas found in these categories of communities suitable for building density (tab.6). Second, research must address the question of the quantifying figures that represent thresholds. The third research question relates to focusing densification on procedures to enable high-quality internal residential development a reality.

In the broadest sense this pertains to issues covered in Articles 1, 3, and 8 of the revised Spatial Planning Act³⁰. In the course of the spatial planning revisions, these must be addressed by the cantons and implemented by the communities in instruments that are binding for landowners.

1.4 State of research

Before dealing with the individual research questions, we first want to present an account of the experiences of small- and medium-sized communes with densification. For historical reasons, there are local variations in procedures and spatial-planning tools, and the former are also influenced by a common cultural background. Therefore, the focus is on the situation in modern Switzerland and in its neighboring German-speaking countries.

The topic of inward development has featured very prominently in the scientific, political, and public discourse – and not only since the enactment of the revised Spatial Planning Act in May 2014. In recent years, numerous guides, work tools, and manuals for inward development were published by cantonal, regional, or research groups (RZU 2008, BADEN WÜRTTEMBERG 2009, KANTON AARGAU 2011, KANTON BASEL-LANDSCHAFT 2011, KANTON LUZERN 2011, METRON 2011, RAT FÜR RAUMORDNUNG 2012, KANTON ZÜRICH 2012, VLP 2012, KANTON AARGAU 2013, KANTON LUZERN 2013a, KANTON LUZERN 2013b, HSLU 2014, KANTON GRAUBÜNDEN 2014). The federal government has signaled its support for inward development based on best-practice examples (ARE 2009) for the creation of the agglomeration programs for transportation and settlement. In its pilot projects for sustainable spatial development, the Federal Office for Spatial Development formulated recommendations for the implementation of projects, with the goal of inward development (ARE 2013). The success factors can be summarized as follows:

- **Collectively recognizing a problem:** The starting point for any long-term process – such as inward development – is jointly identifying the problem by the actors involved. Only mutually recognized problems invite cooperation. The common awareness among the participants, however, can only develop if the concerned parties themselves are aware of the need for action. The need for action must be acknowledged by all, and the pressure to act must be sufficiently great for all. During the pilot project, it emerged that merely identifying reserves for inward development by the canton triggers the pressure to act at the communal level.
- **Identification of the relevant actors:** A project should be implemented in a cooperative process in which all relevant stakeholders are involved in

the decision-making and implementation process. Making decisions in close consultation and agreeing on the resulting binding rights and obligations makes it possible to avoid appeals. Any party that becomes involved at a later point in time might be less willing to cooperate, which in turn – especially in the case of owners of key land sites – can jeopardize the entire process.

- **Communication creates planning security:** Open and transparent communication of the public sector with the population, the landowners, and other involved stakeholders builds a solid basis of trust for the successful implementation of a project. A high level of competence and professionalism on the part of the authorities and strong support from the municipal executive are decisive factors here. Likewise, the population concerned must be made aware of what inward development means for each and every individual, and that it entails a continuous process over several years. Key actors are the private or public landowners, who must be informed regularly about the importance of their land for inward development. Knowledge gaps about projects of the public sector can cause uncertainty in both landowners and the broad population. This in turn can lead to a mistrust between the actors, bringing the project to a standstill.
- **Space caretakers und binding deadlines:** In order to help inward development to a breakthrough, the key stakeholders at least must really want the process, which in turn boosts staying power. There is a need for technically sound and dedicated individuals who themselves want to take on responsibility and who can also inspire others to get involved. This does not necessarily must be the same person in every project phase, because each phase needs specific skills. But the participants must be prepared to devote adequate time to the project. For this, the creation of events with binding deadlines has proven effective.
- **Flexibility in the process:** Planning processes should be able to respond flexibly and quickly to changing circumstances. Open communication on a common basis of trust consolidates the collective knowledge of the possibilities afforded by a certain space, and if changes should occur in the initial position, it is possible to revert to alternatives in the short term. Often, there is only a small window of opportunity for including landowners in an inward development project.

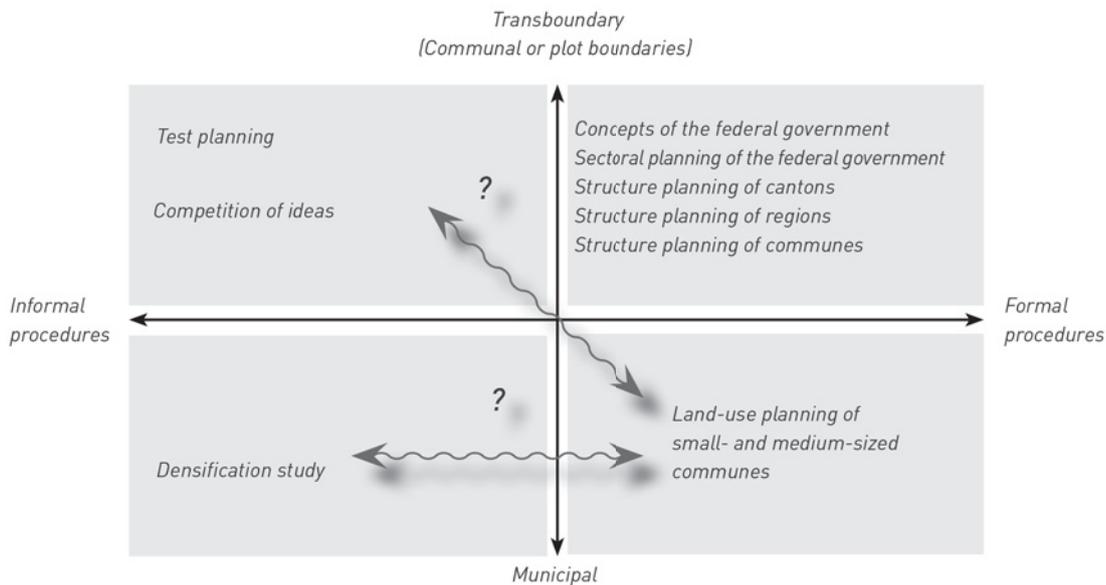


Figure 16: Gap in research (source: author's representation)

The existing aids in the theoretical implementation of inward development focus primarily on presenting best-practice examples and only insufficiently on challenging underlying paradigms and instruments necessary for implementation. In addition, they are almost completely restricted to options such as the redevelopment of brownfields, the development of vacant lots, or the building of new replacement constructions. In Switzerland there is great reluctance to adopt informal procedures that explore the possibility for inward development at the innermunicipal level, and which would culminate in instruments that are binding for landowners as well as in concrete construction activities.

One of the few current examples is the structure plan for Lausanne West, which aims to implement the growth strategy policy (SDOL 2012) by means of concrete projects. Eight autonomous and equal communities defined a common vision with principles and measures to implement them concretely in space. The authorities and the population used a joint approach by involving the relevant parties in the transformation process in the context of informal procedures. This procedure may well be described as pragmatic, even minimalist:

'The depth and the ambitions of what has been set in motion in Lausanne West starkly contrasts with the resources used, to the simple structure of SDOL [Schéma directeur de l'Ouest lausannois, n. AG] and to the efficiency of a handful of people who – thanks to a sometimes minimalist approach and smallest interventions – are transforming a place that had been left to its own devices for decades' (SDOL 2012:36, translation by the author).

Decisions were made on a 'case-by-case basis' by a small, intercommunal body, resulting in prototypical solutions. Exactly this commitment from some few actors from the administration, experts, and landowners formed one of the success factors of the process (ETH ZÜRICH 2013a). Nevertheless, the question remained as to how the qualities of this cross-border process could be transposed to the plot level. Municipalities are reliant on landowners and investors to translate the results of the informal process into the formal innermunicipal structure plan 2014–2018. It is not yet clear how these communes will react to increasing settlement pressure and what consequences will ensue.

The most recent, and so far only, example in Switzerland of an informal procedure across cantons and at all three levels of government is the competition for ideas 'Perspective Planning Limmattal PeRL.' In

2013–2014, five federal agencies, two regions, the Cantons of Zurich and Aargau, and nine communes with the collaboration of Zurich ETH (ETH ZÜRICH ET AL. 2014b) participated in the procedure. The approach in the planning process can be described as an exemplary model. A consensus for a long-term developmental perspective was developed cooperatively, and the stakeholders agreed on a few but significant concrete directions. After completion of the informal procedure, the establishment of a cross-cantonal sponsorship is planned for 2015, which will accompany the transfer of the main principles of the recommendations into the formal instruments.

1.5 Gap in research and hypothesis

There is consensus on all levels of government that the minimum strategy ‘inward development before outward development’ should be the general principle for future spatial development. Yet the operational implementation at the local level still exhibits various difficulties. As pointed out above, there is an evident discrepancy between theoretical knowledge and implementation at the site level. There is a lack of practical knowledge on how such informal procedures may be adapted to the specific needs of small- and medium-sized communes, and how they can find their way into the proven formal instruments (fig. 16, p. 29). There are no specific scientific studies in Switzerland on the inward development of the Swiss Central Plateau, especially in small- and medium-sized communes with their specific forms of organization and resources.

Consensus-oriented concepts are of great importance for inward development, since national and cantonal laws and regulations cannot unambiguously apply to the specific situations; the mobilization of reserves is ultimately dependent on the willingness of landowners. Consensus on what might have the potential for inward development is also subject to social and economic changes – and is highly dependent on the existing qualities of the built stock. Procedures are necessary that reach landowners earlier and involve them more closely than is customary the case with the formal procedures for revising spatial planning. Only cleverly designed processes can help make the minimum strategy ‘inward before outward development’ a reality. Maurer and Freisitzer underline also that

‘designing our environment depends less on the state of the art of individual scientific findings and more on proper procedures that better exploit the generally available intellectual potential than before’ (FREISITZER/MAURER 1985:6, translation by the author).

As an action-oriented discipline, spatial planning does not limit itself to describing current phenomena and problems relating to structural density, it also provides recommendations for action in concrete spaces. Therefore, the focus of this work lies on methods for implementing high construction density in small- and medium-sized communes. Designing the procedures for inward development in general – as well as in the specific case of building density – is particularly challenging in small- and medium-sized communes where significant reserves are confronted with low human and financial capacities. It is very important to align the number of coordination problems with the existing resources, specifically in small- and medium-sized communities that rely on a nonprofessional governance system for their resources.

The following hypotheses form the basis of the research outlined above:

1. inward development in Switzerland in the main area of settlement is feasible.
2. Building densification in small- and medium-sized communes cannot be implemented by means of formal instruments alone.

For practical implementation, the hypotheses are adapted into more differentiated ones:

- Building density represents the physical expression of a process of negotiation between society and landowners.
- A planner needs to have intimate knowledge of the formal instruments in order to develop informal arrangements for inward development and densification.
- Applying tacit knowledge and the orientation of the planning culture toward informal procedures is an essential condition for a process of transformation.

1.6 Path and goal

1.6.1 Understanding of Science

Research in the discipline of spatial planning is characterized by the following:

- **Problem orientation:** Shortcomings and their associated unresolved difficult problems comprise the starting point of a research paper. The chosen method for answering research questions resulting from these problems is tailored to the initial problem and cannot be prescribed from the outset.
- **Spatial reference:** Initial problems are dealt with in specific areas with specific research questions. These so-called 'laboratories' have characteristics typical to current or future issues. The limits of a perimeter may vary depending upon the initial problems and can be narrowed only during the research.
- **Action orientation:** The objective of research is to gain practical knowledge. The results are recommendations for practice and proposals for the relevant parties in the investigated area.

This scientific understanding runs contrary to the standard Newtonian production of knowledge and the perception, common to the natural sciences until recently, of the nature of scientific discourse (GIBBONS et al 1994: 3). Called 'mode 1,' this understanding is distinguished in particular by the fact that the cognitive and social norms of universities determine the type of production and dissemination of new knowledge, which inevitably leads to a purely disciplinary discourse within an academic circle (peers). In contrast, the production of knowledge in 'mode 2' develops in a transdisciplinary fashion and is broadly reflected on. Thus, researchers are also made accountable to society. Quality control is accomplished by an interdisciplinary team and external stakeholders. Yet, 'mode 2' can neither displace nor replace 'mode 1,' because they work in completely different ways: 'Mode 1' can be characterized as disciplinary, homogeneous, and hierarchical, whereas 'mode 2' is interdisciplinary, heterogeneous, and has a variable organizational form (GIBBONS et al 1994: 3).

The present work is committed to 'mode 2' in the sense of having a group of practitioners work together temporarily on a problem in its specific and localized context.

1.6.2 Aim of the work

This research wants primarily to generate practical knowledge as to how inward development, as specified in the revised Spatial Planning Act, can be made operational at the local level. Starting with concrete spatial problems in a previously defined laboratory, procedural approaches tailored to the needs of small- and medium-sized communities are developed, using the theoretical basis for action-oriented planning. The work is problem-oriented by identifying the complex core tasks for spatial planning in connection with the increase in structural density in small- and medium-sized communes. Second, the results should contribute to a more objective debate about density and densification in Switzerland by exemplifying what densification means concretely.

Another objective is to explore any additional potential for residential development which goes beyond the reserves found in the model and research project 'Raum*.'

1.6.3 Structure of the work

In detail, the content of the work is designed according to the following structure (fig. 17, p. 32):

- The first chapter is devoted to the background and the knowledge assumed to be a given, which forms the foundation of the present research. The concepts that are essential for understanding are clarified and the focus of the work is differentiated from topics not covered. The essential part of the introductory chapter is devoted to the initial problems on which basis the research questions and hypotheses can be formulated.
- The second chapter sets out the theoretical foundations for the research.



Figure 17: Structure of the work (source: author's representation)

- The third chapter explores the possibilities for inward development and densification in small- and medium-sized communities on three scale levels. The available scope for density is explored using a practical example.
- These insights culminate in chapter four in a proposal providing a starting point for procedures aiming to intensify the built stock. The chapter concludes with the development of a process as precise and practical as possible which accompanies high-quality densification in built stock in small- and medium-sized communes.
- Finally, in the fifth chapter, the findings of the exploration and the proposal for procedural approaches are reviewed critically, and the applicability to larger contiguous spaces is assessed. Conclusions for practice and teaching complete the work. It closes with an outlook for further research.

The five main chapters open respectively with a short text explaining the meaning of the chapter in the overall context and summarizing the key results. In addition, Chapters 2, 3, and 4 close with an interim conclusion on insights have already gained for follow-up work.

1.6.4 Target audience

In action-oriented spatial planning, the parties involved are the target audience of research. These are affected either as individuals or as a local authorities because of anticipated conflicts, or they are actively involved in processes. Moreover, players can join up to form stakeholder groups who pursue the same objective and are subject to a similar institutional setting. These groups have an interest in the development and the results of a designed process, and they can influence these by their active participation or a deliberate waiver of the latter.

The recommendations for action resulting from the present study are primarily aimed at executive politicians in small- and medium-sized communes in the Swiss Central Plateau. They are the ones who decide on planning results and are mostly laypersons. The results and recommendations must be presented in such a way as to make them easy to understand, they must transparently show how they have been reached, and they must contribute to answering the essential questions for practice.

1.6.5 System demarcation

The subject is delimited in terms of geographical areas, timeframe, and subjects covered:

- **Geographical area:** The laboratory for study is the Swiss Central Plateau, in particular the small- and medium-sized communes. This is where the main settlement areas of Switzerland are located and where there will continue to be significant long-term investments in the construction and maintenance of infrastructure.
- **Timeframe:** The research project focuses on the period after 2030, based on the planning horizons in the development of public transportation and the cantonal structure plans. This means focusing on the needs of the next generation.
- **Subjects covered:** The main focus is spatial planning. When dealing with the practical example, aspects of architecture are also included.

This work does not address the esthetic and social dimensions of the issue of density. For these, reference is made to the publications of Dietmar Eberle and Eberhard Tröger (EBERLE/TRÖGER 2015) and Nikolai Roskamm (ROSKAMM 2011a). Nor is the theoretical approach to design in spatial planning the focus of this work. In this connection, see Markus Nollert (NOLLERT 2013) and Marita Schnepfer for current approaches to this area (SCHNEPPER 2012).



47°10'59' N 7°33'28' E

2 Thinking patterns and theoretical foundations for inward development

There are no unified theories of inward development on which to base research questions. Rather, planners consider such issues through thought patterns or planning approaches. One promising planning approach for inward development consists of the problem-orientated 'third-generation' planning model as well as the use of normative approaches at an early stage of the problem-solving process. Normative approaches are conducive to working early with hypotheses and favorable to a rigorous and critical testing of the latter in specific clarification processes. Spatial planning is an action-oriented discipline, making procedures for the preparation of sequences of decisions and actions central to the theoretical discussion. The action plan is a promising approach to planning and primarily concerns the targeted clarification of the basic possibilities of decision and action as well as the resulting impact and consequences. Test designs are an effective tool for this clarification process and are particularly suitable for producing the knowledge needed to help visualize an unresolved difficult task in a concrete manner.

2.1 Understanding spatial planning

2.1.1 Spatial planning is an action-oriented discipline

Spatial planning is concerned with exploring, clarifying, and solving unresolved issues (SCHOLL 2011:279). Most difficult, unsolved problems can be traced back to decision-making problems, which in turn derive from actions (BEHN/VAUPEL 1982:40f.). These may include spatially relevant conflicts as well as desirable spatial developments, because the latter can also lead to difficult unsolved issues. There is no suitable predetermined procedure to follow; rather, the tasks to be accomplished determine the procedure, so that the latter must be tailored to the respective individual problem. This puts preparatory procedures for the sequence of decisions and actions – the methods employed – squarely at the center of the focus of research in spatial planning. A method may be

'understood as regulated procedure for systematically exploring, clarifying and solving difficult spatially relevant problems; suitable methods should also support the checking of effects and consequences of realized solutions' (SCHOLL 2011:284).

This can equally apply to the invention of innovative methods, which should help to clarify the fundamental ways in which decisions are made and action is taken, in order, at best, to increase the use of space, or at least maintain it – or at worst not to harm it.

Focusing on sequences of decisions and actions turns spatial planning into an action-oriented discipline; hence, the procedures that prepare actions are at the center of theoretical discussions. Simply describing the conditions and 'deducing' the respective forecasts does not comprise spatial planning. This point is reiterated by the legal scholar and development planner Martin Lendi:

"Spatial planning" that limits itself to analysis and description does not constitute spatial planning, because of its unwillingness and incapability to solve problems. Analysis and description are part of spatial research, i.e., the exploration of the living space as an object in motion. They may be associated, but not identified with, spatial research. They form rather a – usually indispensable – factual condition for spatial planning. However, they do not displace the "decisive and acting as well as controlling and managing" spatial planning which wants to have a spatial impact on spatial events ...' (LENDI 1996:27, translation by the author).

Spatial planning means identifying desirable futures using appropriate approaches by people who are involved in and affected by the planning. Intelligently designed processes should foster the creation of an array of arguments to balance various interests when faced with difficult tasks – and thus contribute to a better understanding of planning interventions.

2.1.2 Spatial planning means counseling politicians

Especially for small- and medium-sized communes, the implementation of the minimum strategy 'inward development before outward development' presupposes a change in thinking patterns and paradigms³¹. At the same time, the planners who work in these communities are faced with more stringent requirements. They will invariably need a subtle talent for properly preparing policy decisions. Martin Lendi makes the point that the more complex the spatial impact problems, the more urgent the advice of the planning body is to policymakers; it even is the duty of the planners to advise authorities for dealing with these difficult and spatially influential tasks. If this advice by the spatial planning body to the politicians is not taken seriously, so Lendi's warning, spatial planning risks losing competence and no longer being able to fulfil its cross-sectional objectives. The principles of the referendum and initiative opportunities enshrined in the Swiss Federal Constitution exert a preemptive effect on policy-making processes. Authorities are encouraged to consider early-on the conditions for having their decisions accepted by the voters (LENDI 2003: 2).

This is particularly true in the case of inward development and even more so of one its elements – densification – in small- and medium-sized communes. Given the basic problems, especially the obstacles to mobilization and a lack of acceptance for building density, it is crucial to raise the awareness of key players in this respect in a timely manner – that is, before their integration into formal procedures. The importance of the advisory role of local planners increases particularly in communities that delegate their planning tasks to laypersons working on a voluntary basis³². Designing and monitoring specific clarification processes is increasingly becoming a part of the repertoire of spatial planners. When focusing on inward development, it is no longer sufficient to exclusively deal with planning projects within the framework of formal procedures.

2.1.3 The importance of theories for spatial planning

Research in spatial planning is concerned with searching for methods to prepare for decisions and actions. This becomes all the more important in the case of inward development, as the orientation of the spatial development toward the largely over-constructed areas entails an increase in the overall number of parties involved in planning and thus in possible actions. It therefore makes sense, when developing clarification processes, to formulate the approach explicitly and to transparently express the theories and planning approaches used. This is the only way one can describe, compare, and improve the approach within multidisciplinary stakeholders. Using only intuition, without explicitly articulating the procedure and communicating it to other parties, poses a real risk of reaching any arbitrary, and thus interchangeable, solution.

In spatial planning, only a few theories can be used for research questions (SCHÖNWANDT, JUNG 2005: 790). Using theories in planning is advantageous if they allow predictions for the future or help to deal with uncertainties. In order to clarify the question of whether and how theories can contribute to the preparation of actions and decisions in the context of inward development, it makes sense to first deal with the concept of theory in spatial planning.

2.2 Constructs and approaches to planning

2.2.1 Definitions of theories

The term 'theory' stems from the Greek word *theoria*, meaning 'looking at, viewing, contemplation,' but it is used with different definitions in various disciplines. The philosopher and physicist Mario Bunge notes that few terms have been 'mistreated' like the term 'theory'³³. Many different concepts of theory are used in discussions, yet, as far as Bunge is concerned, none of them is quite accurate (BUNGE 1996: 113 f.):

31 See page 12.

32 See page 70.

33 Literally: 'Few concepts have fared worse in the social sciences than that of theory.'

- In some disciplines, for example, any discourse on general rules is already considered theory.
- However, this definition does not apply to logic, mathematics, or theoretical physics, where the word 'theory' refers to a system of statements derived from each other.
- Theory is sometimes contrasted with facts, though some theories do not match the facts they claim to represent. Such theories are merely incorrect or irrelevant.
- Also, not every theory is less useful than measured values. The most important theories in social studies ('grand theories') are of a speculative nature – untested and partly nonverifiable.
- Furthermore, theories are not methods. A method, according to Bunge, is nothing more than observing and treating objects, problems, or facts in a certain way.
- Theories do not equal hypotheses. They can develop specific claims within a subject area, but do not reduce these to a set of principles.
- Unlike empirical generalizations, theories include terms that may not occur in the relevant measured data. Theories are thus no mere collections of data ('data packages'). However, this does not mean that scientific theorizing can do without them. Theories should substantiate measured data or control the search for data.
- Principles ('axioms'), too, should be treated with caution. They have to prove effective by leading to 'true' or at least plausible inferences by consensus. Thus, it is not true that every basic theory – apart from the theories of logic or algebra – is abstract and free from conventions.

According to Bunge, the word 'theory' designates a system of hypotheses³⁴, wherein cogent chains of argument can be formed. This is the case in all major fields of scientific research, such as classical and quantum mechanics or the chemical bond theory. In contrast, Bunge does not believe dialectics, phenomenology, or psychoanalysis can be considered independent theories. Rather, these are just a set of statements that may even be contradictory (BUNGE 1996:114).

At the same time, Bunge notes, theories are not 'born fully formed,' but rather represent a disorderly collection of fairly loosely connected statements ('propositions'), which initially often contain some 'fuzzy' concepts. Such assumptions evolve by adding and selecting, by concretization and generalization, with concept refinement or verification using empirical data. This clarification process he calls 'theorizing' (BUNGE 1996:115).

The use of theories has obvious advantages. A theory combines several hitherto scattered hypotheses, allowing certain hypotheses to be combined with the strengths of others. Some of the resulting implications may be novel, i.e., they were unknown before the formation of the theory. The mutual support by the elements of a theory makes it easier to examine each individual element critically in light of the other. Each confirmation of any one of the components of a theory indirectly reinforces all others. If theories are well organized – that is, if they have been declared the founding principle or axiom – they have all of these properties to a high degree (BUNGE 1996:115).

2.2.2 Constructs for use in planning

The various definitions of 'theory' described above cannot be directly transferred onto spatial planning. It is therefore useful to our discussion to further differentiate the concept of theory.

A planner can certainly quite easily avoid working with theories in planning practice. But when processing a planning problem, one inevitably uses concepts that are then combined into statements in their respective contexts. Bunge considers 'concepts,' 'statements,' and 'contexts' to be subsets of 'constructs' (BUNGE 1983a:44). The latter are abstract conceptual objects, as opposed to material objects. All in all, Bunge mentions four kinds of constructs: 'concepts,' 'statements,' 'contexts,' and 'theories' (fig. 18, p. 38):

34 [...] the word theory designates a hypothetico-deductive system – that is, a system of hypotheses within which valid arguments (i.e., deductive chains) can be constructed; [...]. (BUNGE 1996:114).

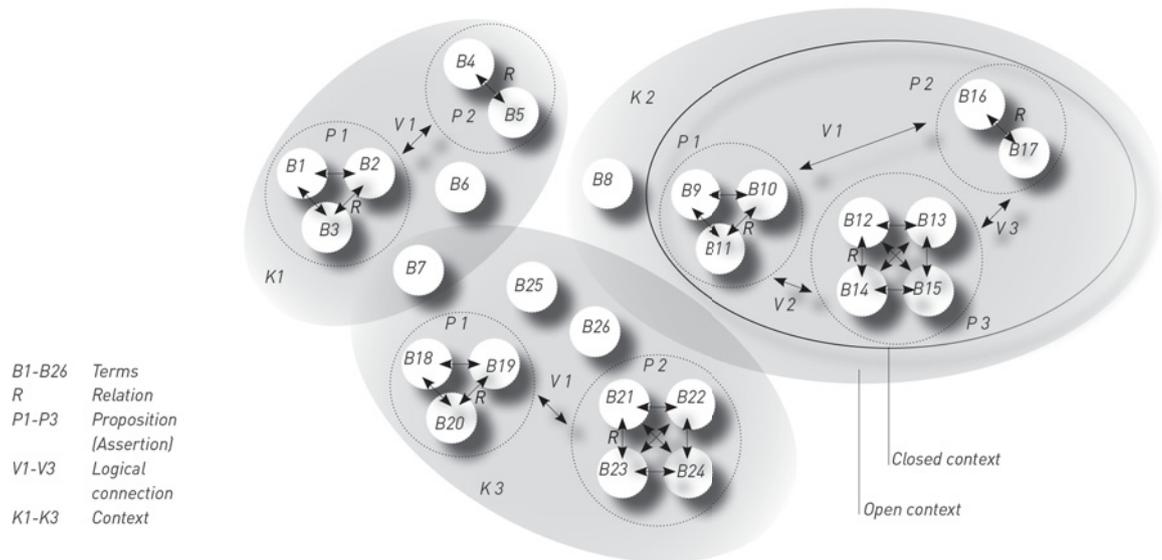


Figure 18: The components of constructs [source: author's representation]

- **Concepts:** Concepts are the media of the planning knowledge; they indicate the meaning of an object and largely also guide the action. Examples of important concepts for inward development include 'inner reserve,' 'vacant lot,' 'brownfield,' or 'building density.' These are units of meaning that are neither right nor wrong; they can only be exact or fuzzy, accurate or inappropriate, beneficial or unproductive (BUNGE 1996:49).
- **Statements:** Interrelated concepts constitute statements. Accordingly, there is a direct connection between two or more concepts. A relation, for example, may represent a qualitative evaluation ('All vacant lots are reserves') or establish statistical relationships ('In commune A, 20% of the inner reserves are brownfield'). Furthermore, relations illuminate a functional dependency between concepts, such as in the statement: 'The building density is formed from the quotient of the realized gross floor area at the time t and the eligible land area.' Relations can also be probabilistic, i.e., they can express the probability of an event occurring. Bunge further differentiates between genealogical relations (BUNGE 1983b:305) – they express, for example, the biological principle 'species A and B have the common ancestor C' – and causal relationships such as 'urban sprawl leads to increasing costs for public budgets.' Schönwandt complements Bunge's list with spatial and temporal relations between concepts that are also of importance in land-use planning (SCHÖNWANDT

2002:85). The spatial relation between two concepts can be illustrated with the statement: 'In commune A, there are five inner reserves within a radius of 300 meters from a public transportation stop.' The following in turn expresses a temporal relationship between concepts: 'The lead time between security planning and constructing project X is 6 months.' A statement is thus the simplest meaningful arrangement of concepts and expresses what the content of the sentence denotes (BUNGE 1999:229, SCHÖNWANDT 2002:76). A statement in the framework of inward development might be: 'The increase in building density is accompanied by a decline in population density in the same perimeter.' Unlike concepts, statements can be true or false because they claim something that can be refuted empirically.

- **Context:** The context indicates the subject area to which a set of statements with their respective concepts belongs. A context is considered its own system only when it is composed of concepts that have at least one common referent, i.e., which include at least one common object to which they refer (BUNGE 1999:49, 245). The description of the context is important because it allows one to unambiguously determine the content of statements in the first place, making statements verifiable at all. A construct may make sense in one particular context, while being meaningless in another. For example, the construct 'inward development' together with the concepts 'density' or 'potential'

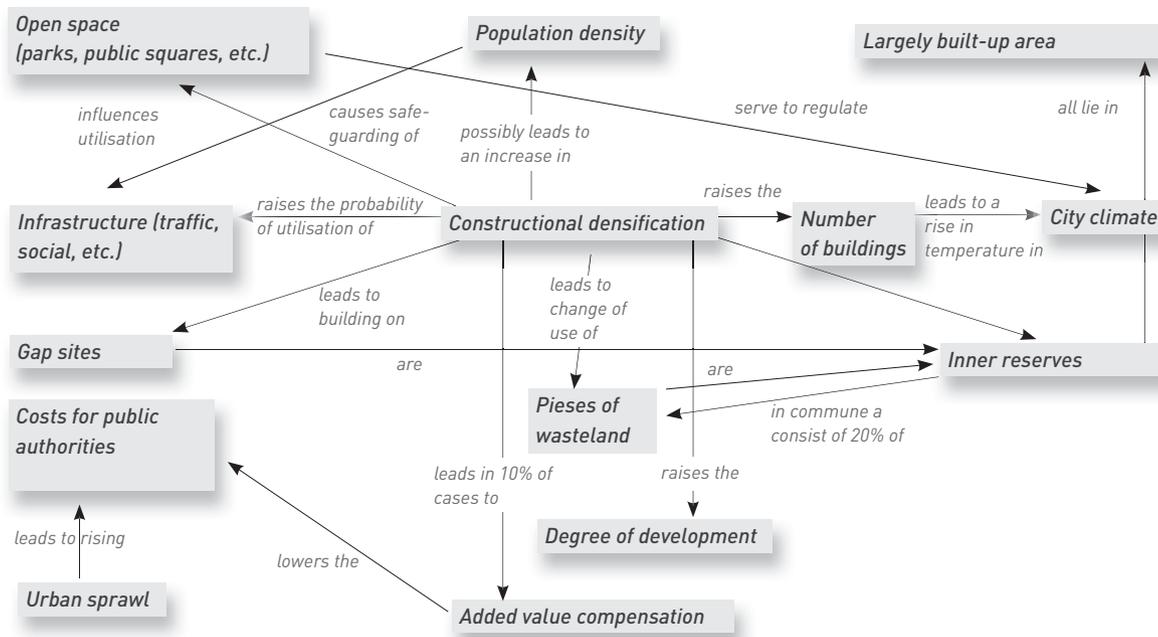


Figure 19: Construct formation for inward development (source: author's representation)

loses its precise meaning if the context of spatial planning is not given. The terms 'density' or 'potential' are also common in other disciplines, such as sociology or physics. Context is therefore of particular relevance in the discussion on density and densification, such that a precise definition and naming of the context must be undertaken in order to attain verifiable results.

- **Theory:** According to Bunge (BUNGE 1983a:44), only after a construct has been located in a closed context – so that all possible logical operations are declared final and all the concepts have common referents – may one speak of a theory. What is referred to by some authors as a 'theory'³⁵ can in many cases be reduced to individual statements.

However, in spatial planning, a closed context is hardly possible because the interaction between the various disciplines involved is too strong. Accordingly, inward development in fact lacks theories in the sense described above; there are only concepts and propositions including their context.

2.2.3 The stages of construct formation

In today's planning practice, if a cluster of constructs – having achieved a certain level of maturity by means of 'theorizing' – is combined into a set of logically related statements, it is sometimes already considered a theory (SCHÖNWANDT/JUNG 2005: 790, SCHÖNWANDT 2002: 107). Accordingly, in Bunge's definition of theory, classified as an 'almost-ready' theory. If they are to achieve this 'certain level of maturity,' constructs must undergo a phased process of formation (BUNGE 1974: 99). For problem solving in action-oriented spatial planning, it may be useful to distinguish among these phases and formulate them explicitly for the stakeholders involved; this may facilitate mutual understanding in interdisciplinary groups of interested parties by clarifying whether a construct is only a vague scheme or has already progressed further. Constructs are therefore situated in one of the following phases of the development process (BUNGE 1974: 99, SCHÖNWANDT 2002: 107f.):

- **Schema:** The first step in construct formation consists in the simple listing of objects and their particular characteristics or the description of their components. In construct formation relating to

35 For example, the Theory of Central Locations (CHRISTALLER 1933, LÖSCH 1940) or Export-Based Theory (ANDREWS 1953, NORTH 1955).

<i>Descriptive theory</i>	<i>Prescriptive theory</i>
<i>Assertion (constative speech act), e.g., agreeing, disagreeing, reporting, predicting etc.</i>	<i>Request (regulative speech act): e.g., requesting, commanding, prohibiting, permitting, recommending etc.</i>
<i>morally justifiable in a discourse</i>	<i>needs to be morally justified in a discourse</i>
<i>-</i>	<i>imperatives and norms</i>
<i>theoretical</i>	<i>action-oriented</i>
<i>relatively or absolutely justified</i>	<i>relatively or absolutely justifiable</i>

Table 7: Classification of theories in descriptive and prescriptive
(source: own representation on the basis of MITTELSTRASS 2005:455, translation by author)

inward development, these would include, for example, the concepts that describe and qualify inner reserves through their very features. A particular characteristic of a 'vacant lot,' for example, is the degree of development (developed or undeveloped). However, such lists – or schemas – do not show how and whether at all the objects have a relationship to each other.

- **Diagram:** In problem-oriented spatial planning and in the formulation of recommendations for action, it is essential to recognize any existing dependencies between the concepts or their respective characteristics. Therefore, in the second stage of construct formation, the objects are set in relation to each other using a diagram or chart. Diagrams always include the previously formulated objects (fig. 19, p. 39).
- **Theoretical model:** In the third stage, the diagram is articulated with words, and a theoretical model emerges. The second stage of construct formation made apparent only whether there was any relationship between one or more objects of a schema at all. These relationships are of a qualitative, functional, probabilistic, causal, spatial, temporal, or genealogical nature. The third stage makes these relationships explicit (fig. 19, p. 39). However, this theoretical model depicts a specific construct that is valid only within the corresponding context.
- **General theory:** Following the formation of the theoretical model, Bunge defined another phase that transforms the theoretical model into a general theory. To this end, the attributes of a group of objects are recorded in their context and described in such an abstract manner that they can refer to all objects within a field of knowledge. For example, this would be the case if a 'theory of inward development' can be applied to each and every 'inward development case' in Switzerland and all its cantons.

As mentioned above, this final phase of action-oriented planning is rarely achieved and is therefore not very helpful. A general theory does not take specificities into account, excluding, for example, customized procedures for inward development which contradict the problem-orientated approach in spatial planning³⁶. In contrast, a schema, diagram, or a theoretical model might indeed provide assistance in understanding the problem at its core and, based on these insights, consequently preparing actions and decisions.

2.2.4 Descriptive and normative theories

In the theoretical discussion in spatial planning, some authors differentiate between 'normative' and 'descriptive theories' (LENDI 1996:125, MAURER, 2007:5). Philosophy, too, classifies theories as descriptive and prescriptive (normative) (MITTELSTRASS 2005:455). According to Mittelstrass, a descriptive statement provides an assertion, whereas a normative expression is a recommendation (tab.7). To be considered valid, claims must be justified in discourse, whereas recommendations are justified by values. Requests or recommendations relating to a situational context are called 'imperatives,' and those that apply irrespective of the context are 'standards.' The latter tacitly presume a general acceptability. There is no common distinction between descriptions, similar to that between imperatives and standards, because in the case of descriptions, contextual independence is generally assumed. A philosophical justification of a claim remains of a theoretical nature, that of a recommendation leads to action. If the justification of a description is successful only for an individual or a group, it is relatively justified; if that justification succeeds for everyone, it is absolutely

justified. Accordingly, a recommendation, justified only for a group or an individual, is relatively justified, whereas should the recommendation be successful for everyone, it is absolutely justified. The success of explanations or recommendations, of descriptions, or of prescriptions therefore depends on whether the statements are met with acceptance (MITTELSTRASS 2005:455).

In planning practice, the properties 'descriptive' and 'normative' are often used as antonyms, for example, in planning reports, to distinguish purely descriptive overviews and analysis from recommendations for actions. In these cases, 'normative' is often equated with 'judgmental.' This could give the impression that surveys, unlike recommendations, are 'value-free' and 'observer-independent,' but this is not the case. The creation of surveys also includes decisions such as which criteria qualify for being included in a survey or what quantities represent thresholds. For example, the categorization of reserves in a survey about 'vacant site,' 'infill potential,' or 'inward development potential' is based on the hypothesis that the mobilization of these reserves requires different methods of organization. Even in an early phase of the planning process, these choices result in assessments, that is, even descriptive theories are not 'value-free' and 'observer-independent.' Descriptive statements can at most 'describe something in a non-value-free manner,' whereas normative statements can 'recommend something.'

In light of the definition set out in the preceding chapter of a theory as a 'system of hypotheses' (BUNGE 1996:114) and a 'quantity of logically related statements' (SCHÖNWANDT 2002:107), it becomes evident that even at an early stage spatial planning should be concerned with formulating hypotheses. Normative theories are conducive to working with hypotheses and proceeding in 'a direction toward something.'

As far as the situation in Swiss spatial planning is concerned, Martin Lendi and Jakob Maurer both voiced their opinion on the alleged controversy between descriptive and normative theories (LENDI 1996:124f., MAURER 1995:54, MAURER, 2007:5). Martin Lendi is also convinced that because it practices an interdisciplinary approach spatial planning cannot provide an unambiguous distinction between descriptive and normative statements. Some of the disciplines involved are oriented more toward anal-

ysis and description (such as geography or political science), whereas others use both descriptive and advisory statements (such as law, economics, or the environmental sciences). It is important to declare to stakeholders during the planning processes whether such statements are meant to be descriptive or normative; both kinds are judgmental and observer-dependent. Planning equally emphasizes the description and analysis of spatial development, as it makes normative recommendations for the future. Yet, planning as a discipline often emphasizes only the normative aspect (LENDI 1996:124 f.). Jakob Maurer notes in this respect that 'normative' is often linked exclusively to 'judgmental,' which amounts to too narrow a definition. No single normative theory can fully encompass planning.

'Applying normative theories requires choosing descriptive ones, depending on the respective situation' (MAURER 2007:5, translation by the author).

Jakob Maurer, too, urges to bear in mind that theories about spatial changes, such as Christaller's Central Place Theory (CHRISTALLER 1933), are often based on the assumption of a linear continuation of historical events, which is why they cannot be considered for the future and are therefore unsuitable for formulating recommendations for action. According to Maurer, such theories may not be called normative (MAURER 1995:54), since normative theories focus on action (MAURER 2007:5): Normative location theories do not confine themselves to descriptions, but rather justify the choice of location:

'Normative theories explain why how much of something is supposed to be somewhere and descriptive theories describe why how much of something is somewhere or will be somewhere' (MAURER 1995:49, translation by the author, my emphasis).

Jakob Maurer notes that normative theories for spatial planning are increasingly being neglected (MAURER 2007:6). Nevertheless, the provisions in the revised Spatial Planning Act Switzerland that entered into force in 2014 could promote the application of normative theories to renewed relevance. Communes can no longer simply 'derive' their local planning from a projected increase in population over the next 15 years and apply new settlement areas. Rather, the priority of inward development means that all theories that make assertions needing to be justified

only unilaterally lose their legitimacy. In contrast, normative theories call for justification by means of discourse, that is, the weighing up of interests before the definitive result, prescribed in the cantonal building and planning laws. For example, voting for construction zone dimensioning beyond communal boundaries³⁷ requires a balancing process of 'why how much of something is supposed to be somewhere.'

2.2.5 Planning approaches rather than theories

As explained above, if there are no theories for inward development – nor should there be – then working with hypotheses becomes the focus of discussion on inward development. The question therefore arises how to formulate fruitful hypotheses, which in turn has a normative character, because every planner and every party involved in a planning process perceives the planning problem from their own particular point of view. Each planner consciously or unconsciously sees things from their own perspective using their own 'approach.' A planning approach is the way of observing the things in the everyday world surrounding us as well as their mental processing and implementation through planning (SCHÖNWANDT/VOIGT 2005: 772).

Once more, Bunge further elaborates on the term 'approach' (BUNGE 1996: 79), including the way problems are 'wrestled' with³⁸. Approaches consist of four components: a set of views on problems in connection with a set of objectives and a set of methods in a certain context (BUNGE 1996: 79 f., SCHÖNWANDT/VOIGT 2005: 772):

- **Background knowledge:** This consists of the existing relevant, discipline-specific knowledge together with its underlying philosophy. Philosophical background knowledge deals with the question of the characteristics and components of the 'real world' (ontology), how mental processes occur, and what they result in (epistemology) and which values and morals underlie planning (ethics). The

ethical background knowledge often forms a central basis of some planning approaches (SCHÖNWANDT/VOIGT 2005: 773).

- **Types of problems:** Problems that can be addressed with a scientific approach are purely mental problems; practical problems belong more to the technological or moral area. Each planner's observation of, description of, and solution to a problem is based on the existing background knowledge in combination with targets and methods. Thus, no planning approach is truly 'objective,' i.e., observer-independent.
- **Targets:** In contrast to objectives in planning, targets represent what should be achieved. Targets, too, are not viewer-independent, based as they are on the viewpoint or thought patterns of the chosen planning approach.
- **Method:** A method is a clearly described procedure, that is, an ordered sequence of target-directed operations (BUNGE 1999: 178). Methods are expected to solve the problems within the planning approach. Depending on the planning approach, a specific repertoire of methods is available

However, each planning approach offers only a limited number of solutions to problems, allowing one to choose between different planning approaches (SCHÖNWANDT 2011: 298).

In planning, the types of problems, goals, and methods should be formulated with a certain background knowledge. Especially in small- and medium-sized communes that lack a particular thinking pattern³⁹ when facing the implementation of the provisions of the revised Spatial Planning Act, the explicit formulation of background knowledge, problems, goals, and methods could help clarify the situation. One possible paradigm for inward development (tab. 8) is based on the philosophical basis of a holistic approach to the environment, in which humans – unlike in an anthropocentric understanding – are not seen as the center of nature, but as part of it. It is essential for interventions to be beneficial to all of nature and not merely serve humans. Thus, a certain weighing up of interests in the planning process is sought, namely, between the components of the settlement, landscape, infrastructure, and energy.

37 Art. 15 para. 3 Federal Law on Spatial Planning of 22 June 1979 (status per 01.05.2014).

38 A 'way of wrestling with problems ...' (BUNGE 1996: 79, translation by the author).

39 See page 27.

<i>Components</i>	<i>Characteristics</i>
<i>Philosophical background knowledge</i>	<i>Holistic environmental ethics that ascribes an intrinsic value to all individuals, species, and habitats – in contrast to the anthropo centric worldview; sustainability ethics, land is declared a non renewable public (not individual) resource similar to water or air; planning as the creation of conditions wherein inward development can succeed.</i>
<i>Discipline-specific expertise</i>	<i>Knowledge of spatial planning (instruments and procedures), architecture (lifecycles of buildings, typologies, design, etc.), environmental science (natural hazards, biodiversity), traffic planning, environmental engineering (energy efficiency, energy production, etc.), law (legal provisions for land ownership, etc.), politics (non professional governance system), psychology (e.g., in participatory processes, addressing landowners), communication (participatory processes).</i>
<i>Views on problems</i>	<i>Lack of public acceptance of structural changes within the existing settlement area (exposure to noise, vibrations, and dust), fear of a loss of quality in the built area due to structural additions (loss of architecture-historical values or free spaces, distances between buildings too small, outside surfaces too small, shadows, more traffic, greater noise emissions due to higher population density), universal (psychological) rejection of any kind of change, lack of acceptance for housing typologies with high structural density, lack of acceptance for living in neighborhoods with high population density, lack of market liquefaction because of hoarding of building land, lack of methods for addressing landowners, limits of the non professional governance system.</i>
<i>Aims</i>	<i>Conserving land as a non renewable resource; upgrading of public space; adaptation of obsolete inventory to changing framework; increasing the number of units for work and residence in the largely developed areas (building densification); conservation of open spaces; integrated development of settlements, landscape, infrastructures for transport and energy as well as social infrastructure with the aim of efficient use of resources.</i>
<i>Methods</i>	<i>Clarification processes as a simultaneous process with sequences of actions and decisions; informal instruments and procedures.</i>

Table 8: Components of a planning approach for inward development in small- and medium-sized communes
(source: own representation)

The specific expertise for inward development may be spread across many disciplines. For a planner, it no longer enough to possess largely special knowledge in methods and tools, as was often the case with outward development. Nowadays, additional knowledge in the fields of architecture, environmental engineering, specific legal areas, etc., is necessary. Yet the approach to problems taken by the planners and the other stakeholders involved remains firmly shaped by their own background knowledge.

Because of inward development and the increasing number of land-use conflicts, economic and psychological aspects as well as communication problems within different groups of stakeholders are increasingly coming into play. Thus, a real estate economist will bemoan the lack of liquidity of building plots because of hoarding of building land in largely built-up

areas; or an affected landowner equates the problem of inward development with the deterioration of living quality because of increasing emissions from construction noise and additional traffic.

Despite these different views on the problems, a common goal can be discerned. Inward development serves to protect land as a nonrenewable resource and to enable a more efficient use of resources. In contrast to outward development, inward development is limited in terms of its efforts to the largely overconstructed areas, thus also resulting in a clear focus on space. Finally, the methods available for inward development cannot build on the experiences acquired over recent decades with respect to outward development, as the initial problems of outward development⁴⁰ differ significantly from those of inward development.

40 The irreversible loss of farmland due to soil sealing, in the long term unsustainable costs for public finances for the maintenance of the dispersed settlement areas (supply and disposal, transport, security), decline in biodiversity (sealing surfaces, surface loss, and fragmentation of habitats for animals and plants), neglect of the stock within the settlements (avoiding problems inside by means of area expansion).

Thus, methods always relate to the initial problems – and not vice versa. The procedures necessary to explore, clarify, and resolve a problem cannot be generalized, but must be tailored to the specific problem and situation in small- and medium-sized communes. This puts the clarification processes – which encourage a definition of the problem and allow a hypothesis for a solution to be generated – at the very center of the methodological approach.

As shown above, background knowledge as well as types of problems, objectives, and methods can be described for inward development. The specific challenge in small- and medium-sized communes lies in the fact that the planning tasks are undertaken by laypersons (nonprofessional governance system), which means the discipline-specific knowledge of spatial planning cannot be accessed as readily and as comprehensively as in cities. Because many more varied subjects are involved in inward development, it is helpful if the methods consider the different viewpoints taken by the different parties. Above all, they are designed to provide assistance for multidisciplinary groups of stakeholders in exploring, clarifying, and resolving regionally significant problems. The proposed ‘planning approach for inward development’ takes this into account by preserving the greatest possible freedom in the choice of methods.

2.2.6 Problem orientation

As evident from the above explanations, jointly recognized problems form the starting point in a planning process for inward development. According to Bunge, problems are also the starting point for research projects (BUNGE 1996:79), in particular according to Schönwandt (SCHÖNWANDT 2011:294) ‘socially constructed problems’ that can be solved by planning should be at their center. A transdisciplinary approach, based on the principle of ‘problems first,’ is thus required. This approach – or if you will thought pattern – shifts regional planning problems into the center of research, as the actual object of study.

In connection with the design of procedures in relation to inward development, it is important that strategies based on initial problems supplement formal instruments and procedures. They are no substitute for strategies for which there already are processing routines. Thus, the problem-oriented planning approach is particularly suitable for the organization and implementation of strategies in the build-up to formal procedures (SCHÖNWANDT 2011:294).

A problem represents a difficult, unsolved task (WAHRIG 2009: 672), so no negative connotations are necessarily attached a priori to the term. Unlike Scholl (SCHOLL 1995:22), who emphasizes the neutral character of the term problem, Schönwandt believes that a problem necessarily involves a deficient state, which either already exists or may be expected in the foreseeable future, something deemed negative by affected or interested stakeholders (SCHÖNWANDT 2011:299). A certain condition is classified as a problem only because of someone’s subjective evaluation. Should the paradigm shift from outward to inward development fail, the idea of a future deficient state is rather apposite in the context of inward development. Thus, problem P comprises a negative initial state A or a deficient state, which is expected in the foreseeable future (SCHÖNWANDT ET AL. 2013:24 f.):

$$P = A[-] \rightarrow M? \rightarrow B [+]$$

On the other hand, there is the desirable and positively evaluated target state B, which should be defined as an objective, wherein the measures M that lead from the deficient state to the target state are initially unknown. If the measures were known, the problem could be solved as a routine task⁴¹ and would consequently no longer be considered a problem. Explaining which persons or groups of persons are affected by the deficient state makes up part of the definition of the problem. It is also important for a robust argument to also name the positive aspects of a problem, such as the question which persons or groups stand to benefit from the situation in which the described deficient state is encountered.

41 See page 49.

Attention should be paid to clarifying the problems to be solved at the beginning of a planning process in order not to let the results become arbitrary. Especially when the research questions and the results of the policy are of political importance may the precise formulation of the problem counter any potential criticism by the executive body. This also signifies that planning to solve problems cannot invoke known procedures, such as the use of standardized methods or discipline-specific measures or existing theories:

'Identifying a problem as accurately and soundly as possible is [...] a basic prerequisite for even being able to develop a coherent concept for a solution: Failing to articulate the problem to be solved in a sufficiently precise manner at the beginning of planning means subsequently being unable to develop a stringent chain of argumentation from a problem to its solution, simply because the problem to be solved is not specified and hence is unknown.' (SCHÖNWANDT 2011:300, translation by the author).

For delimiting and clarifying spatially significant problems at the beginning of a planning process, Schönwandt proposes examining seven parameters (the 'Key Seven,' as he calls them), which either constitute a core definition of the problem or, as experience shows, when modified exert the most far-reaching influence on the planning results (SCHÖNWANDT 2011:298 f.). The field in which solutions are sought can thus be restricted, and a planning task is afforded a meaningful focus. One aspect of this delimitation process is called problem-shift (SCHÖNWANDT ET AL. 2013:24 f.). Once the problem has been identified by the parties concerned at the beginning of the planning process, it should then be subjected to a thorough examination. Problem-shift broadens up the options for seeking solutions and enables examining whether the formulation of the problem applies only to a symptom or to the causes. The purpose of conducting a problem-shift is to search for the causes of a problem:

'The questions "Why is that?" [backwards shift, A.G.], "What is the result?" [forward shift, A.G.], and "Doesn't the problem really concern ...?" open up

new perspectives and attack the "the roots" of the problem' (SCHÖNWANDT ET AL. 2013:24 f., translation by the author).

Only a backwards shift can attack a problem 'at its roots.' Thanks to a forward shift, it is possible to postpone the tasks of remedying the drawbacks associated with solving a problem to a subsequent step. In order not to block planning processes during a problem-shift, it is important to frame the analysis sensibly and with good judgment. The above-mentioned deficient states should not be completely banished from the discussion, but rather should be voiced as a causal link during the discussion about alternative causes.

2.2.7 The planning model of the 'Third Generation'

The 'third generation' planning model (SCHÖNWANDT 2002:30 ff.) forms the basis for a procedure according to the principle of 'issues first,' which should come as close as possible to the complexity of the planning process. This model includes the spatial, social, political, environmental, and economic aspects of each respective planning task and takes into account the limits both of human perception and of the possible intervention that planning may influence. Furthermore, it also factors in ethical components of planning (SCHÖNWANDT 2002:30).

Roughly up to the early 1970s, the 'first generation' planning model was taught and practiced (RITTEL 1972). That model assumes that human beings act rationally, and that their decisions are based on intellectually verifiable criteria. The planner was supposed to adopt a detached position regarding a current problem⁴² (RITTEL 1972:390). This approach was interdisciplinary, meaning the planner was more of a generalist than a specialist or expert. Finally, in broad terms, the planner should have an economic mindset⁴³ (RITTEL 1972:390). A comparison of this procedure with the complexity of real planning processes and tasks in practice, however, showed that the expectations placed on the planner 'are utterly unre-

42 'He should try to be rational, objective and scientific in attacking his problems.'

43 'He is trying to maximize productivity in the sense of optimizing resource allocation' (translation by author).

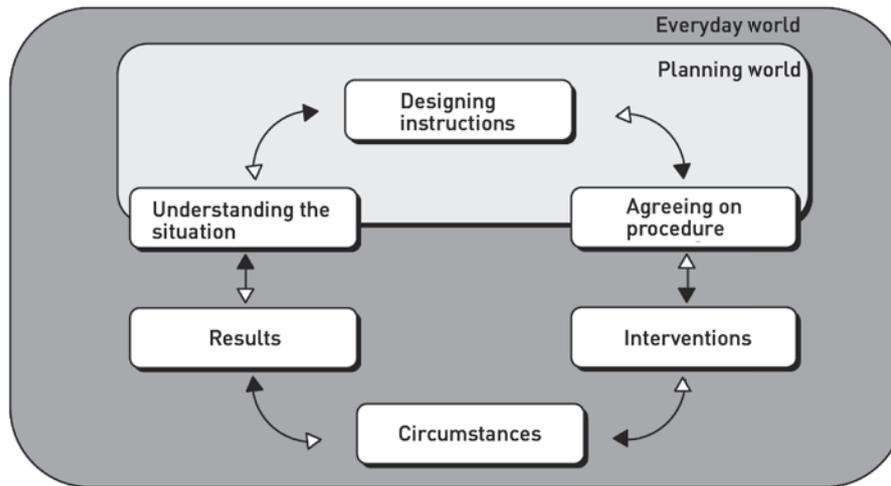


Figure 20: Basic diagram of the planning model of the 'third generation'
 (source: SCHÖNWANDT 2011: 296, translation by author)

alistic and therefore not feasible' (SCHÖNWANDT 2002:32). The planning theorist Horst Rittel pointed out that the planning model of the 'first generation' had shortcomings and was useless for planning tasks (RITTEL 1972:391). Consequently, the rational planning model was frequently challenged and the search for an alternative has kept planning theorists busy ever since (SCHÖNWANDT 2002:32).

Rittel himself thus contrasted the 'first generation' planning models with those of the 'second generation.' He assumes that planning is not concerned with 'tame problems' – like those underlying the model of the first generation – but almost always with 'wicked problems' (RITTEL 1972:392, RITTEL/WEBBER 1973:160, RITTEL 2013:44). In 'tame' problems, the task, the permissible solutions, and the objective to be achieved are clearly and unambiguously defined, for example, in playing chess or solving mathematical equations. 'Wicked' planning issues, by contrast, are characterized among other things by uniqueness as well as by a lack of both a conclusive definition and a definitely quantifiable number of solutions and measures. They cannot be tested in a laboratory, and as a result they are beyond any verification. Solutions to 'wicked problems' are therefore not 'right' or 'wrong,' but simply 'better' or 'worse.'

The central scientific finding of the 'second generation' is the insight that every planner and every party will use some kind of viewpoint, a planning approach through which they see the world, and that all planning and action is influenced by subjective perception

and experience. Planners therefore have an individual conceptual point of view:

'The result of this introduction of the conceptual point of view for planning is that, if there is no single "objective" point of view, we are dealing with many different perspectives, based on different standpoints and representing different knowledge. Hence, it is inevitable that these different perspectives, viewpoints, and hence ultimately planning contents should be communicated in order to get to know the others and, on this basis, to eventually develop planning solutions' (SCHÖNWANDT 2011:295, translation by the author).

It is to Rittel's credit that the discipline of planning has been provided with a theoretical basis, by showing the importance of dealing with uncertainty or how knowledge is dependent on certain assumptions (SCHÖNWANDT 2002:33).

The 'second generation' planning model can be faulted for being similarly characterized by too narrow a perspective resulting from the authors' excessively strong focus on individual aspects – especially the importance of communication – in the planning itself, which finally offers no orientation for planning. No systematic overview of the multifaceted field of planning is made available – indeed, the maxim 'Every wicked problem is essentially unique' (RITTEL 1972:393) would prohibit this outright. Walter Schönwandt notes in this connection:

'What it [...] especially lacks at the moment are appropriate theories in the "mid-range" between the (excessively) general approaches [...] and the (excessively) singular approaches [...] that integrate as many of the aspects occurring in planning in as coherent a fashion as possible and that provide them in a systematic relationship.' (SCHÖNWANDT 2002: 35, translation by the author)

He therefore introduces a systemic 'third generation' planning model that aims to integrate the appropriate aspects of the planning models from the first and second generations – and simultaneously counteract their weaknesses. This systemic model is based on the work of Claus Heidemann (HEIDEMANN 1992) and Charles Lindblom (LINDBLOM 1959), the latter of whom pursues a 'science of muddling through,' renouncing any strategic considerations because of the thesis that only a gradual, step-by-step approach can effect any changes, in both practical daily life and in particular in political life. The theoretical foundation of this planning model is the systemic theory devised in the 1920s by the biologist and philosopher Jakob Johann von Uexküll. In his 'system-umwelt paradigms,' he describes the relationships between a system and its umwelt (environment). Accordingly, the immediate umwelt relevant to a living being – and thus also to humans – comprises only those components of the entire environment that are accessible and reachable for living beings. Every living creature enjoys a unique relationship with its own umwelt by having its own subjective space and subjective time (UEXKÜLL 1928/1973, 42 ff., 228 ff.).

The 'third generation' planning model is characterized essentially by the fact that it considers planning processes not as linear-chronological, but as cyclical, and that it embeds planning both in the world-oriented, external environment of the actors (umwelt) as well as in the inner-world (innenwelt) of the planner's thoughts (fig. 20). In this planning world, planners act as a 'professional community': Against the background of their own consciously or unconsciously employed planning approaches, they develop instructions. Accordingly, planners design their instructions

with their own approaches initially in the planning world and seek feedback in the everyday world. The latter surrounds the planning world and comprises all stakeholders outside the planning world who are affected by a planning process or participate in it (politics, administration, landowners, interest groups, etc.). The everyday world also includes the political and social conditions prevailing at the time of planning as well as the properties of the physical space in which the planning takes place. Significant opportunities arise here for the planning process in small- and medium-sized communes, by directly involving politicians in a nonprofessional governance system who are active in the everyday world of the community, in a suitably designed process within a cycle alternating between the everyday world and the planning world.

The planning process revolves between the planning world and the everyday world (SCHÖNWANDT 2011: 269). Its precondition is a mandate and the adequate operational and organizational structure. The process is divided into the following steps (fig. 20):

- Between the everyday and the planning world, the (provisional) problem is determined by means of an exploratory process, and a common understanding of the circumstances is developed.
- Planners design instructions, which include identifying the target state (goal), laying down restrictions, designing variants and assessing risks. By determining evaluation criteria, they can then again reduce the number of variants and set out options for action.
- Together with participants and relevant stakeholders from the everyday world, the planners agree on actions in the form of agreements such as resolutions or contracts. Prior to this, however, the target state must be discussed in the context of a suitably designed participation process.
- Concrete interventions are implemented in the concrete space, by specifying instruments, choosing locations, creating organizations, and possibly managing behaviors.

- These engage with the spatial, social, political, environmental, and economic conditions.
- The interventions in the circumstances lead to (preliminary) results, which are assessed in an evaluation. These results in turn may require a new common understanding of the facts. And then the systemic cyclic process starts all over.

The process steps during planning need not necessarily follow the order described. Moreover, an iterative approach is also possible, so that individual components can be repeated before the next step is undertaken. This scheme distinguishes the three components of (1) everyday world, (2) planning world, (3) process steps, although they cannot be completely separated. All three exist in ongoing exchange with one another and influence each other in the course of the planning process.

The action-oriented approach, as proposed in the 'third generation' planning model, provides a suitable paradigm for inward development. Inward development is an ongoing task, resulting in a systemic approach. Early indication of a potentially deficient state is important especially in a political context, because decisions must be made in the present about how to avoid it in the future, in light of the rather long lead times that may occur in spatial planning. However, neither planning nor politics can with absolute certainty predict whether, in the light of changing circumstances, this deficient state will in fact materialize. Nevertheless, resources must be provided and meaningful procedures for their anchoring in the formal instruments must be initiated, so as to preclude the surprise of undesirable conditions in the future. Regularly going through the different steps in the cycle of the 'third generation' planning model therefore represents an appropriate framework for problem-oriented spatial planning.

2.3 Action Planning

Designing customized clarification processes constitutes an essential basis for implementing the minimum strategy of 'inward development before outward development.' The clarification process as envisaged in action planning (SCHOLL 1995) is particularly promising in this respect because it explicitly calls for the integration of the relevant stakeholders in the informal processes before deciding on formal instruments.

2.3.1 Approach for clarification processes

Action planning is essentially about the targeted clarification of the basic possibilities for decision and action and the resulting effects and consequences. It pursues an action-oriented method:

'Action planning is governed by action and develops [...] out of a deliberate sequence of actions that should make it possible to achieve breakthroughs in difficult tasks and pave the way for realizing solutions worth pursuing' (SCHOLL 1995:9, translation by the author).

Especially at the beginning of a clarification process, an opaque, sometimes muddled situation emerges, well within the scope of Rittel's 'wicked problem'⁴⁴. A clear view of individual objects and their context is impeded as though being viewed through a fog or cloud – some would say confusion or 'mess' – and can only be established by means of the designed clarification process (SCHOLL 2011:282). The aim of this clarification process lies in choosing or abandoning a particular option.

44 See page 46.

Type of task	Characteristics	Example
Routine task	<ul style="list-style-type: none"> • Problem, process, and solution (result) are known • Objects and parties involved are given • Organization is set up and directed toward durability 	<ul style="list-style-type: none"> • Planning permission for smaller construction works • Implementation of formal tasks
Project task	<ul style="list-style-type: none"> • Problem, process, and solution (result) are known to a large extent • Objects and parties involved are known to a large extent • Some routine tasks are integrated • Duration of organization is limited 	<ul style="list-style-type: none"> • Constructing a bridge for non motorized traffic • Planning and access development of new settlement areas
Complex core task	<ul style="list-style-type: none"> • Problem is unclear, solution (result) is unknown, high complexity • Procedure, and parties involved are, to a large extent, unknown • Few routine tasks are integrated 	<ul style="list-style-type: none"> • Brownfield conversion • Infill development • Inward development

Table 9: Types of tasks (source: own representation based on SCHOLL 2011:289 ff., 1995:32 ff.)

2.3.2 Distinction of task types

Action planning unfolds its effect particularly when exploring, clarifying, and solving complex core tasks. The method to be used must be tailored to the problem and its circumstances. Before deciding on the methods to be used, it is necessary to have – at least temporarily – clarity about the type of task. The regular assessment about tasks can be carried out with routine procedures and the needs addressed with special procedures – an important task for spatial planning. Only by assigning problems to specific types of tasks is it possible to economically manage the increasingly scarce resources such as people, financial means, and time. This represents the ‘minimum strategy for influencing spatial development’ (SCHOLL 1995:33).

Organization theory distinguishes between routine and project tasks and accordingly makes use of routine and project organization systems (SIMON 1981). Routine tasks are tasks that remain consistent over long periods of time and can be solved by the usual methods and tried-and-tested organization systems. Examples of a routine task for a commune include the authorization of simple construction jobs such as extensions or adding floors (tab.9). The administration is sufficiently prepared to accomplish this task, as the processes are tested and the relevant participants known by name. The parties involved are not required to consider every time anew how such tasks should be achieved. Routines have the further advantage of rendering solutions identifiable and verifiable.

Projects, by contrast, are unique tasks with a clear deadline determined by the planning and implementation period of the project. An example of such a task might be the construction of a bridge for nonmotorized traffic. Project tasks can outwardly take many different forms. If project organizations have perfected the practices of cooperation through repeated testing, they can be considered close to routine tasks. On the other hand, project tasks can also prove to be extremely complex, especially when many stakeholders from different organizations and disciplines are involved. Nevertheless, all project tasks are characterized by the fact that there is a general – if sometimes only vague – idea of the desired outcome. Some spatially significant tasks cannot be solved on a sector level alone and require an overarching technical and organizational collaboration – sometimes even across multiple levels of government. In addition to the distinction between routine and project tasks, the introduction of complex core tasks therefore has proven to be helpful in spatial planning (SCHOLL 2011:289 f., 1995:32 f.).

‘One rightly speaks of complex tasks, i.e., tasks that are interwoven and intertwined with others, where, when trying to solve one, new problems are constantly encountered and traditional practices fail, including the use of conventional design organizations. Before feasible projects are at all ready, it takes considerable planning effort to create and specify them in the first place’ (SCHOLL 1995:36f., translation by the author).

Inward development, with its manifold and different elements, constitutes such a complex key task. The complexity of the task requires that all stakeholders be involved in an orderly process of clarification, which allows conflicts to be efficiently handled and fast responses to new information to be made. However, not every seemingly complex task justifies the use of such an organization. Complex key tasks and their organization should be employed only when there are strategic decisions by political leaders to focus scarce resources on the solution of a grave problem (SCHOLL 1995:37).

Clarification processes are seen to be particularly successful – at least from a political point of view – if the chain of reasoning for or against an option becomes transparent and comprehensible. This applies in particular to significant spatial and complex key tasks such as inward development. Cleverly designed clarification processes are vital to assisting in the breakthrough of the minimum strategy for ‘inner before outward development.’

2.3.3 Targeted information gathering

Targeted information gathering is of decisive importance for the clarification process, since decisions in spatial planning must be made despite existing uncertainties. One reaction to encountering a ‘fog’ or ‘cloud’ at the beginning of a clarification process is the indiscriminate accumulation of information, which, in retrospect, may prove quite useless for clarifying the problem. Accumulating and generating information and reformulating the problem creates a false sense of security that it will lead to safer solutions (SCHOLL 2011:283). One possible explanation for this pursuit of security – disguised as activism – could simply be ‘force of habit’ which, according to the epistemologist Karl Popper, sees a person responding to a confusing situation with routines:

‘We live from the fact that we rely on repetition. The association reinforced through repetition is the main mechanism of our mind, by which we live and act. [...] Habit [...] is the main force that guides our thoughts and actions’ (POPPER 1984: 97, translation by the author).

Another reaction may be to refrain from taking any action or making any decision at all, in other words, doing nothing and having the problem-solving process declared terminated early on. Thus, one reaction ties up considerable resources at the beginning of the clarification processes, while the other prematurely terminates a possibly worthwhile option. A third possibility consists of making a preliminary decision based on the knowledge available in order to solve the problem temporarily. The early deployment of hypotheses for possible solutions helps determine which piece of information is important for solving the problem and which is not (SCHOLL 1995:98, 2011a:283). This procedure is described in literature as the ‘maxim of economy’ (MODIGLIANI/COHEN 1961), which culminates in the ‘maxim of the sharper information’ (SCHOLL 1995:98). The latter proposes collecting only information that is relevant for solving the problem in order to gear the effort toward the respective decision-making situation. Jakob Maurer states:

‘Poor planners collect a vast amount of information, without knowing what they need it for. They confuse heaps of data with knowledge. Good planners are problem-solvers: They immediately create temporary solutions for even the wooliest of problems; they look only for the information they actually need for the next step’ (MAURER 1995:46, translation by the author).

The maxim of economy helps to not get bogged down in details and, at this stage of the clarification process, to put efficacy or effectiveness (‘do the right thing’) before efficiency (‘doing things right’) (DE PREE 1990:42, MAURER 1995:18). Against the backdrop of increasingly limited resources – and the constant availability of information of dubious origin – it is evident that this first phase of the process of clarification of complex key tasks is of major significance. At the same time, it is also the most challenging and groundbreaking phase, because this information exerts a certain early power of definition. The players involved at this point in time have a competitive knowledge edge in the subsequent processes as well.

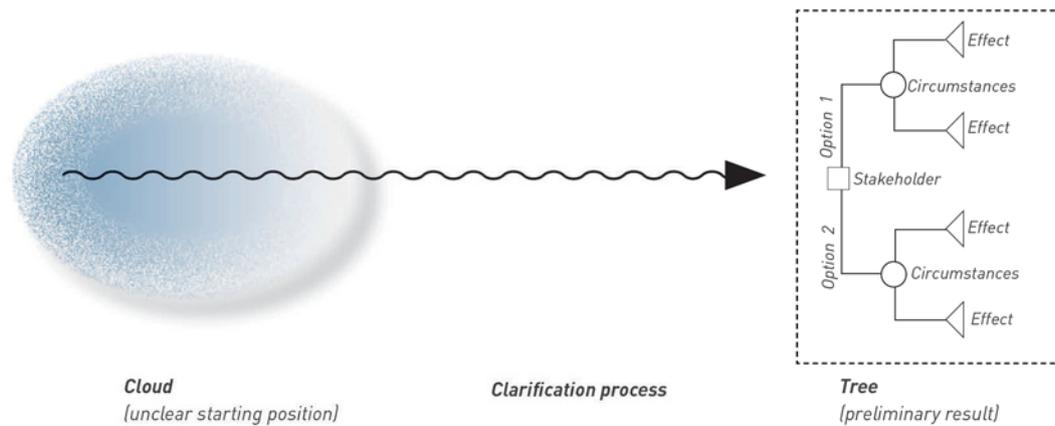


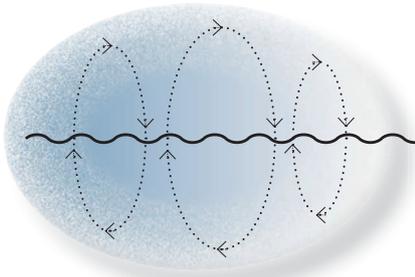
Figure 21: The cloud-tree metaphor (source: own representation, based on SCHOLL 2011:282)

2.3.4 Consequences for the application of methodologies

Acting on the initial problems, and acting on clarifying which task types should be assigned to the tasks that need solving, represents a continuous process. At the same time, the maxim of economy dictates ‘do not collect large amounts of data without a decision-making problem’ with respect to the selection and the use of methods: The amount of effort expended must justify the expected returns. This principle shows that reasonable means for clarifying processes should meet certain requirements (SCHOLL 2011, SCHÖNWANDT ET AL. 2013: 167 f.). The decisive factors are the careful handling of risk, surprising turns of event, and time:

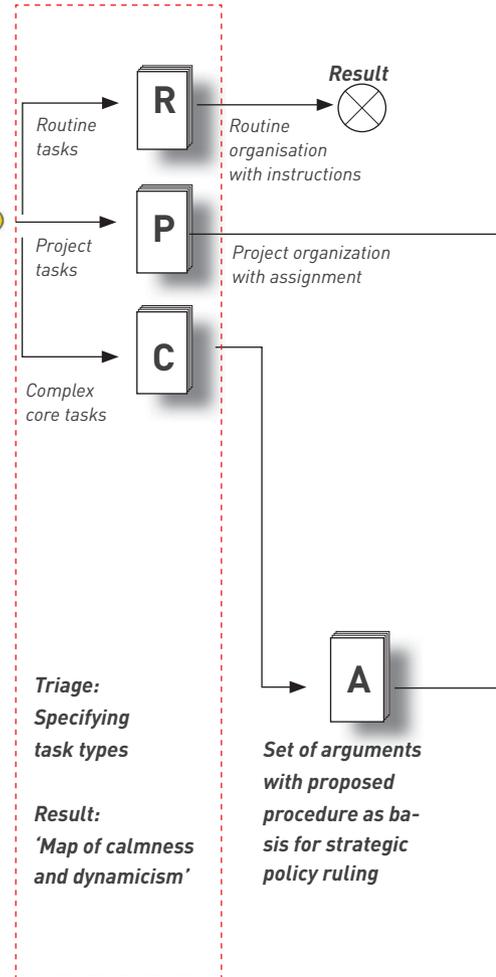
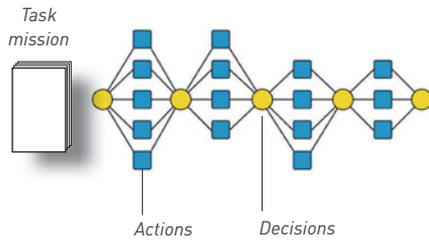
- **Dealing with uncertainty and risk:** In spatial planning, despite the best intentions of everybody involved, the desired effects of decisions taken may not, or only partly, materialize. Conversely, unintended effects may arise. Decisions are always made in uncertainty and bear some risk. Methods implying apparent safety, for example, forecast methods that ‘derive’ (i.e., interpolate) future developments in a linear fashion from previous facts must be rejected. Instead, methods should address uncertainties and risk by systematically incorporating the possibility of error into the decisions. For example, they can provide ‘break points’ in the event of failure or apply the principle of alternative equivalents (SCHOLL 1995: 104 f.).
- **Dealing with surprises:** Surprises occur because of the ‘not knowing what we don’t know’ (SCHOLL 2011:285). These may entail positive outcomes or, vice versa, have adverse – especially chaotic – effects in the planning process. Possible precautions against unwelcome surprises include, for example, providing adequate time reserves in the planning process. A rule of thumb is to declare a third of the required time as time reserve (SCHOLL 1995:112), particularly when faced with a complex problematic situation. Intuitions – in the sense of immediate insights without the discursive use of reason and which apparently arise spontaneously (BUNGE 1996:306) – should be considered and encouraged by selecting appropriate methods for clarification.
- **Use of time:** The mindful use of time is of central importance in clarification processes. This may be the scarcest of all resources and is even more challenging set against the background of the human difficulty of intellectually grasping future time periods. An incorrect assessment of time sequences in spatial planning leads to wasting scarce resources. In order to ensure that all the important information necessary for decisions is ready at a given time, many subject areas must be dealt with by several participants simultaneously. It is helpful to introduce a particular rhythm in order to synchronize processes. Unlike conventional, consecutive approaches, where decisions are based on various reports, the simultaneous approach allows all stakeholders to have, if possible, all the relevant

Method:
Test design, etc.



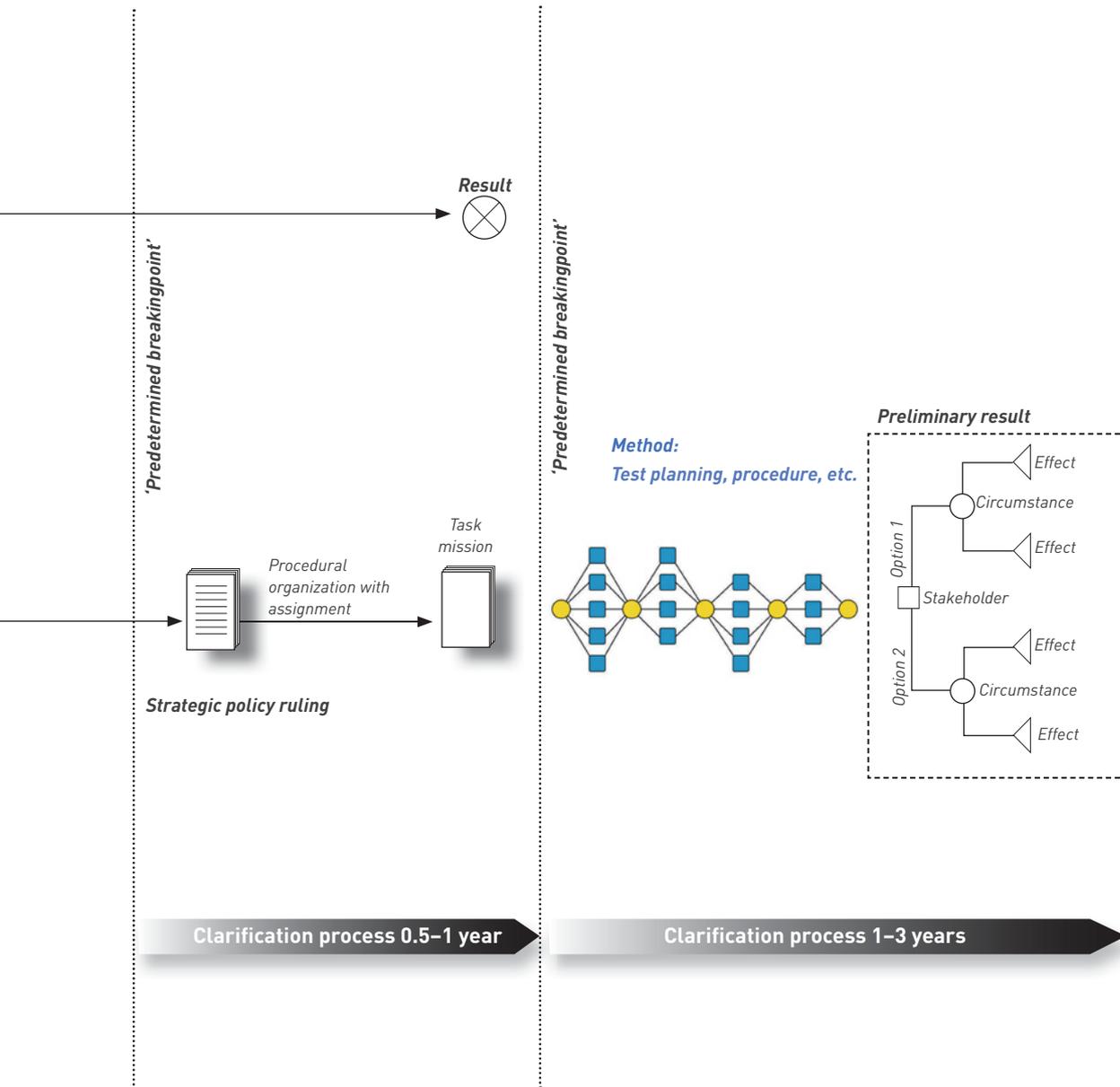
Problem situation or 'cloud'

Method:
Competition of ideas



Clarification process every 1–1.5 years

Figure 22: Elements of a clarification process for inward development
(source: author's representation, following SCHOLL 1995, SIGNER 2011: 310 f.)



information in order to make joint decisions at any given time. Useable methods must permit or even efficiently support such a rhythmic pattern.

2.4 Elements of a clarification process for inward development

In inward development, each case must be assessed on an individual basis, requiring the acceptance of both the landowners and nearby residents with legitimate concerns. Therefore, the use of clarification processes at an early stage of planning is appropriate. The elements of a problem-oriented clarification process are explained in the following sections and illustrated in figure 22, p. 52.

2.4.1 The test design as an instrument for exploration

Spatially significant problems, in the sense of difficult, unsolved problems, form the starting point for developing solutions in spatial planning (SCHOLL 2011). Problem-orientation in an action-oriented spatial planning context focuses on the existence of both a political and an economic interest in the exploration, clarification, and resolution of spatially significant conflicts. Only the insight of sharing common problems can motivate cooperation across administrative borders. Thus, problem-orientation is not concerned with seeking cooperation, as this is legally required by the formal instruments anyway, but rather with identifying the common problem in order to then take coordinated measures to ensure that the desired effects occur. Problem-orientation constitutes the key basis for robust spatial planning.

The orientation of spatial planning toward problems and actions needs methods for exploring, clarifying, and resolving the basic possibilities for action. An appropriate one-fits-all general method is impossible to specify, rather it must be tailored to the actual space for the specific example on a case-by-case basis (SCHOLL 2011). Since spatial planning uses concrete space as a laboratory (SCHOLL 1995:259), research questions always must be approached within a perimeter appropriate to the task. Concepts for

spatial development should be developed by a suitably designed process of designing and testing, because the consequences of planning acts cannot be simulated by means of a theoretical experiment. This clarification process can be illustrated (fig. 21, p. 51) with the 'cloud-tree metaphor' (SCHOLL 2011: 281 f.). Complex core tasks present themselves at the beginning as a messy, chaotic situation. This is a 'tricky,' not routinely solvable problem, which is why the contents of the clarification process must be customized. At the end of the clarification process, a set of arguments or rationale emerges with the choice to either solve or avoid the problem. In the metaphor, this process is similar to a tree with a trunk and branches (options). This decision tree represents a preliminary result and can be adapted for example by modifying initial positions or changing participants.

With respect to spatial planning, it is the task of science to propose bold hypotheses and investigate them thoroughly. Spatial planning, in particular, deals with problems that can be eliminated or avoided only in the more distant future. Hypotheses and the testing thereof form the basis for gaining knowledge.

A test design is a hypothesis in the sense of being a supposition or assessment. It is an informal, quick, and inexpensive way of exploring strategic information ('quick test'). Its results are clear and documented overviews (SCHNEPPER 2012:189). The core of the test design consists of the concrete illustration of an as yet unsolved difficult task. A concrete space is explored concerning its prospects, conflicts, problems, and significant contexts in order to reach a decision on potentially more in-depth interventions. It is thus possible to form preliminary hypotheses within a reasonable timeframe and at limited cost and effort (SCHNEPPER 2012: 18, 86, 90).

A test design encourages everybody to think ahead. The possible actions for implementation all form an implicit part of a test design. Designing therefore amounts to exploring the possibilities for action and gauging any possible scope. A test design can raise the awareness for key questions, without laying claim to one true universal remedy. Indeed, only in this way future are spatially relevant task types made detectable and permit the timely preparation of actions that unfold their full benefit in the medium to long term because of the long lead time. The challenges for the

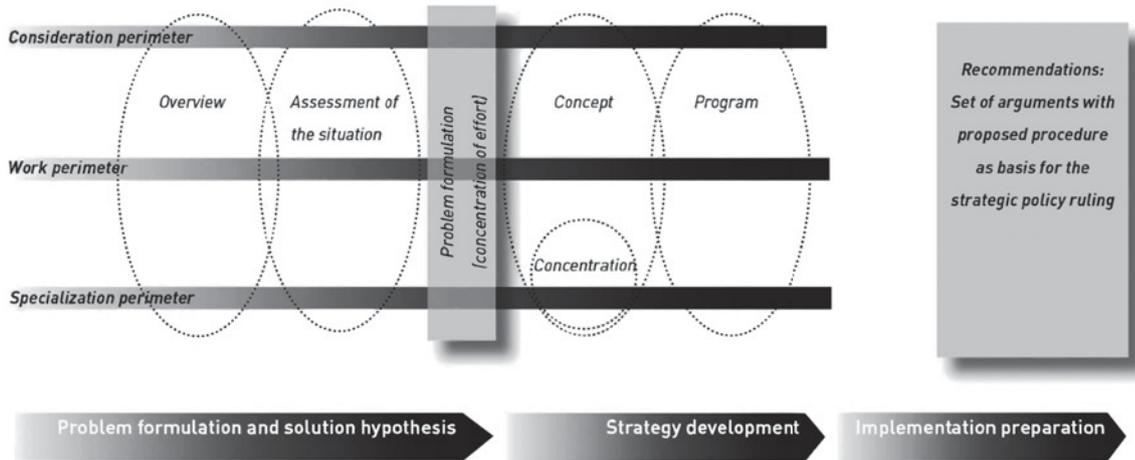


Figure 23: The elements of a test design (source: author's representation)

designer consist of starting the problem-solving process as early as possible with the design. Designing – or establishing hypotheses – is an individual learning process that cannot be delegated.

In this sense, test designs provide hypotheses used by stakeholders as a basis for discussion in order to explore the possibilities of action necessary for the subsequent realization.

The most important task of a test design is to prepare the terms of reference for subsequent simultaneous proceedings. In the negotiations concerning structural densities, trial designs remain a tool for exploration that can be used in order to meet the often conflicting arguments of the various stakeholders.

If the exploration is conducted with a certain focus – for example, to detect potentials for inward development – it could be deemed a 'focused exploration' or 'determining the conditions that will be of tactical importance in future actions' (SWISS ARMY 2004). The results of this exploration constitute the basis for identifying task types⁴⁵ associated with inward development. The test design should make it possible to assign the planning tasks involved (related to densification as a part of the inward development) to the appropriate object types. Another merit of the test design is that it leads to an illustrated set of arguments, which in turn can serve as the basis for a political

decision on the strategic concentration of effort. This decision makes clearer which areas politicians need to focus on in order to advance the minimum strategy 'inward development before outward development.' Only once a decision on strategic concentration of effort has been made should a structured process such as a competition of ideas or a test planning be installed.

A temporary hypothesis for solutions and a proposal for the further course of action are of great importance when preparing this politically motivated concentration of efforts. After all, it is a matter of convincing politicians in the executive to engage in a technically and professionally challenging process that could span several years, and to allow the necessary funding for it. Simultaneously, this timely clarification process is a means of building trust between parties who might not have worked together before. Especially when the collaboration process runs across administrative borders and has to deal with difficult unresolved tasks can the preparation phase turn out to be the Achilles heel – or, if you like, the 'moment of truth': If the cooperation process encounters seemingly irreconcilable differences at this early stage, this may serve as a pointer to designing subsequent phases.

⁴⁵ See page 49.

2.4.2 Elements of a test design

A timely clarification process for inward development in the form of a test design is best structured in different phases (fig. 23, p. 55), though the order they proceed in need not necessarily be chronological, it may also be iterative:

- **Problem formulation:** The clarification process begins by identifying the initial problems in a manner as specific and clear as possible. Using problem-shifting⁴⁶ allows their core to be exposed.
- **Designation of laboratory space:** The laboratory of spatial planning is real space (SCHOLL 2002). According to the '3-level rule' (SIGNER 2011:327), a test design should relate not only to the regional level, but also to incorporate supraregional and local matters of importance. It is thus recommended that an overview perimeter defining the observation perimeter (supraregional), a working perimeter (regional), and a deeper focus perimeter (local) be established. The laboratory should include these three levels; the perimeter definition is always provisional.
- **Overview:** Overviews are compilations of the main problems in the laboratory, the main outline of the internal, and external processes as well as quantitative and qualitative information about characteristics for areas, usage, movements, and demographics (MAURER 1995:55). They take the form, for example, of maps, schematic diagrams, or organizational charts. Different perspectives serve as investigation grids. These summarize the contents of spatially relevant subject matter. Overviews reflect the individual knowledge of those involved at any given time. The components are not rated and not conclusively chosen. Creating an overview does not mean simply identifying and describing as many aspects as possible, but rather consists of identifying the key features for solving the issues in question. Spatial development must be approached from different factual angles, at different spatial levels, and for different time periods (short term, medium term, long term). Then, the typical characteristics, differences, and similarities should be recognized and recorded.
- **Assessment of the situation:** Only after a rating of the factual, spatial, and temporal aspects of this overview exists can the latter be called a status report. Assessing the situation means learning from the preceding activities (MAURER 1995:56). Throughout the clarification process, it is important to regularly carry out a qualitative assessment of the central problems relevant to spatial development and the most significant space-related conflicts (divergent interests in the space) in the laboratory. This enables problems that are known, pending, or expected – as well as those yet unknown but potentially important – to be recorded. Known issues are those that have already been addressed and discussed in planning and politics. The assessment precipitates a reasoned decision regarding the concentration of effort, so that participating parties can regularly update the set of arguments for subsequently balancing various interests. Like the overview, an assessment is always carried out based on an incomplete and preliminary amount of information available at the time. Because the information base is continuously growing and evolving, the assessment must be reviewed periodically in meaningful cycles and adjusted if necessary.
- **Decision regarding the concentration of effort:** The issues identified in the assessment are subsequently evaluated as to their relative importance and urgency in terms of the desired spatial development. The most commonly available means and resources rarely encompass examining all desired issues. Rather, concentrating one's resources – in particular limited time – on the key issues identified in the assessment helps steer them toward a solution. The decision regarding the concentration of effort serves to identify those spatially relevant core problems whose identification and solution will have the greatest leverage effect for the entire area. This decision on concentrating efforts is taken not only on a thematic, but also on a spatial level. Following the first transregional assessment of the situation from a 'bird's-eye view,' part of the area subspace should be chosen for further consideration based on a plausible explanation of how the problems in this part of the area will impact the entire area. At this stage of the work process, it is only possible to assign the different facets of

46 See page 45.

the assessment to the respectively appropriate object types. Because the action plan deals exclusively with complex core tasks (which can neither be solved routinely nor considered project tasks), only these questions are further addressed in the next phase.

Once the problem has been articulated and a hypothesis for its solution proposed, strategy development ensues, consisting of concept and program:

- **Concept:** A concept combines objectives and measures into a unified statement. Whereas targets represent future benchmarks or states to be achieved, measures comprise substantive and procedural arrangements, actions, or practices that are being taken to achieve the objectives (LENDI, ELSASSER 1991). The problem to be solved has now been defined and confined in scope in the assessment phase, and the subsequent decision about the concentration of effort outlined. In the design process, attempts are made to finally solve these problems. The consequences of different alternative solutions are weighed, and unachievable solutions – whether material or factual – as well as those that conflict with major objectives are discarded. In order to increase the chances of its implementation, an approach must be examined as to its feasibility. With an appropriate scale, a more in-depth exploration is undertaken in a location deemed particularly significant in order to illustrate the necessary preparations for implementation. In this respect, it is essential to pay attention to the local level.
- **Program:** Together with the concept design, a plan of action – a program – is designed that includes the measures to be taken according to their objective and the spatial and temporal priorities. Then, the individual measures are assigned to particular participating parties. One must take into account the fact that uncertainty largely prevails also in future decisions by participating or concerned parties. Furthermore, this step should not neglect the search for partners or ‘accomplices’ for the desired spatial development. Which participants could benefit from the implementation of the measures to solve the initial problem? Identifying common problems motivates cooperation and may lead to the creation of synergies, which in turn favor a more prudent use of the always scarce resources.

Sustainable concepts and their coordinated programs (stages) together constitute only a strategy, a ‘compass to the future’ (SCHOLL 2011:289) or a ‘guiding principle’ that can be pursued even when faced with shifting circumstances (MAURER 1995:51). Before defining the strategy itself, one must gauge the scope provided by the strategy both in terms of its flexibility and of its limits. This does not mean that every single detail must be predetermined on a small scale, but rather a flexible strategy must be devised so as to react to emerging concerns or uncertainties.

The result of a test design thus consists of recommendations on how to translate the proposed concept into formal instruments. They are recommendations for action and proposals for decisions intended for the relevant actors.

2.4.3 The three iterations

The steps of overview – assessment – concentration of effort – concept – program should not merely be checked off in a chronological order. Rather, several passes are necessary to clarify the issue and to arrive at a hypothesis for a solution. The maxim of the ‘three iterations’ stipulates that clarification processes should be designed such that the task may be processed in three iterations of approximately equal length (SCHOLL 1995:105). This encourages approaching a solution to a nonroutine problem several times, each with a different focus at the three different scale levels:

1. **Open and narrow:** Bold proposals and a variety of perspectives should predominate at the start of the process. Even seemingly impossible or unaffordable solutions, as well as vagueness and rough estimates, are acceptable. At the end of the first round, the proposed solution takes the shape of a ‘blueprint’ that provides the direction of focus for the start of the second iteration.

2. **Test and discard:** The strategic directions narrowed down by the first iteration are now tested with regard to their effects and consequences as well as their robustness (SCHOLL 2011:288). The proposals for solutions should be able to uphold their legitimacy even under changing conditions. If it turns out that some options are no longer worth pursuing, they are discarded. The documentation of rejected ideas should be saved for when the set of arguments should be drawn up.
3. **Deepening and adjusting:** The principal elements of a possible solution are examined more closely, and the strategic direction is adjusted if necessary. The set of arguments is specified and adapted accordingly. At the end of the third iteration, a preference for a particular option over all others can be justified.

2.4.4 Triage

By the end of the clarification process, task types can be described and allocated to the three categories of routine, project, and core tasks⁴⁷: triage. The term 'triage' originated in emergency medicine and describes the process of determining the priority of patients' treatments based on the severity of their condition, for example, in a mass casualty incident, coupled with the limited resources of medical care. It represents the difficult task of deciding in a very short time how scarce resources (time, human resources, material assets) should be distributed. It also involves the process of risk assessment prior to initial diagnosis (PSCHYREMBEL 2012). Originally, the term triage meant 'the action of assorting according to quality' (WAHRING 1980), which in turn goes back to the Latin 'tritare' or 'threshing (of grain)' (LANGENSCHIEDT 1983). During threshing, the grain is mechanically loosened from the chaff that surrounds it, leaving behind straw, chaff, and grain. The phrase 'to separate the wheat from the chaff' uses this metaphor. Identifying complex core tasks within inward development may therefore also be seen as separating 'the wheat from the chaff.'

Triage reveals which tasks from the 'cloud' can be declared complex core tasks and dealt with legitimately by implementing special organizations and proce-

dures. This is the 'minimum strategy for influencing the spatial development' (SCHOLL 1995:33). This is of particular relevance in small- and medium-sized communes with their limited human and financial resources for informal planning processes. Triage ensures that the scarce resources available are used primarily for complex core tasks.

The product resulting from the clarification process is not a general framework or master plan, but a map identifying possible areas for inward development. At the same time, it shows where development can be addressed by routine organizations and where a need for action is likely to occur only in later generations. Finally, it shows which tasks must be solved with a project organization. This 'map of calmness and dynamism' (MAURER 1995:45) displays the number and scope of the different object types. The focus of interest for in-depth discussion lies in those task types that can be referred to as 'complex core tasks.' Clarifying and solving these tasks forms the basis for a strategic decision of the political executive as to the concentration of effort. It is therefore of central importance to inward development.

Once a task has been classified as a 'complex core task,' the proposal is then prepared on designing subsequent special procedures, which includes is a proposal for the special, customized form of organization.

2.4.5 The set of arguments

The aim of the prioritization, with the test design acting as a tool, is to achieve a proposal for a method to be used by the executive for designing further processes. In essence, it is a set of arguments which serves as a basis for decision and contains a collection of options. This collection should cover not only the arguments that justify the choice a particular option, but also those that discourage a particular choice – or that are irrelevant to the process (SIGNER 2011). Likewise, the arguments that were discarded during the processes of clarification and policy development should be flagged. This provides a solid foundation in the consultation process for deciding

⁴⁷ See page 49.

which option to choose. These documents can provide valuable assistance for politicians, especially when the issues are met with great public interest or resistance.

2.4.6 The repertory

By now it should have become clear that clarifying and solving spatially significant problems with the test design method is extraordinarily challenging. Various repertories (collection of tools) support the process of clarification by offering instruments or drawing attention to traps. Two of them with an excellent practical track record are discussed in more detail below:

- **Diagrams and sketches:** Clarification processes rely on simplification and abstraction. Graphical representations offer an ideal way to present unclear issues in a simplified form and thus better handle complexity. In particular, diagrams and schematics allow essential contents to be represented in a simplified manner. And precisely because spatial planning is concerned with issues from different disciplines, such graphic representations may be a significant vehicle or medium for common cognitive processes.
- **Anchoring:** The early use of estimates in the clarification process to suggest accuracy – and this includes graphics – can cause those involved to lose the ability to distance themselves from these images and figures, possibly leading them to tight embrace the initial idea and overestimate themselves. This ‘infatuation with the first idea’ could in turn be related to the human desire for security. The collective agreement on an issue within the group is evaluated as the ‘correct decision,’ and the search for other solutions is perhaps prematurely terminated. This cognitive bias known as ‘anchoring’ was first described as ‘adjustment and anchoring’ by Amos Tversky and Daniel Kahneman in 1974 (TVERSKY/KAHNEMANN 1974). To avoid the anchoring effect, one should use data distribution in quantitative data analysis, and graphical representations should include tolerance ranges.

2.5 Digression: playing games as a method

Test designs can play a fundamental role in the clarification process, in particular in the exploration of scopes, by allowing engagement in testing or playing, in the sense of ‘trial and error.’ In his work ‘Against Method,’ the epistemologist Paul Feyerabend considered the philosophical background of modes of perception (FEYERABEND 1993, Verso third edition). Peter Jenny, Professor of Artistic Design at the Department of Architecture at the ETH Zurich 1977–2007, used games in his courses as a method for gaining knowledge and understanding. Jenny’s teaching methods have had a profound influence on many of the architects trained during these 30 years at the ETH Zurich; summarized below are key points for use in clarification processes.

2.5.1 ‘Do what you want’ and ‘anything goes’

According to his colleagues, ‘Jenny provides the school an escape from its self-incurred seriousness’ – and gives a nod to Kant (JENNY 2005:4). He is an ‘educational powerhouse’ who manages to awaken his students’ joy in their work, which increases the quality of their work significantly. His confession that he was actually nothing more than a ‘trainer for the art of perception’ (JENNY 2005:4), and that his task was to introduce budding architects to his theory of perception, shows his focused understanding of this manner of transferring knowledge. All the more remarkable are the minimal methodological guidelines he employed for the exercises, the aim being to develop a maximum number of possible solutions.

A central role in Jenny’s doctrine was given to playing – ‘la gaia scienza’ as he called it – and the motto ‘do what you want’ and ‘rejoice at the escape from the self-incurred seriousness’ (JENNY 2005:4). Jenny did not mean the freedom to do or not do according to one’s fancy, but the freedom to use unorthodox methods to resist the usual perceptions. For example, so-called ‘rule breaking’ should disrupt the conventional ideas about a subject, in order to arrive at unexpected new possibilities and new perspectives. Feyerabend, too, stresses the importance of breaking rules in training of the perception in order to gain knowledge:

'We must invent a new conceptual system that [...] introduces perceptions unable to become part of the existing perceptual world.' (FEYERABEND 1993: 22f, translation by the author)

and further:

'I am sure that we are depriving ourselves of new and surprising discoveries as long as we remain within the limits defined by [perception].' (FEYERABEND 1993: 58, translation by the author)

Games and perception training open up new paths for cognitive processes, though it demands an environment permitting the violation of conventions and the making of mistakes. Only this in the end allows the creative spirit to engage in work. Karl Popper also stresses the importance of making errors in the learning process:

'We need to [...] change our attitude toward our mistakes. [...] In traditional professional ethics this leads to covering up our mistakes, to hiding and to forgetting them as quickly as possible. [...] The new order, on the other hand, says that, in order to learn [...], we have to learn precisely from our mistakes' (POPPER 1989: 228 f., translation by the author).

Jenny's motto and his perception games raise the question as to whether the philosophical background to his teaching concept may be found already in Paul Feyerabend's 'Against Method,' first published in 1975 (FEYERABEND 1975/1993). Around the same time as Jenny developed his teaching concept, the latter was advocating the principle of 'anything goes' against all established methods or abstract theories to achieve progress in science. Like Jenny, he stresses the importance of the playful treatment of issues:

'[...]initial playful activity is an essential prerequisite of the final act of understanding' (FEYERABEND 1993: 17, translation by the author).

Moreover, Feyerabend was convinced that the creation of an object and the idea thereof could not be separated, which again points to the immense importance of training perception. Using specific methods of perception, 'some of the most important formal properties of a theory are found by contrast, and not by analysis' (FEYERABEND 1993: 21). He discusses

the term 'counterinduction' (FEYERABEND 1993: 20). Hypotheses should be introduced which contradict the established theories. In a counterinductive approach, ideas are compared with other ideas, and ideas eliminated by such a contest should be improved rather than merely abandoned.

2.5.2 Competition of Ideas as a prerequisite for quality

The future tasks to be faced by spatial planning over the next few years as part of the implementation of the revised Spatial Planning Act and the principle of inward development cannot be met solely with established formal procedures – that is the central hypothesis underlying the present work. Rather, increasingly solutions to difficult issues can be found only in larger, functionally connected areas that cross administrative borders. For inward development, this could mean strengthening the observational exploration of the existing space and working in multidisciplinary groups with the aim of a 'competition of ideas.' Feyerabend states the following:

'A scientist who wishes to maximize the empirical content of the views he holds, and who wants to understand them as clearly as he possibly can, must therefore introduce other views as well; that is, he must adopt a pluralistic methodology.' (FEYERABEND 1993: 21, translation by the author)

The usual approach in the practice of spatial planning, namely, presenting the given circumstances and the future problems of an area systematically according to the topics of housing, transportation, and landscape, and then to 'derive' so-called action plans, could turn out to be unsuitable for future tasks associated with inward development. As Feyerabend quite rightly asks:

'How can we discover the kind of world we presume when we proceed as we do?' (FEYERABEND 1993: 22, translation by the author).

It is no longer the task of the scientist to look for the 'one and only' true solution, but rather 'to sustain the motion of the whole' (FEYERABEND 1993: 21). At the same time, in order to emphasize this even more

clearly, he stresses the importance of the discarded idea – which he calls ‘the weaker case’ – in contrast to the direction that is pursued further.

Demonstrating the inherent possibilities of action by a competition of ideas is a valuable aspect in both spatial planning practice and in politics and should not be underestimated. The cantonal building regulations require the public to be informed of targets and planning progress. Especially projects that propose to increase building density need to have the support of the local population to avoid being rejected later in the municipal vote. Support and consensus are achieved by – among other things – providing timely information. The reasoning behind a decision not to pursue a particular idea or solution requires public documents, e.g., in the form of plans and drawings. Illustrating the inadequacy of an opposing project can increase the overall public consent for a chosen project or a specific direction. It also highlights the significance of the rejected ideas. As Jenny points out:

‘Designing and discarding have always been mutually dependent actions. But sometimes discarding happens too fast. [...] The brain’s waste basket – like it or not – cannot be emptied out that easily’ (JENNY 2001, translation by the author)

2.5.3 Obstacles to implementation

Although it may seem obvious to use competing ideas to clarify regionally significant issues, the obstacles for their actual implementation in practice are considerable. Difficulties arise in spatial planning for the most part once the results of informal clarification processes are set to be integrated into formal instruments. At this juncture the decision is made about the form in which the recommendations are recorded in the instruments, which are then binding for landowners. The risk arises that promising solutions could be rejected because of a lack of a shared language between planners and the electorate since the consequences of future problems have yet to be recognized. Issues concerning the very distant future can be debated only if an ample repository of past experience and knowledge is available. This translation work must be undertaken mainly by planners. Competing designs may help to convey contents. The

importance of inward development for future generations justifies the quite considerable resources of time and money expended for a structured clarification process. Decisions about the future direction, taken after such jointly completed clarification processes, are usually of a very robust and long-lasting nature.

Despite all external constraints, spatial planning is well-advised to embrace the principle of ‘anything goes’ or ‘do what you want’ at an early stage in the clarification process and to examine the whole range of possible solutions with an open mind and in an unbiased, unprejudiced manner. Yet, this demands both the will and ability to deal with approaches that, at first glance, run contrary to one’s own perception and ideas – and thus poses a significant challenge especially for nonprofessional, militia political leaders in small- and medium-sized communes.

2.6 Preliminary conclusion 1: Density must be the subject of clarification processes

Structural densification is faced with rather low acceptance in small- and medium-sized communes, which in turn reinforces another initial problem, namely, the obstacles that occur in mobilizing legally secured building reserves. Without the consent – and enthusiasm – of landowners, inward development and concurrent densification remain impossible. Landowners must realize that they are important actors in the planning process. In order to quantify an increase in structural densities suitable to both location and task, it is necessary to demonstrate the space where densification can occur. Room for density is limited by the quality and quantity. So, when is tight too tight, close too close? Which places are more suitable for moderate densification than others and why? Is density wanted at all in a specific location? These questions should be addressed as soon as possible, before being translated into formal instruments. The early clarification process must become a natural part of planning, even in small- and medium-sized communities without high development pressure.



47°16'11" N 7°41'40" E

3 Exploration in the Swiss Central Plateau

The empirical core of this work is the exploration of the laboratory space offered by the Swiss Central Plateau on various scale levels, the goal being to identify 'room for suggestion and consideration' of densification. To this end, an overview of the settlement area reserves available for inward development is indispensable. An estimate of the reserves in the main urban areas of Switzerland shows that about two-thirds of the settlement area reserves and floor-space reserves lie in residential areas of small- and medium-sized communes in the main urban areas of Switzerland. In addition, about 50% of the floor-area reserves in residential areas are on already built-up but under-used sites. There is a deliberate 'forfeiture of density' in the main urban areas of Switzerland, as the reserves secured by building regulations provide for a theoretical capacity for the absorption of approximately 0.5–1 million additional inhabitants, even without adoption of the formal instruments. Given the basic problems such as lack of acceptance for structural density and obstacles to mobilization in the built stock, it makes sense to explore the scope for density in the communities at an early stage by means of test designs and to find typologies tailored to each location.

3.1 Density denial in the main urban areas of Switzerland

3.1.1 The Swiss Central Plateau as laboratory space

In the past, settlement and transportation development in the Swiss Central Plateau was influenced largely by its topography and water supply; these still form the typical characteristics of this large space (HLS 2009a). Consequently, the spatial definition of the Swiss Central Plateau as a laboratory space is primarily based on topographical features (fig. 24, p. 64). The southern side of the Jura Mountains and the course of the Aare form its northern perimeter. In the South, the Central Plateau transitions into the

Alps, along the boundaries of those communities that identify themselves as mountain communities and are members of the Alpine Convention⁴⁸. In contrast to the Central Plateau, predominantly Alpine regions have given concrete form to the Spatial Concept Switzerland in their territory and articulated specific ideas for the development strategy in the mountain areas which differ significantly from those for the Central Plateau (RKGK 2014). At the Western and Eastern edge lies the two largest lakes in Central Europe – Lake Geneva and Lake Constance, respectively, and define easily identifiable landscape borders. The Basle region is located on the northern border of Switzerland, separated from the Central Plateau by the Jura Mountains that go up to 1,700 m. The settlements are well connected via the Hauenstein tunnel and the Bözberg tunnel with the inner area of Switzerland (which, however, in bio-geographical terms forms part of the Jura Plateau), while the landscape of the Central Plateau is characterized primarily by planes and sandstone hills (ADS 2010). Basle benefits from its border location and is oriented toward a tri-national development space, with its own ensuing specific problems. Therefore, the metropolitan area of Basle does not share the identity of the Central Plateau and is consequently excluded from the present definition.

The Central Plateau occupies approximately one-third of the country's land area and extends nearly 300 km, between Lake Constance and Lake Geneva, without topographic barriers. This area forms a rolling and plane inner area, as illustrated by the French term 'le plateau.' However, according to the French geographer Yves Lacoste, this French designation does not denote a plateau or highland in the English sense of the word. Rather, the term derives from 13th-century French, where it was used as a synonym for 'large area.' It would involve

'a fairly flat relief which [...] dominates the plains or valleys around it'⁴⁹ (LACOSTE 2003: 303).

48 The Alpine Convention is an international treaty between the Alpine Countries for the sustainable development and protection of the Alps and for the defense of the interests of the local population (ALPCONV 2014).

49 Translation by the author. Original: '[...] il s'agit d'une forme de relief relativement plane, qui domine par des pentes ou des versants plus ou moins marqués les plaines ou vallées qui l'entourent.'

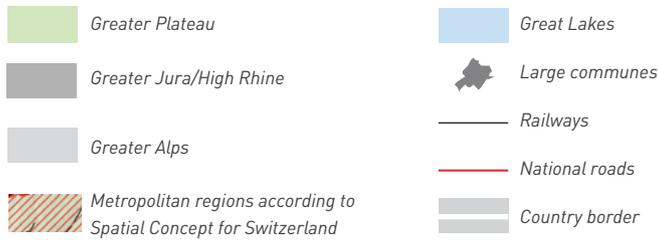
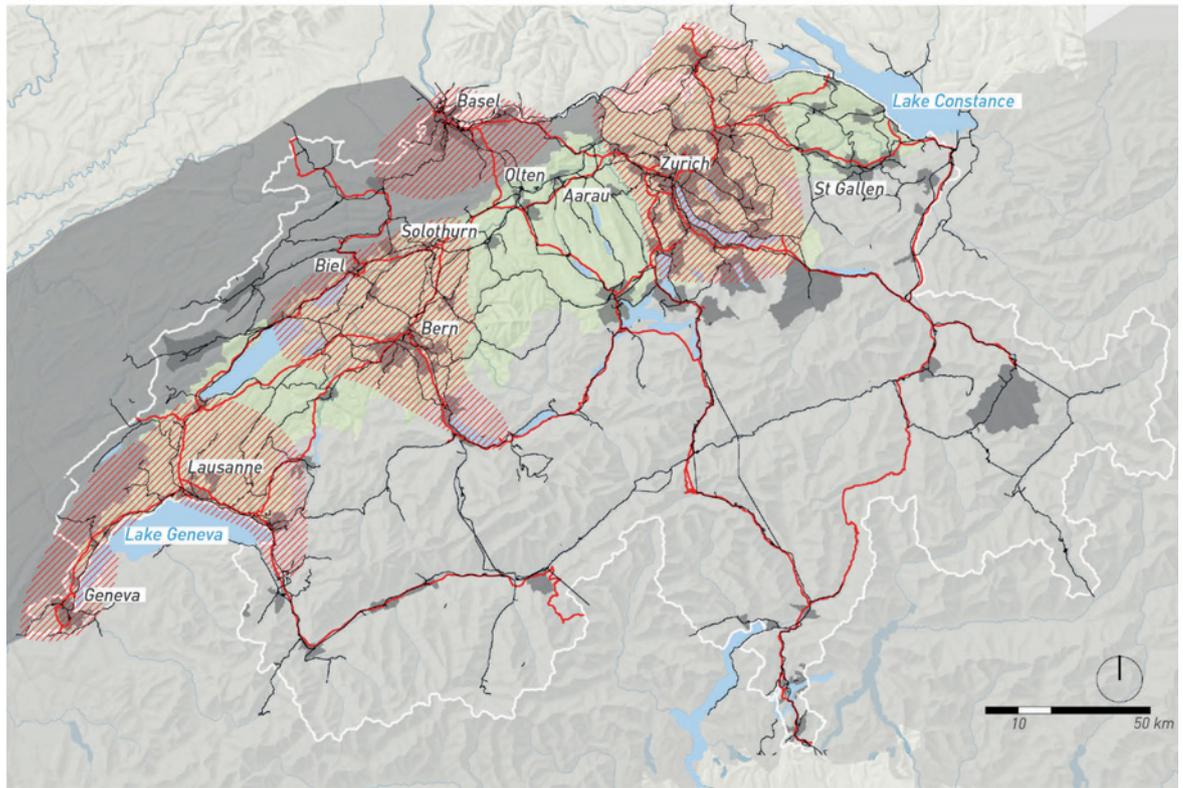


Figure 24: Overview of the Swiss Central Plateau (source: author's own representation, data: swisstopo 2013a, swisstopo 2013b, ADS 2010, ALPCONV 2014, BR ET AL. 2012)

	Local community area *	Population	Employment	Land users	Density of space-user [per km ²]	Population density [per km ²]	Population projection 2015–2035	Level of motorization
Central Plateau	11,476 km ² 29%	5,553,428 68%	3,445,724 70%	8,999,152 69%	784	484	+10% **	550–570 ***
Jura and High Rhine	3,837 km ² 10%	856,469 11%	511,602 11%	1,368,071 11%	356	223	+4% **	470–490 ***
Alps	24,677 km ² 61%	1,729,734 21%	942,094 19%	2,671,828 20%	108	70	+4% **	570–590 ***
Switzerland	39,990 km ² 100%	8,139,631 100%	4,899,420 100%	13,039,051 100%	326	204	+18%	539

*without lakes, commonages, and independent special areas

**own estimate for Central Plateau cantons based on BFS 2015b (mid scenario)

***own estimate based on BFS 2015a

	Number of communes	Small communes < 2,000 inhabitants		Medium-sized communes 2,000–10,000 inhabitants		Large communes > 10,000 inhabitants	
		Number	Population	Number	Population	Number	Population
Central Plateau	1,373 100%	778 57%	645,408 12%	493 36%	2,121,680 38%	102 7%	2,86,340 50%
Jura and High Rhine	329 100%	256 78%	196,104 23%	54 16%	217,283 25%	19 6%	443,082 52%
Alps	694 100%	456 65%	347,087 20%	212 31%	880,268 51%	26 4%	502,379 29%
Switzerland	2396 100%	1,490 62%	1,188,599 15%	759 32%	3,219,231 40%	147 6%	3,731,801 45%

Table 10: Figures for the greater areas of Switzerland 2013 (source: own representation; data: GRAMS 2015: 205)

The English expression might best be described as 'land in-between.' A mild climate, compared to the Jura and the Alps, high soil fertility, forest reserves, and regular running waters have offered favorable conditions in the Central Plateau for settlements along its rivers and lakes since the Neolithic period. Even the vast majority of the Roman estates and around 70% of the cities founded in the Middle Ages were concentrated in the Central Plateau (HLS 2009a). The polycentric nature of today's main settlement areas in Switzerland should therefore be understood as a phenomenon derived from of an earlier, medieval pattern. Most of today's small and

large cities in the Central Plateau developed around a center that was either newly created or extensively restructured during the Middle Ages. The geographical distribution of the medieval city foundations was the starting point for the development of further settlements leading up to the industrialized era (MAL-FROY 1989: i).

A dense network of transportation infrastructure on land as well as navigable waters established the basis for trade. Around the year 1800, just under 60% of the entire Swiss population lived in the Central Plateau (HLS 2009a).

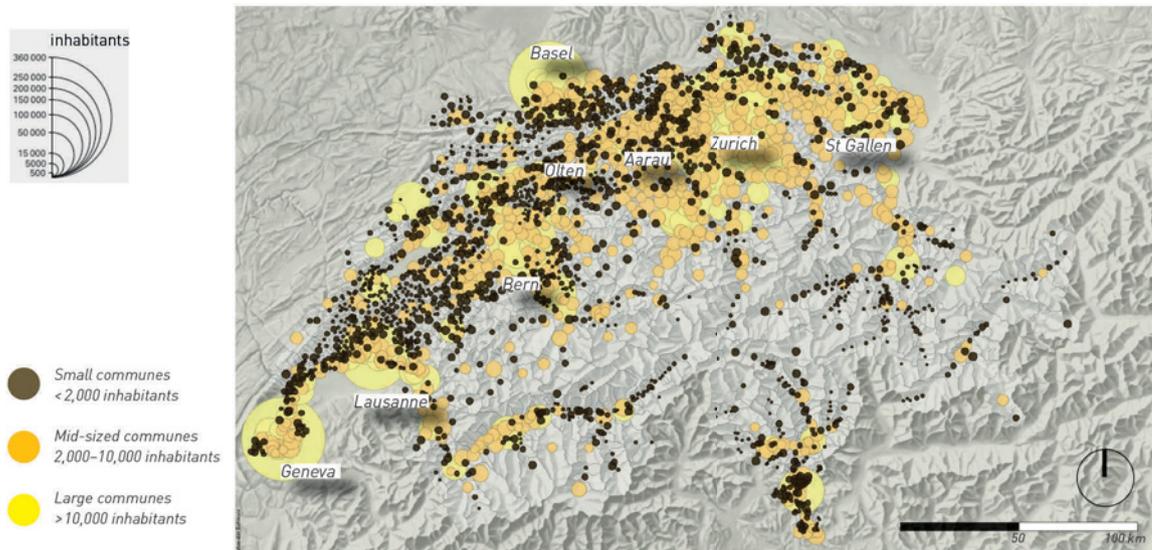


Figure 25: Commune size in Switzerland [source: own representation, data ADS 2010]

The construction of the first railways in the 19th century established the centers along the South side of the arc formed by the Jura mountains, connecting the first major areas of Switzerland by the new mode of transportation, especially the railway line Aarau – Olten – Aarburg – Herzogenbuchsee – Solothurn – Biel (WEISSBACH 1913: 16 f.). These communities, all located along the River Aare, benefited from the water as a source of energy and consequently developed into the first hubs of industrialization in Switzerland. Only with the emerging popularity of motorized private transportation in the 1950s did settlement development become independent of the stops and lines of rail-based public transportation. This was followed from the early 1960s onwards by the construction of national highways.

However, the clear topographical demarcation of the Central Plateau is not reflected in either a political or a linguistic unity. The Central Plateau never formed an economic, political, or cultural unit. Even today, it lacks political and administrative uniformity. According to the present definition of space, only the five Cantons of Schaffhausen, Thurgau, Zurich, Zug, and Geneva are in fact situated completely within the Central Plateau. Parts of the nine other Cantons of the Central Plateau are situated either in Jura region or in the Alps. This means that no single canton can be considered a main actor in this area. Nor does one single national language dominate.

Within the inner space of the Central Plateau, today all regions are interconnected via strong commuter links, thanks to a dense transportation infrastructure network. Because of the systematic development and the polycentric settlement pattern, most communes forming the Central Plateau can be found within the 1.5-hour isochrones of public transportation around the core cities of Zurich, Bern, and Geneva (ARE 2010: 16). The major economic developments in Switzerland have occurred in this area; here is where major medium- to long-term investments in the expansion of the railway infrastructure are being made (BAV 2013), further improving the development and accessibility of the core cities in the Central Plateau.

Although the Central Plateau covers only around 30% of the country's surface area, it forms the living and working space for around two-thirds of the population and space-users (tab.10, p.65). The surface area of approximately 12,000 km² is comparable to that of the West-Nederland region, the main settlement area in The Netherlands. But the population density of the Dutch region, at 650 inhabitants per km², is more than a third higher than the approximately 480 residents per km² in the Central Plateau (ADS 2010). In terms of population density, the Central Plateau resembles the Dutch Zuid-Nederland, with around 488 people per km² (ADS 2010). Most significantly, the outstanding importance of the Central Plateau for Switzerland manifests itself in the space-user densities: The greater Central Plateau is used about

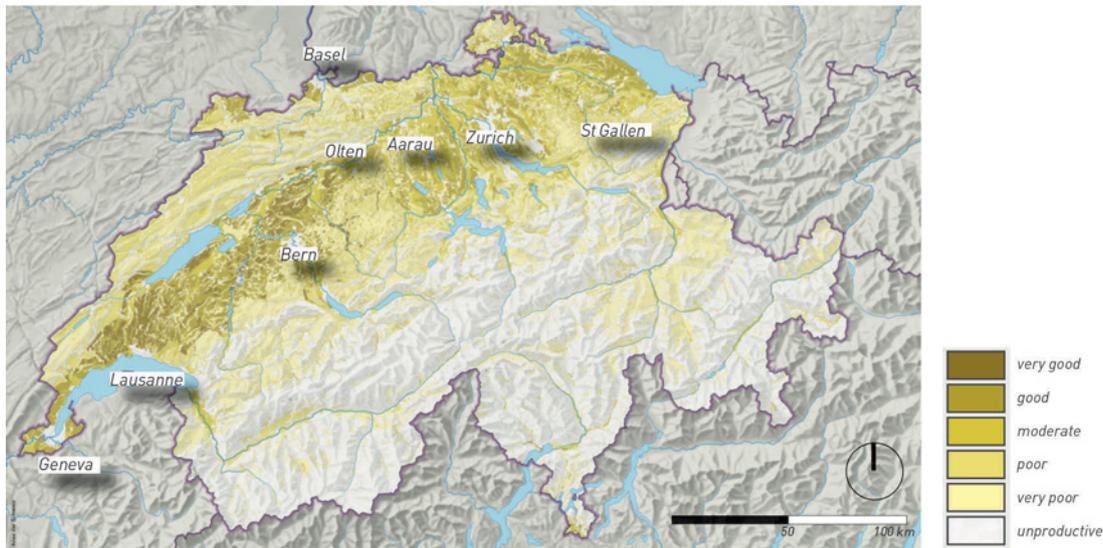


Figure 26: Soil suitability in Switzerland for agriculture (source: own representation, data: ADS 2010)

seven times more intensively than the Alpine region, and there are also clear differences from the greater Jura and High Rhine regions.

The large number of number of small- and medium-sized communes in Switzerland with fewer than 10,000 residents is quite striking. They constitute 94% of the Switzerland's communities and 55% of its population. The Central Plateau shows the same picture (tab. 10, p. 65): 50% of the population live in small communes, accounting for 93% of all communes in the Central Plateau. This means that, in the main urban areas of Switzerland, there is a balance between residents in cities and populations in small- and medium-sized communities, though the vast majority of administrative units are small- and medium-sized communes. In Vaud and Fribourg, north of Lake Geneva, and in the Central Plateau there is a remarkable spatial concentration of small communes with fewer than 2,000 inhabitants (fig. 25). The proportion of larger communes in the Central Plateau with more than 10,000 inhabitants is comparatively low at 7%, but these in turn make up half of the population. At the same time, in addition to the highest land user densities, the Central Plateau also has the most suitable soil for agriculture (fig. 26), which results in conflicts of land use between agriculture, transportation, and urban development, in view of the high accessibility and high space-user densities.

This overview shows the outstanding importance of the living space constituted by the Central Plateau for Switzerland, especially compared to other metropolitan areas. Planning practices as well as any future actions for this area dependent greatly on thinking across the borders of cantons and communes. Yet, a cross-border approach for the main urban area of Switzerland has been missing until now. It is thus all the more important to make shared identified problems the starting point for cooperation.

3.1.2 Small- and medium-sized communes as the main actors in the Central Plateau

As the overview shows, the territory of the Swiss Central Plateau is dominated by small- and medium-sized communes. These are accessible via a dense network of rail infrastructure of different track widths. Significantly more than half of them lie within the 60-minute isochrones of public transportation around the three major cities of the Central Plateau, namely Zurich, Bern, and Geneva. At the same time, about 62% of small- and medium-sized communes of the Central Plateau have a connection to the rail network in their territory (fig. 27, p. 68). In addition to the dense passenger network, two main lines for the transalpine freight transportation of European

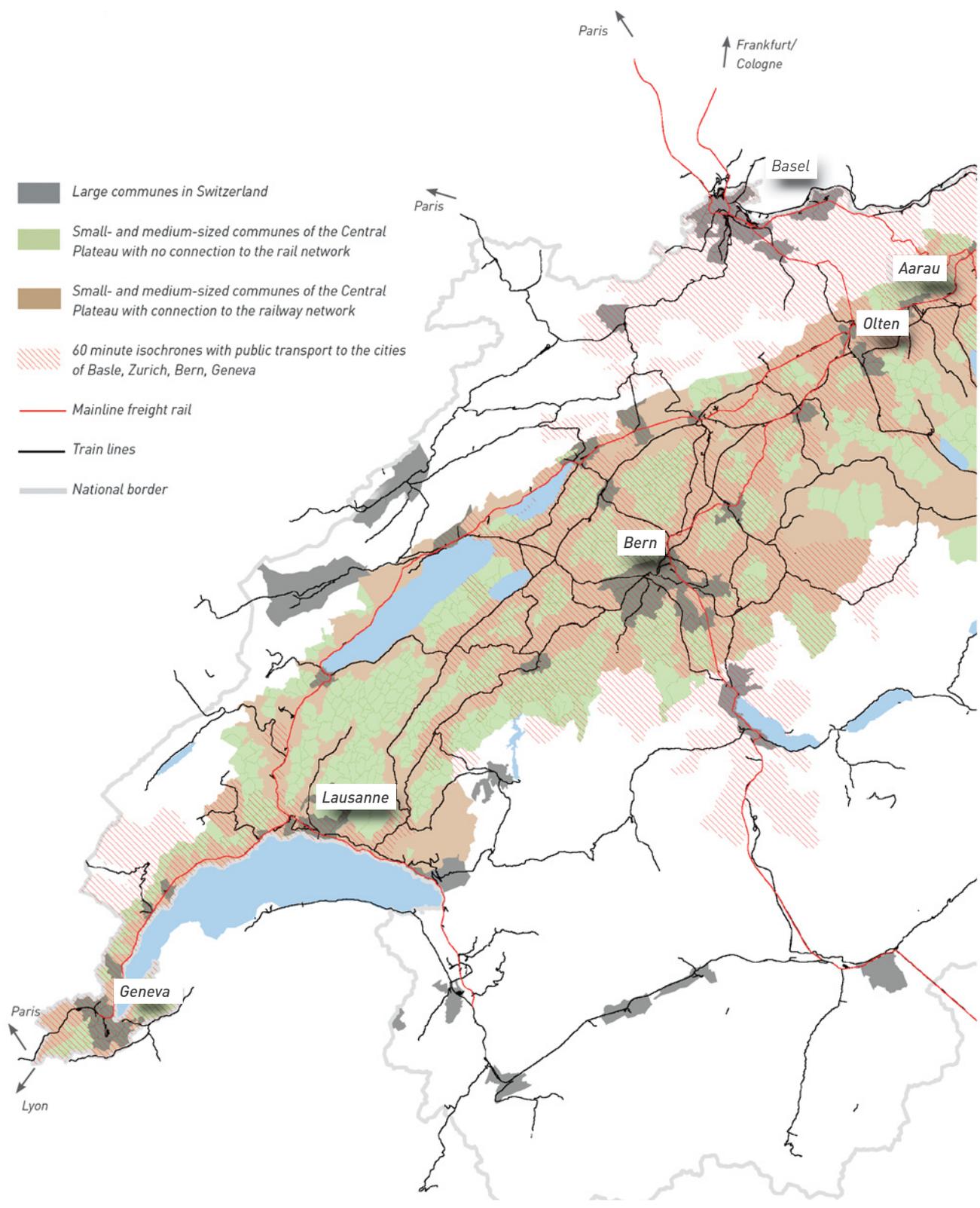
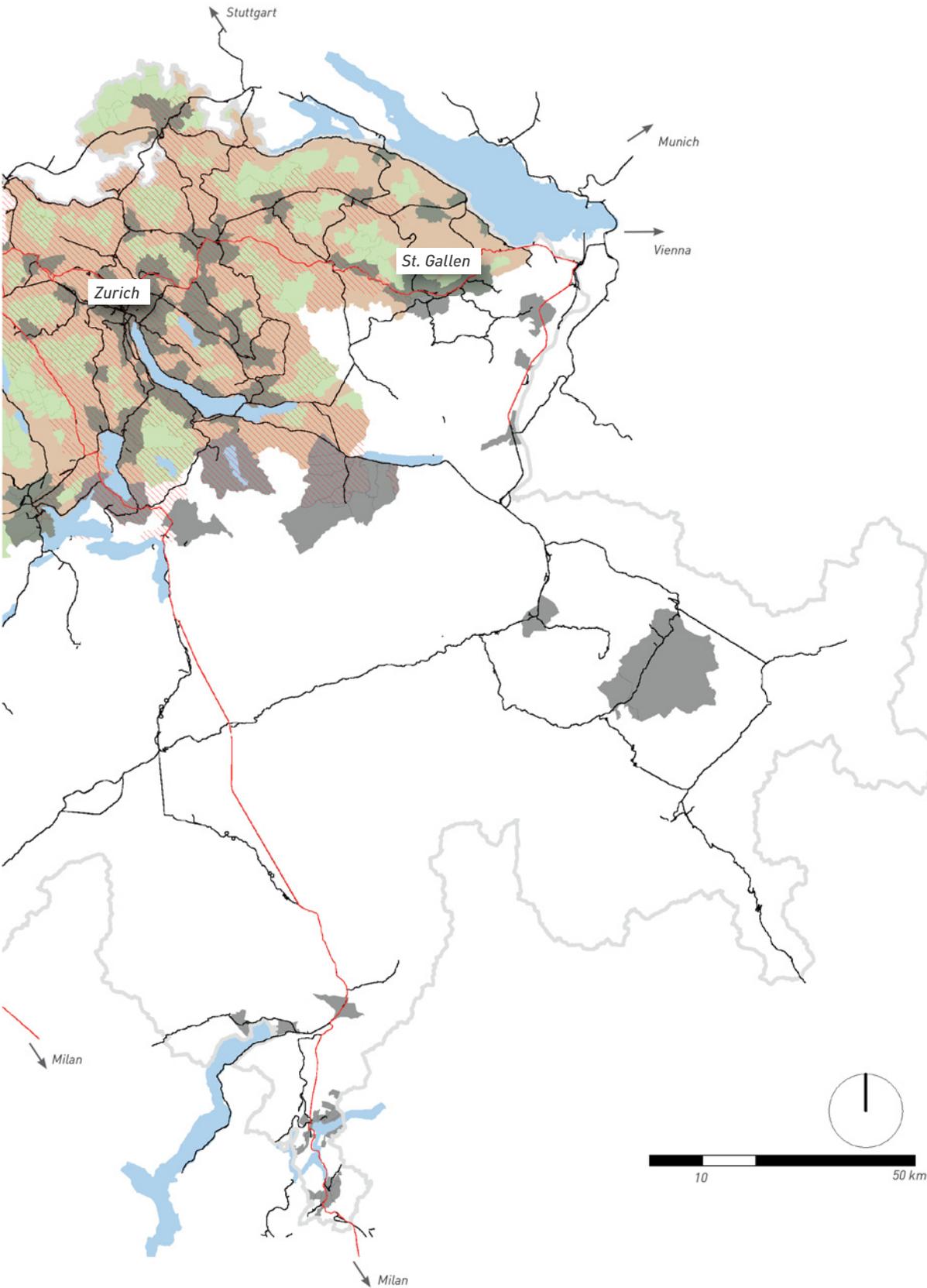


Figure 27: The network of small- and medium-sized communes in the Central Plateau
 [source: own representation, data: swisstopo 2013a, swisstopo 2013b, ARE 2010]



importance as well as the East-West line for Swiss domestic freight extend through the Central Plateau. Future developments in the Swiss Central Plateau area will be largely characterized by the interplay of small- and medium-sized communes with the operational concepts of the railways.

Several aspects contribute to the usefulness of classifying communities according to their population in action-oriented spatial planning and in our approach to the present research questions. Planning in larger contiguous spaces without an administrative unity means categorizing information relevant to space on a communal level (depending on the topic) and thus developing transferable statements. In Switzerland, there is no universal, quantitatively absolute definition of what comprises small-, medium-, and large-sized communities in the communal laws or in the cantonal planning and building regulations. In theory and in practice, however, this classification is quite common: Various decrees, statistics, and studies consider communities with 2,000 to 10,000 inhabitants as medium-sized, communities with fewer than 2,000 inhabitants as small-sized. Communities with more than 10,000 inhabitants are considered large-sized communes (or cities). There are numerous subject areas where the categorization of communities by their population is important, as the example of the Canton of Bern demonstrates:

- **Authority to issue planning permission:** Communes with more than 10,000 inhabitants are granted by law the authority to issue planning permissions. On request, the canton transfers the full authority to issue planning permissions to communities with fewer than 10,000 inhabitants, if they have a suitable building administration⁵⁰.
- **Coupled voting power for regional assemblies:** Granting a community the right to vote in the framework of regional assemblies is linked to their achieving a certain inhabitant threshold. A community with 1,000 inhabitants has one vote, every additional 3,000 residents garners another vote⁵¹.
- **Threshold value for mergers of communities:** Merged communities must have at least 1,000 inhabitants. The Canton offers financial support in

such cases. Upon justified request, the grant may exceptionally be awarded when the new community has a population of fewer than 1,000 people⁵².

By international standards, Switzerland with its predominantly small-sized communities – the median value is 1,214 – is organized in very small structures indeed, though it also displays one of the most highly developed intercommunal cooperative systems in Europe (LADNER ET AL 2013: 35). On the other hand, a representative survey among Swiss municipal authorities in 2009 showed that over one-third of the communities had reached their limits when exercising their executive function, dealing with spatial and zoning planning and the building permit procedures (LADNER ET AL 2013: 6). A continually increasing population also means that more communities are edging closer to their performance limits. Only large communities of 10,000 inhabitants and more show any identifiable signs of relief in this respect (LADNER ET AL 2013: 9).

The central political governing body in small- and medium-sized communes is the executive, consisting of the mayor and about four to eight other executive members, most of whom are employed part-time. According to the Swiss local council policy, this principle is called 'nonprofessional government system' or 'militia system.' This organizational principle, known only in Switzerland, is based on the idea that each able citizen has to assume some duties in public office, be it part-time or as a volunteer (HLS 2009b). Nevertheless, around 30–45% of the small- and medium-sized communities are faced with difficulties in recruiting sufficient candidates for the communal executive (LADNER ET AL 2013: 15). Reasons include the need for professional skills and the time requirement as well as relatively low compensation compared to the effort required. In 2009, approximately 15,000 elected officials working part-time in Switzerland, clocking up 6.2 million work hours, the total compensation for which amounted to CHF 180 million. This corresponds to an hourly rate of approx. CHF 29 (GESER ET AL, 2011: 112).

50 Art. 33 para.1 Bern Building Law.

51 Art. 148 Community Act of the Canton of Bern.

52 Art. 3 Community Merger Act of Bern.

This compilation begs the question of how small- and medium-sized communities will deal in the future with the changing framework, also because of the revised Spatial Planning Act. Small communes mainly delegate their construction management and planning tasks to external private consultants and experience technical difficulties even with the operationalization of the requirements from planning guidelines (ETH ZÜRICH 2013a).

The importance of small- and medium-sized communes in the implementation of the revised Spatial Planning Act will continue to increase. This was confirmed by the Federal Councilor in charge of Regional Planning after enactment of the law (GEMEINDEVERBAND 2014):

'In the end, it is you [communal authorities, note AG] with your concrete implementation of land-use planning who will actually shape the future face of Switzerland. A new way of thinking about using space will be necessary [...]. The new Law on Spatial Planning of the Confederation allows a certain scope [...]. We have considered tackling this concretization already now, at the level of the commune, without waiting until the cantons adapted and approved their structure plans. [...] We should use this phase to develop good examples [...], where communities can learn from each other [...], where they can already deal with [...] the leeway they have. [...] The distribution of tasks between federal and cantonal authorities is present in the new law, such as how the cantons deal with the communes, how much scope they have, though this can and does also differ. [...] You are invited to exploit the potential in your settlement area and promote inward development. Inward development means thinking increasingly in terms of space and not in square meters. [...] Your responsibility: to promote this inward development. In the implementation phase, in the actual design, you know the potential, you know the requirements, but you also know the conflicts. [...] Look for cooperation with other communities!' [translation by author]

It is therefore of great importance to the coordination of spatial activities affecting the main settlement areas of Switzerland to understand how small- and

medium-sized communes are facing the challenges related to the implementation of the revised Spatial Planning Act. The initiative should be taken first and foremost by the communities and only secondarily at the cantonal level by means of the regulations in the structure plan.

3.1.3 Considerable floor-space reserves in small- and medium-sized communes

The statutory minimum strategy 'inward development before outward development' will make inward development the de facto norm for future residential development in Switzerland, with outward development then being the exception. In order to promote the notion of inward development before outward development and to help it achieve a breakthrough, it is very important to demonstrate sufficient opportunities for inward development – and thus alternatives to outward development. Without these, there is a real danger that during implementation time pressure and a lack of practical knowledge will result in resorting to the most obvious solution, namely, 're-zoning the green field.' This would lead to a further loss of very high-quality agricultural and farmland areas in the Central Plateau and exacerbate the negative consequences of land-intensive settlement development. To direct the settlement development internally, individual communities must present at least an inventory of reserves and potentials as part of their formal instruments. When voting on construction zone dimensions across communal boundaries occurs, article 15 of the Spatial Planning Act requires regional surveys of reserves of settlement areas. But Switzerland does not have a current and nationwide overview of such settlement area reserves in the building stock uniformly carried out across cantonal borders (ETH ZÜRICH 2012: 1). Also, no such surveys are available in many places at the cantonal level, although the Spatial Planning Ordinance actually prescribes recording and regular updating usable reserves⁵³. In recent years, only five cantons with communities in the Swiss Central Plateau have created or updated a comparative intercantonal survey of their

53 Art. 31 and 47 Spatial Planning Ordinance of 28 June 2000 [status per 01.05.2014].

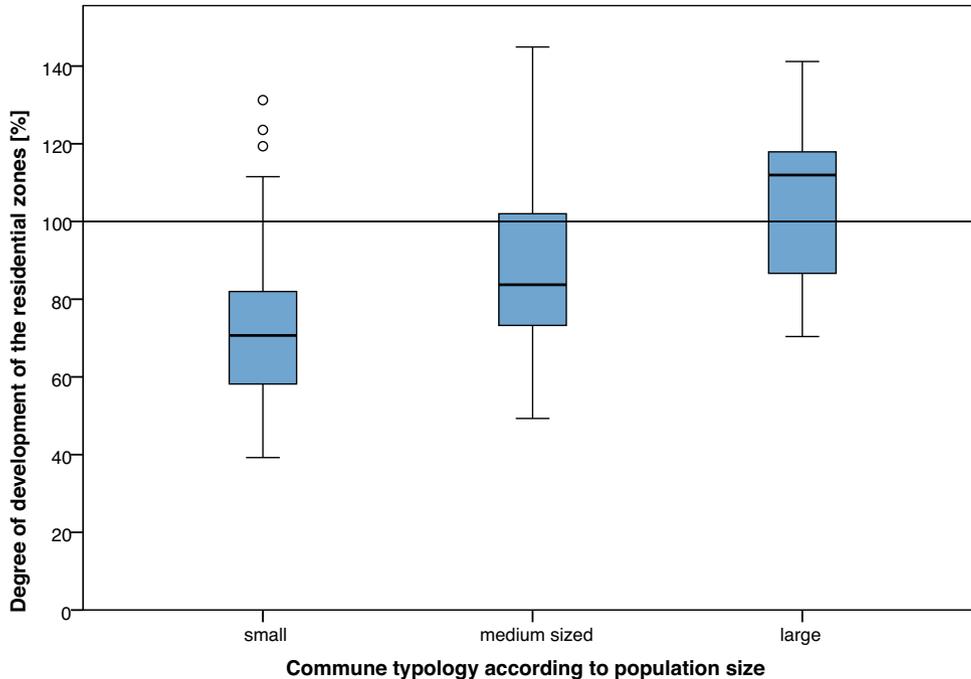


Figure 28: Degree of development of the residential zones in communes of the Cantons of Aargau, Lucerne, and Zug (2012) [source: own representation, data: swisstopo 2013a, Cantonal spatial planning specialist units (INFO PLAN ARE 2012), AGIS Canton Aargau 2013, Land and Survey Office Canton Zug 2013, rawi Canton Lucerne 2013]

settlement area reserves using the 'Raum+' method of the ETH Zurich⁵⁴. To assess the structural density, it is also very important that, in addition to the settlement area reserves, an overview of the internal floor area on individual site level be undertaken. These are floor areas permissible within the legal framework and legally granted which have not yet been implemented. For inward development, it is very important to know the floor-area reserves on the individual sites, as these form the basis for approaching landowners with a view toward their mobilization.

Overviews regarding gross floor-area reserves in the formal instruments across cantonal and communal borders, created with a uniform method, are sorely lacking in Switzerland. This is even more so in the case of the Central Plateau, and especially using the categories of small-, medium-, and large-sized communities. However, because such overviews are essential to arriving at practical knowledge, the present study provides a quantitative estimate of the floor-area reserves in the residential zones of the Swiss Central Plateau by means of a uniform method (Appendix I).

One way of representing the floor-space reserves secured in the formal instruments is to estimate the degree of development in the legally secured building zones. The expansion level refers to the actually realized floor space as a percentage of floor space permitted by building law. This is a measure of the actual usage of the space and indicates the degree of economical use of land as a resource. Knowledge about the degree of utilization of a site is the basis for knowledgeably discussing the increase in building densities.

The density value forms the decisive assessment parameter in communal building regulations. It limits the permitted building density by means of the floor-area ratio or cubic content ratio. The large number of communes affected by the investigation – the Central Plateau in the present definition comprises around 1,400 communes – renders a survey on the communal level practically impossible without extreme effort. Estimating the degree of development in the Central Plateau must therefore be based on information gathered from the cantons. At our request sent to the relevant authorities of all Swiss cantons,

<i>Floor area reserves in residential areas of the Central Plateau</i>	<i>Absolute value [million m²]</i>	<i>Per capita (median value) [m²]</i>	<i>Real estate value [billion CHF]*</i>	<i>Population capacity (40–50 m² floor area / inhabitant)</i>	<i>Relative distribution of the gross floor area reserves</i>
<i>Small communes</i>	12–15	20	48–60	240,000–380,000	
<i>Medium-sized communes</i>	26–32	14	104–128	520,000–800,000	2/3
<i>Large communes**</i>	19–24	10	76–96	380,000–600,000	1/3
<i>Total</i>	57–71		228–284	1.1–1.8 Mio.	
<i>Assumption degree of mobilisation 50%</i>					
Total net (rounded)	30–35		100–150	0.5–1.0 Mio.	

* Estimate CHF 4,000 per m² (completed build)

** excluding the cities of Zurich and Geneva, since the estimate for floor area reserves per capita in the Land Use Plans ≤ 0 .

Table 11: Estimate of the floor space reserves in residential areas of the Central Plateau (2012)

(source: own representation, data: swisstopo 2013a, Cantonal spatial planning services (INFO PLAN ARE 2012), AGIS Canton Aargau 2013, Land and Survey Office Canton Zug 2013, rawi Canton Lucerne 2013)

only Aargau, Lucerne, Zug, and Zurich reported the systematic integration of density figures in their cantonal surveys of zoning plans⁵⁵. One canton has an overview based only on estimates, whereas others have incorporated density figures into their overviews of zone plans in some of their communes, albeit not comprehensively. Therefore, a data situation that would allow an estimation of the degree of the development in the residential, mixed, and central zones in Switzerland would prove to be extremely heterogeneous. In addition, the only information available of adequate quality pertains to residential zones since the assessment of gross floor-area reserves in the built stock relates solely to residential zones.

In order to arrive at an estimate, the data used was of those cantons which are typical and representative of the Swiss Central Plateau due to their regional identity and the existing settlement patterns. They are the Cantons of Lucerne, Aargau and Zug. The Canton of Zurich was excluded from the assessment because of its considerable number of large communes. However, all the communities of the three cantons were taken into account, provided there was sufficient data available, in order to have the highest number of communities available. Overall, it was possible to

include the residential areas of 240 communes in the study, of which 12 (5%) are large communes with more than 10,000 inhabitants, 116 (48%) are medium sized and 112 (47%) are small communities (Appendix I). This distribution is again typical of the situation in the entire Central Plateau.

To reach an estimate, we used the data from those cantons typical and representative of the Swiss Central Plateau because of their regional identity and the existing settlement patterns: Lucerne, Aargau, and Zug. The Canton of Zurich was excluded from the assessment because of its considerable number of large communes. However, all the communities of the three cantons were taken into account, provided there was sufficient data available, in order to have the highest number of communities available. Overall, we included the residential areas of 240 communes in the study, 12 (5%) of which are large communes with more than 10,000 inhabitants, 116 (48%) are medium-sized, and 112 (47%) are small-sized communities (see Appendix I). This distribution is again typical of the situation in the entire Central Plateau.

55 Written request by the author on 15.04.2013.

Accordingly, this estimate shows a significant difference between the situation in small-, medium-, and large-sized communities (fig. 28, p. 72). In the large communes, the reserves within the framework of communal land-use planning have been mostly exhausted. In many cases, special communal land-use plans make a higher building density possible than originally provided in the basic planning usage. Half of the large communes consequently show a degree of development of 85–120% in their residential areas, median lying significantly above 100%. In the residential zones of the medium-sized communes, on the other hand, there are significant gross floor-area reserves, with the median lying at about 85%, although large variances must be taken into consideration. On the one hand, there are communities with residential zones with degree of development of approximately 50%; on the other hand, there are also cases with a degree of development of over 140%. However, half of the communes show a degree of development of between 75% and slightly over 100%. In the area examined, the low degree of development in the small communes is most conspicuous. Clearly, the majority of gross floor-area reserves secured by building regulations can be found in communes with fewer than 2,000 inhabitants, with a median development level of around 70% and a lowest value of 40%.

A trend for the situation in the entire Central Plateau can be deduced from the representation of the median floor-space reserves for residential use per capita in the three commune categories (tab. 11, fig. 29). Because of insufficient data, a complete survey is not possible. Nevertheless, the present estimate provides a possible trend for further discussion. The following conclusions can be made for the Swiss Central Plateau according to the three categories of communities:

- At least two-thirds of the floor-space reserves in the residential zones of the Swiss Central Plateau are found in small- and medium-sized communes.
- In absolute terms, twice as much floor-space reserves are located in medium-sized communities rather than in small-sized communities, although the percentage of this type of community in the Central Plateau is substantially lower.
- Small-sized communities have the largest reserves of floor space per capita, at 20 m² in residential zones. Only 10 of the 112 examined small-sized communities show a degree of development above 100% in their residential areas.
- The values for the large-sized communes must be viewed with the utmost caution. The basic data cover only 12 large-sized communes⁵⁶. It can be assumed that the value of 10 m² of floor space reserve per person in the largest cities of the Central Plateau (Zurich, Geneva, Lausanne, Bern, and Winterthur) is significantly lower.
- In theory, 100 to 150 billion CHF of potential property value lie dormant in unused structural densities in the residential zones of the Central Plateau. Even assuming a mobilization level of only 50%, this amount significantly overshadows the roughly 62 billion CHF in construction spent in the whole of Switzerland in 2012 (BFS 2014d)
- Around 40 million m² of floor area in residential zones have been secured but not implemented from landowners within communal development plans for small- and medium-sized communities in the Central Plateau. These comprise also grossly underused buildings in addition to undeveloped sites. Empirical data from the real-estate industry indicate that a site with a degree of development of up to 60% is an attractive prospect for a replacement building, since only in these cases would an increase in building density cover the expenses necessary for their realization, and only then can a return be expected once that threshold value has been reached. However, there are substantial regional differences in the property market which depend on numerous factors very difficult to predict (WÜEST & PARTNER 2014: 78f.).
- A theoretical maximum limit for a population capacity of almost 2.0 million persons in the residential zones of the Central Plateau clearly exceeds the projected population growth in the medium scenario of 0.6 million by 2035 for all Cantons of the Swiss Central Plateau⁵⁷. However, expecting a complete mobilization of all the reserves seems rather unrealistic. Assuming a utilization level of 50%, there are still 0.5 to 1.0 million people who could be accommodated in the Swiss Central Plateau without need for addressing any adjustment of

56 Brugg, Zofingen, Spreitenbach, Ebikon, Oftringen, Horw, Wohlen AG, Cham, Wettingen, Baar, Kriens, and Zug.
 57 Own estimate based on Federal Office for Statistics BFS 2015c.

the formal instruments on the communal level. The capacity would rise if we included the mixed zones in the assessment, leading to a projected increase in the population density in the Swiss Central Plateau from currently around 480 to around 550 inhabitants per km². Such figures can be found elsewhere in Europe, for example, in the German state of North Rhine-Westphalia (ADS 2010).

Knowledge about existing reserves in the formal instruments becomes important when the dimensioning of a communal construction zone should be assessed. In the implementation of the revised Spatial Planning Act, small-sized communities with sizeable reserves will probably face a conflict of interest from the obligation to rezone to nonbuilding zone. Knowledge of the degree of zonal development forms a crucial basis in this respect. The population in small- and medium-sized communities in particular must deal with the issues of inward development and the ensuing structural densification, because that is where the most virulent initial problems exist. At the same time, compared to the rest of Switzerland, that is where considerable floor-space reserves are found but only meagre human resources are available for spatial planning.

3.1.4 Density denial and change of typology on site level

The main share of the floor-space reserves secured by the building regulations in residential areas of the Swiss Central Plateau are located in communes with fewer than 10,000 residents. This includes reserves on undeveloped sites as well as underused properties that, on the surface, seem to be fully built up. Although a higher building density is provided for in the formal instruments, it may be not realized on site, whether deliberately or not. A further differentiation in the degree of development in communes at the site level is needed to address this problem and to explore options for further action.

The Canton of Solothurn, a typical representative Canton of the Central Plateau, is well suited for additional explorations. Comprising only the cities of Solothurn, Grenchen, and Olten numbering more than 10,000 inhabitants, the main part of the canton consists of small- and medium-sized communes. In addition, this canton is located between the metropolitan areas of Zurich, Basel, and the capital region of Bern – and maintains connections with all of these by means of good transportation links. On the one hand, this canton has gathered broad experiences in dealing with small- and medium-sized communities; on the other hand, it might contribute to the performance of the near Metropolitan regions. It is furthermore suitable as an interesting laboratory subject because, compared to the rest of Switzerland, its communes enjoy a high degree of autonomy – the building committee usually serves as the actual building authority⁵⁸. At the same time, more than 40% of the canton councilors serve as executive members of the community, the highest level in all of Switzerland (AVENIR SUISSE 2012 : 56).

The study area thus comprises the agglomeration encompassing 19 communities surrounding the core city of Solothurn and displaying the characteristic features of many communities in the Swiss Central Plateau. Typical of many small- and medium-sized communes in the Swiss Central Plateau, the settlements are nestled in hilly regions and provide immediate access to a larger body of water. They are integrated in the functional space of a midsize core city and are well connected to the latter by means of public transportation. Each commune displays the usual zoning types of one- to four-story residential zones, and because of their industrial past some serve as the location for the largest brownfield sites in Switzerland⁵⁹. These communities are currently considering merging with the city of Solothurn (HSLU 2012), which makes an overview of the current reserves in the existing land-use plans all the more significant.

Using a uniform method across communal boundaries (fig. 32, p. 80 and Appendix II), the site-specific estimate of the level of development provides a spatial overview revealing the extent of undeveloped and

58 Art. 2 para. 2 of the Building Ordinance of the Canton Solothurn of 03.07.1978 (status per 01.03.2013).

59 The Attisholz area (107 ha) community of Riedholz and Luterbach, the Schoeller area (100 ha) community of Luterbach and Derendingen, the papermill Sapi (25 ha) community of Biberist, and the Sultex area (17 ha) community of Zuchwil.

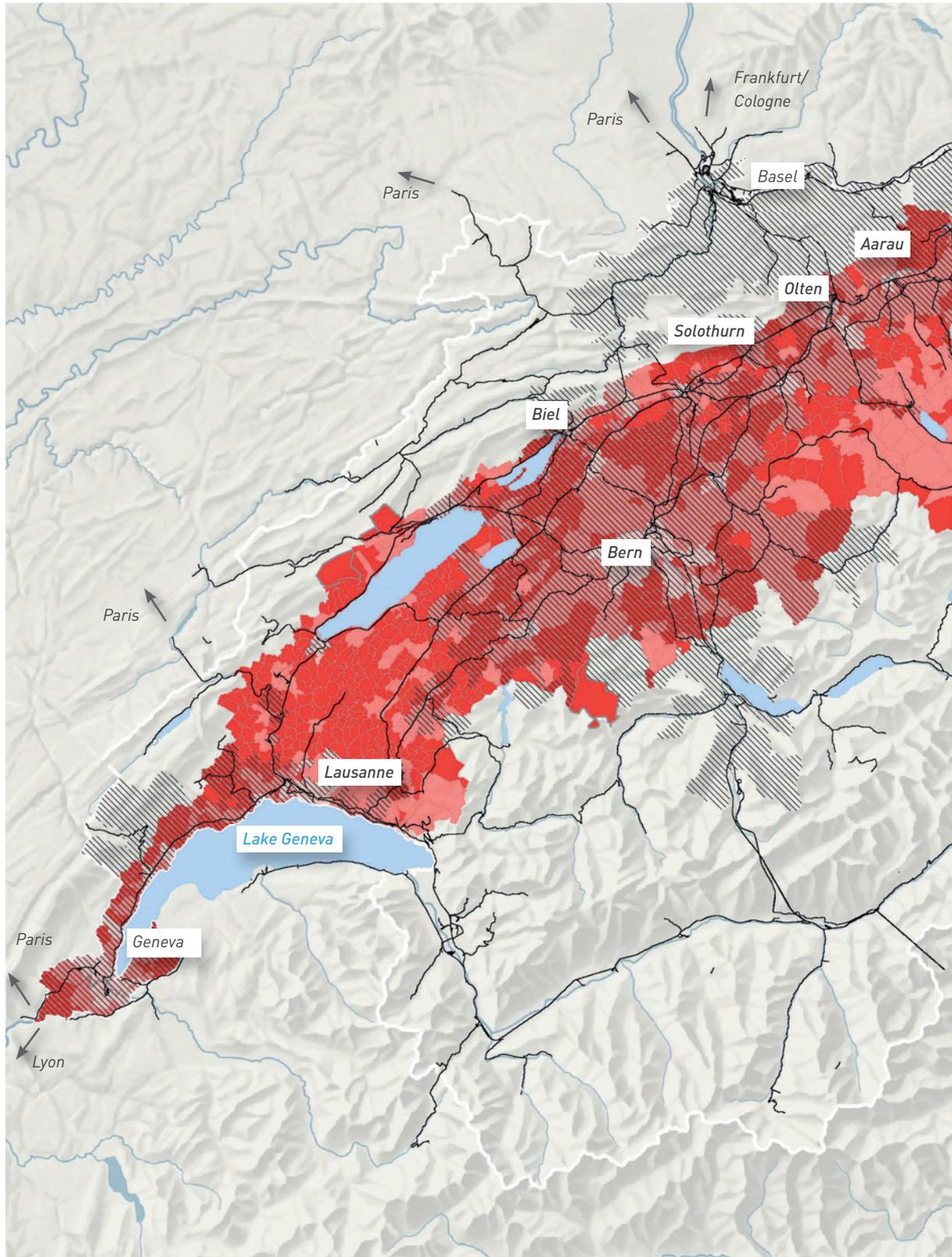
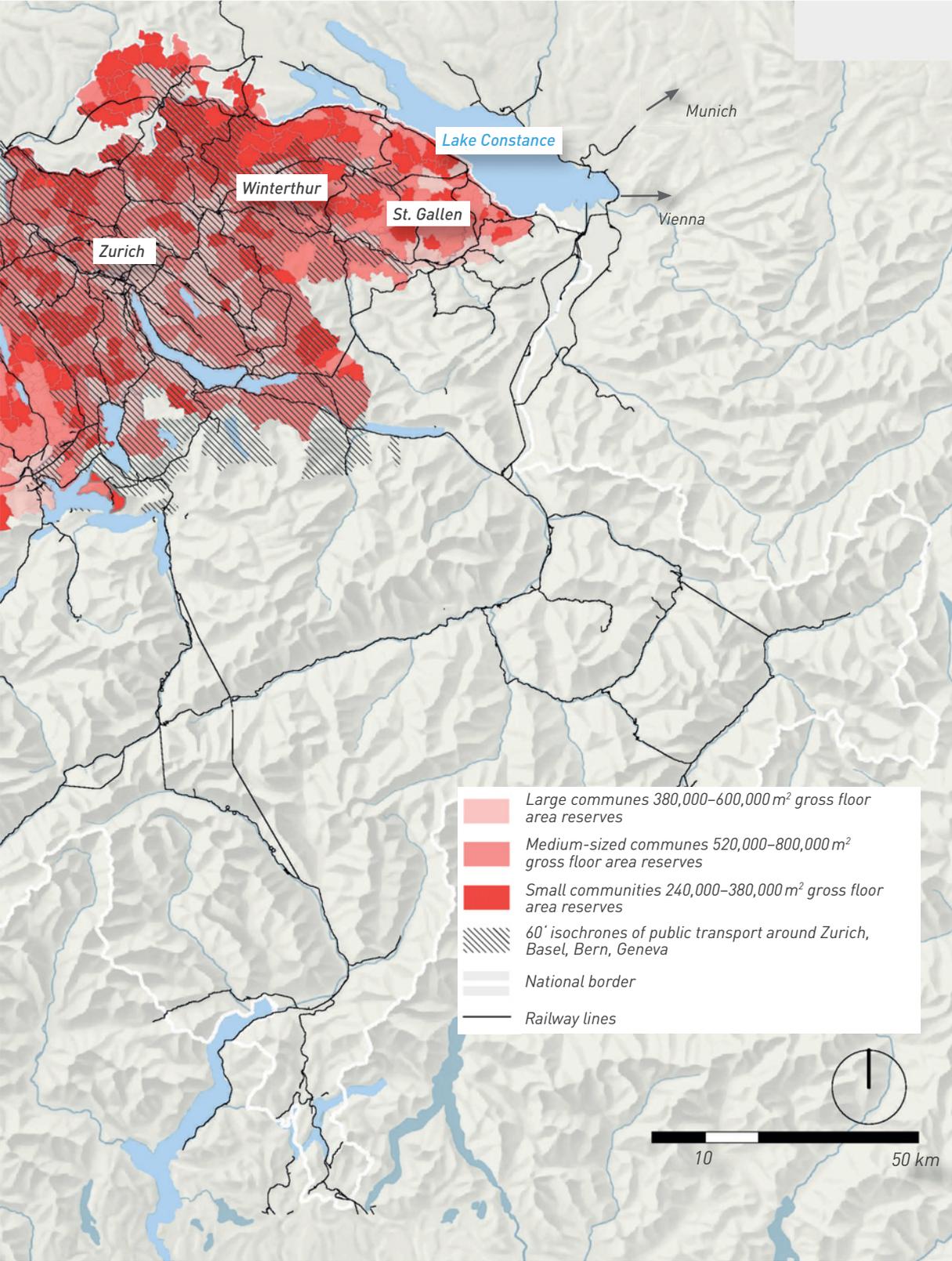
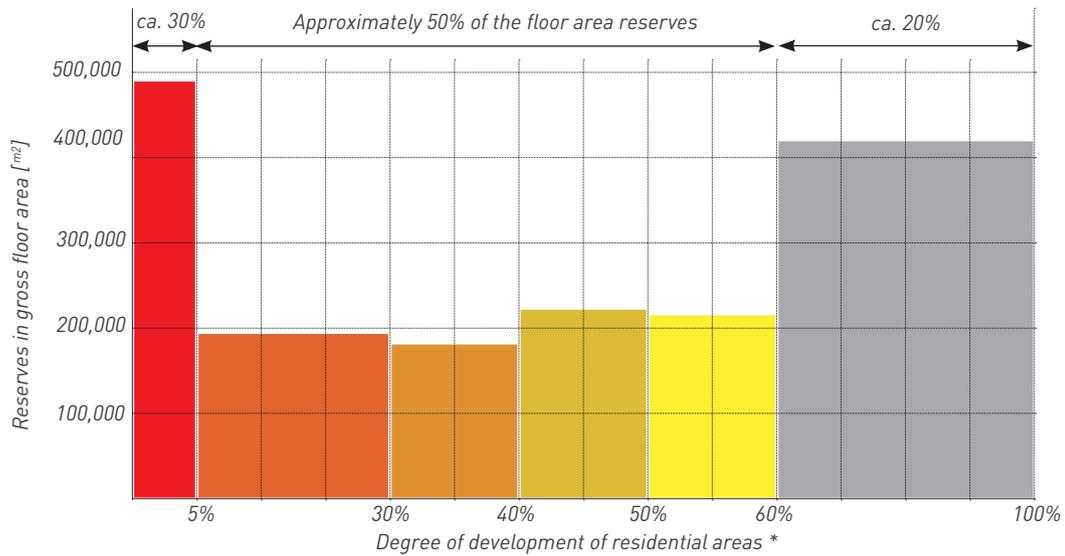


Figure 29: Reserves in gross floor area in residential zones of the Swiss Central Plateau
 [source: own representation, data: swisstopo 2013a, swisstopo 2013b, ARE 2010]





*Sites with a level of expansion exceeding 100% and/or below 200 m² are not shown

Figure 30: Reserves in gross floor area in the residential zones of 19 small- and medium-sized communities in the Canton of Solothurn (2013) [source: own representation, data: swisstopo 2013a, swisstopo 2013b, Canton Solothurn SO!GIS 2013, current zone maps and regulations of the communes examined]

unused sites in all residential zones. The large number of sites with development levels of 5% to 30% is particularly striking in communes with no connection to the rail network, such as Kriegstetten or Rüttenen. Furthermore, whole neighborhoods stand out where more than half of the sites are greatly underused – such as in southern Gerlafingen or the central settlement area of the commune of Riedholz. The tendency toward the spatial distribution of undeveloped sites points to large undeveloped sites located at the settlement fringe, rather than in largely overconstructed areas, for example, in the communes of Lohn-Ammansegg, Subigen, or Bellach. Only around 30% of the gross floor-area reserves in residential zones can be detected on the sites that are developed up to 5% or undeveloped. In contrast, the largest percentage of the gross floor-area reserves (around 50%) are found in the residential zones on those sites, which are built up from 5% to 60% (fig. 30). Under the present definition, a site is considered ‘developed’ from a degree of development of $\geq 60\%$ and therefore contains no gross floor-area reserves. Thus, within the examined perimeter, the under-exploited sites with low built density theoretically offer a larger reservoir of gross floor-area reserves than the undeveloped sites.

The most prominent finding, however, becomes clear by comparing the degree of development of the site to density values determined according to communal zoning plans in residential zones (fig. 31). The degree of development of a site decreases with an increasing density ratio in the formal instrument of the land-use plan⁶⁰. This trend may be called a ‘denial of density.’ However, the degree of development rises sharply again if the thresholds of 0.45 and 0.65 are reached because of the building typology found on these sites, which can be referred to as ‘typology jump.’ Whereas a residential unit on a site, situated in the W2 zone, traditionally has floor areas of between 150 m² and 300 m² (detached house), larger buildings in W3 zones have floor areas of 400 m² to 700 m² and occupy correspondingly larger sites (multiple dwelling). In the small- and medium-sized communes within the perimeter of the investigation, floor-area ratios above 0.7 are rarely found; nevertheless, one may assume that the typology jump in this area has occurred for the third time. The effectively realized building density thus depends on the choice of the typology – regardless of the site size and the allowable density values in the communal land-use plans.

60 The diagram shows the median expansion degree in the respective zone (i.e., 50% of the values are above and 50% below the median).

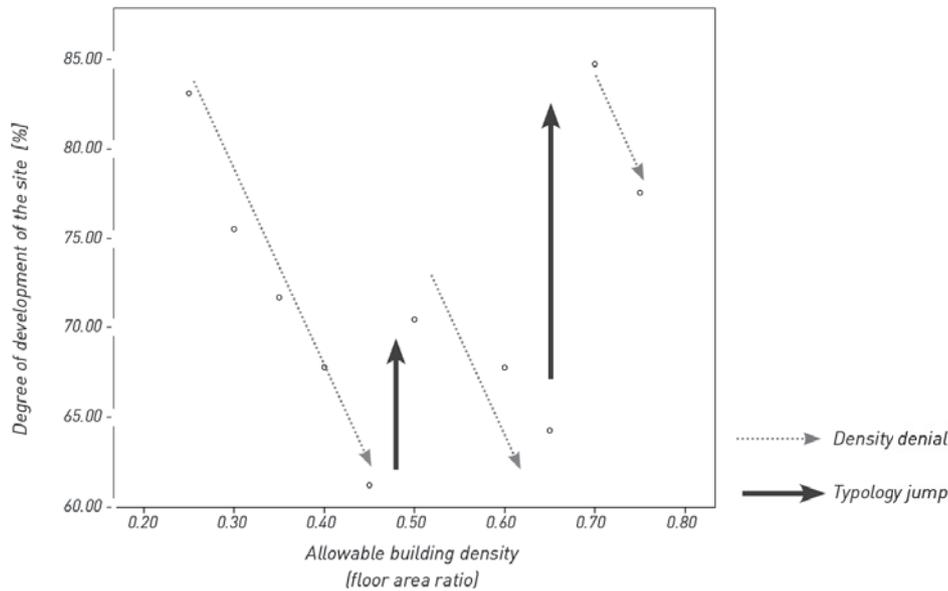


Figure 31: Density denial and typology jump in the residential zones of the Solothurn agglomeration
 (source: own representation, data: swisstopo 2013a, swisstopo 2013a, Canton Solothurn SO!GIS 2013, current zone maps and regulations of the communes examined)

In the residential zones of the 19 small- and medium-sized communities examined, the formal instruments estimate that there are some 1.7 million m² of already secured gross floor-area reserves. In the sites with a relevant degree of development of 0–60%, this amounts to approximately 1.3 million m² of gross floor-area reserves (Appendix II). Assuming that at least half thereof can be mobilized, there are still approximately 650,000 m² remaining, corresponding to a population capacity of around 13,000 to 16,000 residents⁶¹. If we factor in the reserves for housing in the mixed zones, the value would be even higher. For the entire Canton of Solothurn, for example, a population growth of 7.5% is forecast for 2035, that is, some 19,000 people (KANTON SOLOTHURN 2012:50). Almost the entire population growth in the Canton of Solothurn could therefore theoretically be accommodated within the existing settlement area in the agglomeration of Solothurn alone by developing the existing built stock.

3.1.5 Gross floor-area reserves in private hands

As the above findings indicate, the majority of the gross floor-area reserves in the small- and medium-sized communities examined are found on sites with a degree of development $\leq 60\%$. However, these gross floor-area reserves are spread among many landowners. A comparison of the number of sites with their degree of development clearly shows that, in the communes studied, approximately 4,000 sites with gross floor-area reserves relevant for the inward development of floor-space reserves would be available (see Appendix; fig. A2). If half of these landowners showed a willingness to discuss development, it would be necessary to talk to at least 2,000 landowners in the 20 communes studied, corresponding to about 100 people per commune, which, at a rate of 1 to 2 meetings per week, would take 1 to 1.5 years.

An example of a medium-sized community with substantial gross floor-area reserves is Biberist in the South of the cantonal capital Solothurn. The land register of the commune reveals the ownership of sites

⁶¹ 40–50 m² floor-area requirement per person.

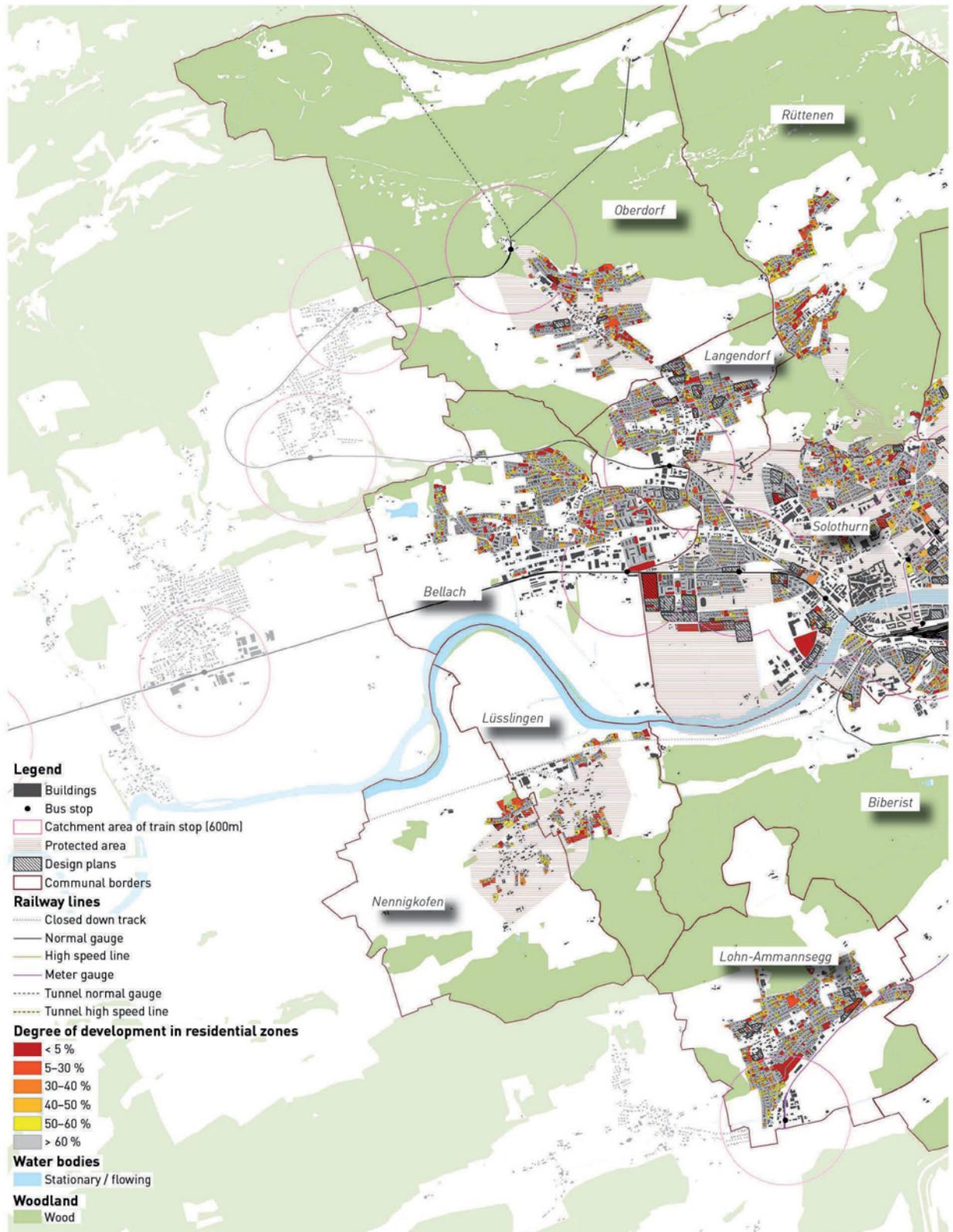


Figure 32: Degree of development of plots in residential zones in the region of Solothurn

[source: author's representation, data: swisstopo 2013a, swisstopo 2013b, Canton of Solothurn SOIGIS 2013, current zonal plans and regulations of the examined communes]



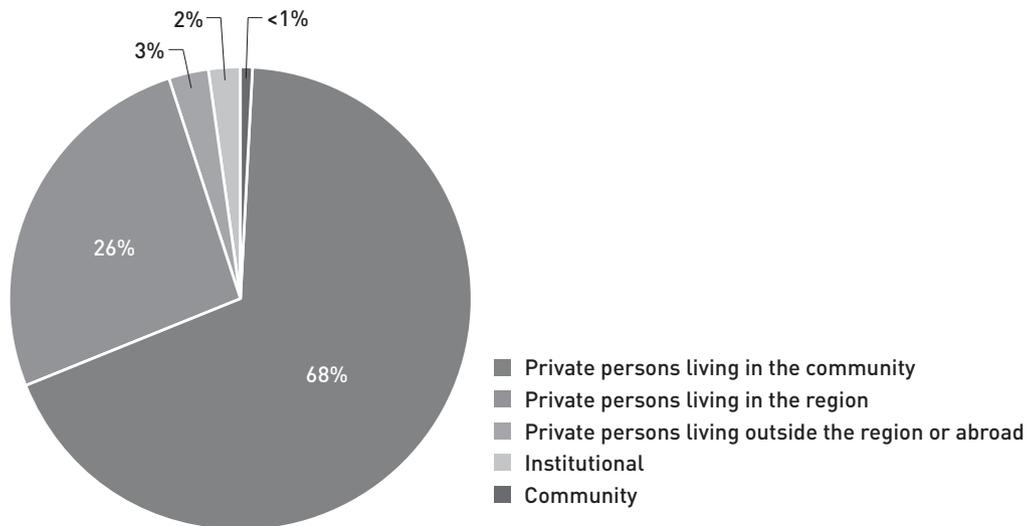


Figure 33: Owners of the floor area reserves in residential zones of the community of Biberist
(source: own representation, data: KANTON SOLOTHURN 2014c)

and properties in residential areas with existing gross floor-area reserves (KANTON SOLOTHURN 2014c). Accordingly, over two-thirds the gross floor-area reserves are held by private landowners residing within the locality (fig. 33); this applies to sole ownership or joint ownership⁶². The second largest category of owners consists of private persons living in the region. The approximately 3% of landowners residing outside the region, be it in Switzerland or abroad, are very small indeed. Institutions (foundations, public companies, etc.) and the public sector own only an insignificant proportion of property with gross floor-area reserves ensured by building regulations in the residential zones. By far the largest part of the gross floor-area reserves therefore lies in the hands of local citizens, which simplifies the approach for landowners in nonprofessional government politics.

For a targeted landowner approach, it is also vital to determine at what stage of life the property owners currently find themselves. Of the private individuals described above who are in possession of the gross floor-area reserves, almost 77% are in the 'posteconomic' phase of their life, i.e., over 65 years old (KANTON SOLOTHURN 2014c). It is important for inward development, especially at an early stage, to ask such owners about their plans, in order to be able to mobi-

lize the secured gross floor-area reserves in case of a possible generational change in the property. This necessitates a systematic approach, tailor-made to the circumstances of the property owners.

3.1.6 Comparison of the results with surveys from Raum+ in Switzerland

It is interesting to compare the present assessment of the gross floor-area reserves with surveys of reserves of settlement areas at the communal level. The initiative Raum+ from the ETH Zurich conducts surveys in larger contiguous regions concerning the settlement area reserves in the residential, mixed, and working zones at the communal level. These surveys include undeveloped sites > 200 m² (ETH ZÜRICH 2014a:5). Data for reserves of settlement areas were already collected in 284 communes in nine cantons⁶³. More than half are small-sized communities, around a third are medium-sized communities, and nearly 10% of the communes examined have a population in excess of 10,000 inhabitants, which is quite representative for the distribution in the Central Plateau. This assessment also shows the importance of small- and medium-sized communities, as approximate-

⁶² Community of heirs or joint property as well as simple partnerships.

⁶³ The Cantons of Uri, Schwyz, Basle-Land, Schaffhausen, Appenzel Inner Rhodes, St. Gallen, Grisons, Ticino, and Valais.

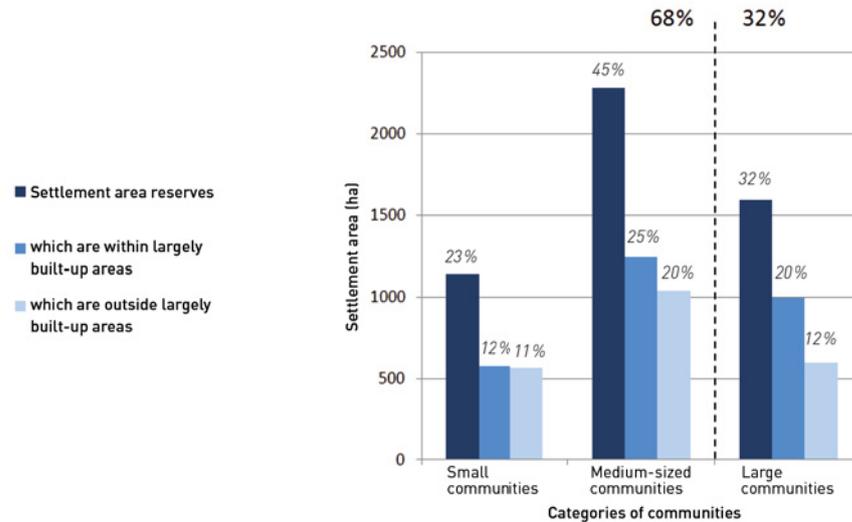


Figure 34: Distribution of settlement area reserves 2014 in the commune categories according to Raum+
(source: ETH ZÜRICH 2014d)

ly two-thirds of the reserves of settlement area are found there (fig. 34). Also noteworthy is the fact that around 37% of communal land reserves are in the largely developed areas of small- and medium-sized communes⁶⁴, significantly more than in large-sized communes. Not all of the communities examined are located in the Swiss Central Plateau region. Nevertheless, the statement can be applied to the major urban areas of Switzerland, because the 93% small- and medium-sized communes in the Swiss Central Plateau Region are quite comparable to the sample of Raum+ (90% small- and medium-sized communities).

Both the entire settlement area reserves as well as the gross floor-area reserves in residential zones are consequently considerable as provided for within the existing instruments of small- and medium-sized communities within the perimeter examined. This assessment is also confirmed throughout the whole of Switzerland. The 2012 study of the ETH Zurich on the inward use of reserves in Switzerland (ETH ZÜRICH 2012) estimates a population capacity in existing tools in residential and mixed zones of 0.7–1.9 million persons for the whole of Switzerland. If we compare these numbers with the present assessment of the gross floor-area reserves in residential areas of the Central Plateau, with a capacity of 0.5 to 1.0 million

people, it turns out that, by taking the density values into consideration, the differentiated assessment of the gross floor-area reserves leads to a considerable increase in the theoretical reserves.

It thus becomes clear that the discussion concerning density and densification refers not only to undeveloped sites, but also includes the gross floor-area reserves, leading to a more precise examination of the density values associated with the settlement areas.

3.2 Parameters for densification on the Swiss Central Plateau region

Knowledge about the quantities of the gross floor-area reserves in the small- and middle-sized communities is a first step toward identifying the available scope for densification. Nevertheless, the discussion remains at a theoretical level because the results expose a wide range, referring exclusively to the totality of the gross floor-area reserves. The local tolerance for increasing building density in coordination with the village-scape or further measures necessary for quality inward development cannot be discussed in this manner. Rather, concrete quality tests in addi-

64 Based on 50% of reserves of settlement area per community lying within and 50% outside of the largely built-up area.

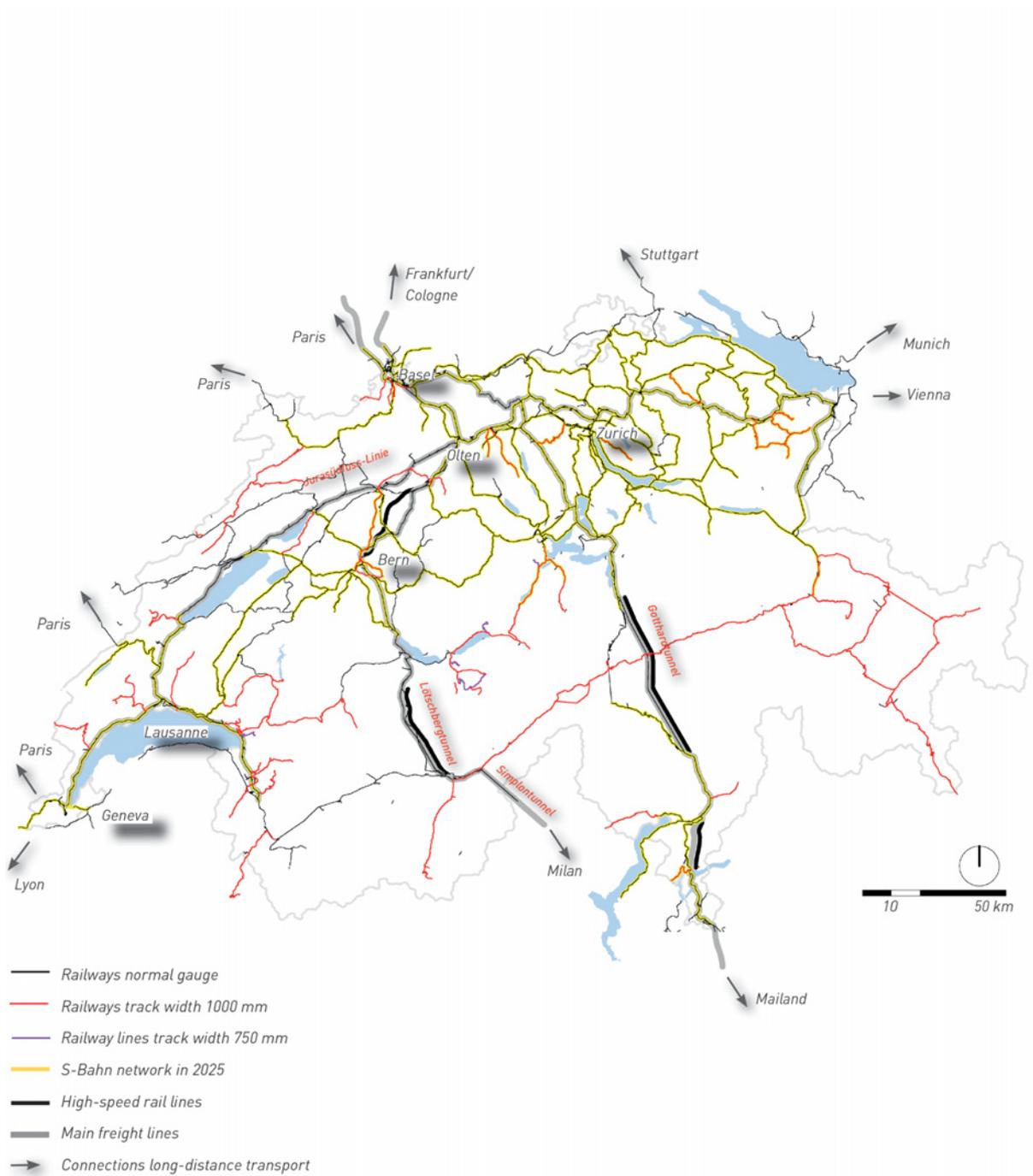


Figure 35: Rail Network Switzerland (source: own representation, data: swisstopo 2013b)

tion to the quantitative surveys are necessary. What follows identifies the parameters decisive to a meaningful and moderate densification as an element of inward development.

3.2.1 Railway infrastructure as strategic backbone for settlement development

The integrated development of the area and of the infrastructure constitute the basis for the stability and development of the network of small-, medium-, and large-sized communes in Switzerland. Both the strategy of sustainable development of the Swiss Federal Council (BR 2012a) as well as the Spatial Strategy for Switzerland (BR et al. 2012) consider railway infrastructure to be a central backbone for spatial development in Switzerland, which in turn forms the key infrastructure for the vigorous implementation of the minimum strategy 'inward development before outward development.' The rail-bound transportation infrastructure, in tandem with the reserves, becomes the starting point for the debate on future settlement development.

The construction, operation, and further development of Switzerland's railway system is strongly directed toward and conditioned by the topographical conditions. Whereas a dense network of rails of varying track width has established itself in the East-West direction in the flat areas of the Central Plateau and in the Alpine foothills, the Alps (approximately 4,500 meters above sea level) and the Jura Mountains (approximately 1,000 meters above sea level) are traversed by only two main lines (fig. 35). These also form a central element of the trans-European rail link for freight traffic from the logistics hubs of the northern ports in the Netherlands and Belgium to the consumer markets in central and southern Europe. For Switzerland, this has resulted in opportunities and conflicts that are of great significance from a European perspective (ETH ZÜRICH 2013c). Because of the transit agreement of the then European Economic Community (EEC) with Switzerland in 1992 and

the Bilateral Treaty on Land Transportation between Switzerland and the European Community from 1999, Switzerland must in principle allow unlimited cross-border land transportation for freight carriage from border to border. According to the will of the voters, this should be handled by the rail network, as enshrined in the Traffic Transfer Act⁶⁵ and in the Federal Constitution⁶⁶. This subsequently led to the decision to build new flat lines through the Alps for receiving the transalpine rail freight. This is also of benefit for the transportation of passengers, as Switzerland can be connected in the best possible way to the European high-speed rail network⁶⁷.

These expansions are significant in several respects for the inward development in the Swiss Central Plateau. Railway operations entail both adverse effects on the settlement area, such as noise pollution (especially at night), vibrations, fine particulate matter, and threats from hazardous transports as well as desired changes because of the improvement of access conditions. Accessibility can be even considered a key factor for spatial development (KELLER 2003, KELLER/STEINMETZ 2003). Improving accessibility between the centers, however, places an additional burden on the spaces and planned routes in-between them, which must be kept available from an early stage on for any future expansion of the superordinate infrastructures. At the same time, these communities benefit less from the positive effects, but have to live with undesirable effects and, because of possible displacement effects between freight transit and regional passenger transportation, allow the conflict to play out on their territory. Traditionally, this has affected small- and medium-sized communities that, at the time of inception of the railway planning in the late 19th century, were not yet industrialized centers. In the guiding principles at the federal level, these spaces are situated 'in-between,' yet according to the Spatial Concept for Switzerland, as stated above, they fulfil important national political tasks (BR et al. 2012).

Against this background, it becomes evident that the expansions and operating concepts on the transalpine lines and their access routes between the Jura

⁶⁵ Federal Act on the Shift of Transalpine Freight Traffic from Road to Rail of 19 December 2008 (status 1 January 2010).

⁶⁶ Art. 84 of the Swiss Constitution of 18 April 1999 (status 18 May 2014).

⁶⁷ Federal Law on connecting Eastern and Western Switzerland to the European high-performance railway network on 18 March 2005 (status per 1 January 2010).

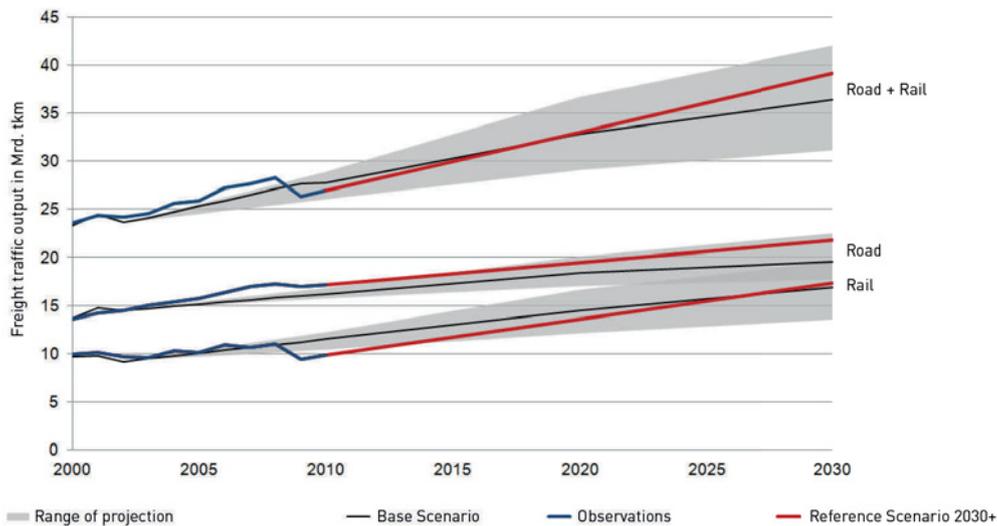


Figure 36: Development and projections for transport services in freight transport from 2000 to 2030 [source: ARE 2012a: 34]

and the Alps direct affect the major urban areas of Switzerland. The recommendations for the Swiss Central Plateau from the Interreg project 'CODE24' (ETH ZÜRICH 2013C: 50) are as follows:

- Establish integrated planning of settlement and infrastructure development along the corridor: The regional passenger transportation forms the basis for the spatial development of the regions concerned. This should be secured and not displaced by increasing freight transportation. More urgently, priority measures must be taken to clarify the spatial issues in ad hoc procedures in the areas of Basel – Central Plateau and the Gotthard access routes in the North.
- Identify areas of national importance for processing tasks in the national interest to achieve inter-municipal coordination of activities: Set up appropriate platforms for handling the corresponding tasks and enable the joint processing of tasks by all interested parties involved, such as cantons and regions, infrastructure companies, and other stakeholders.
- Set priorities for the optimal use of limited resources from a temporal and financial perspective: Securing stock is paramount before increasing capacity or increasing speed.
- Develop a regional logistics concept between Basel and the Central Plateau and its coordination with adjoining regions.

In light of developments on the main lines of transnational freight traffic, the upshot for the Swiss Central Plateau is:

'The absence of coordination of the spatial development strategies on both sides of the Jura and the lack of a logistics concept for Switzerland constitute impediments to the expansion of integrated spatial and infrastructural development. A coordinated approach to the planning of the railway infrastructure as well as spatial development is needed.' (ETH ZÜRICH 2013c: 26, translation by the author)

By using their reference framework, the Swiss Federal Railways (SBB) have developed guidelines for the development of their infrastructure facilities over a timeline of 20 to 40 years. These guidelines serve as an instrument ensuring the coordination of the approved and future expansion stages. Areas needed for expansion will thus be identified early on, and the interests of the SBB vis-à-vis spatial planning will be communicated. The reference framework plan strives to increase the planning security for upcoming conversion and expansion. The planning results are coordinated with other cantonal projects and should be incorporated into the structure plan of the cantons concerned as well as in the sectoral plan for traffic (Part Infrastructure/Rail) of the Confederation. The SBB's reference frameworks are comparable to a cantonal structure plan, though without being binding. The reference frameworks Basel (SBB 2013) and

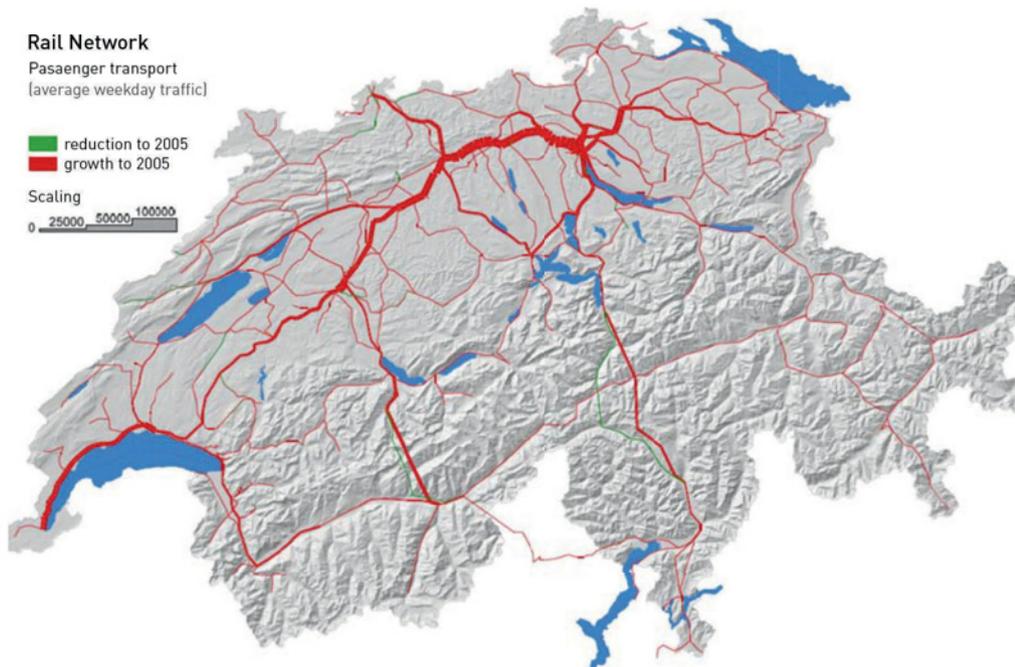


Figure 37: Absolute shift of loads between the baseline in 2005 and the reference state 2030+ (source: ARE 2012b)

Lausanne (CFF 2014) consider the following impetus relevant to the development in the Swiss Central Plateau:

- The connection frequency for long-distance traffic should be further increased, depending on the projected demand.
- All Swiss S-Bahn lines should be gradually extended to run every quarter of an hour.
- Increase in capacity for freight transportation Basel – Swiss Central Plateau crossing the Jura. In the long term, a new Jura crossing will be inevitable.
- Route overlaps for the transportation of goods and of regional passengers will create route conflicts. The planned increase in freight and passenger transportation on the same railway lines will further exacerbate this conflict.
- The characteristics of the Biel-Lausanne-Sion line with max 10‰ incline remain; it can thus accommodate heavy freight trains.
- Trains should run every half-hour for passenger transportation on the South side of the arc formed by the Jura Mountain via Bussigny.
- Increase rail services for freight transportation between Lausanne railway yard and the South side of the arc formed by the Jura Mountain.

The most extensive need for coordination for inward development arises from the route conflicts between the increase of freight transportation and the intended increase in frequency for passenger transportation. Projections by the European Union foresee an increase in traffic volume in the transportation of goods by rail, based on the assumption that a large proportion of road transportation can be moved to the rail. Forecasts for Switzerland also foresee a significant increase in transportation services by rail, both for transit and for national freight transportation (fig. 36). According to the Federal Office for Spatial Development (ARE), freight transportation services by rail could increase by about 70% by 2030 (ARE 2012a). In conjunction with this, the transalpine transit freight route could surpass inland freight transportation or transit inland freight traffic could surpass the regional passenger transportation within the country. This conflict becomes all the more obvious if the estimates for the development of the passenger traffic volume by rail are also included (fig. 37). The development scenarios by the federal government assume railway passenger traffic growth of around 60% by 2030 (BAV 2013). At peak times, an above-average demand in agglomerations should also be expected. According to these forecasts, passenger transportation, in particular in the East-West direction, could greatly increase especially on the



Figure 38: Dense typologies with a high degree of development and reference to the topography
 (source: photo A.G. 2014)

route Zurich–Bern, and the conflict with the transit freight traffic on the access lines to the Lötschberg and Gotthard base tunnels would intensify.

The ‘Strategic Development Program STEP 2030’ must be seen against this background. It advocates expanding the railway infrastructure in the main urban areas of Switzerland in the coming years in stages of 4 to 8 years (BAV 2014). The first expansion step should be carried out through the year 2025 and includes projects worth 6.4 billion CHF, which should be realized parallel to the already approved program ‘Future Development of Railway Infrastructure [ZE-B]’⁶⁸. This project is concerned primarily with expanding capacity for both passenger and freight transportation on the East-West axis. Already approved are projects to connect the Eastern and Western parts of Switzerland to the European high-speed rail traffic. Although the strategic development program with its maxim ‘capacity before speed’ is not directed toward orienting the Swiss rail network to high-speed traffic, the fundamentals remain unaffected, namely, to

build a high-speed network in Switzerland in the future, since the extension and construction of railway lines necessitates including structural requirements for high-speed trains (MANGE 2012). In the coming years, the Federal Office of Transport plans to develop concrete measures for the next stage of expansion in 2030 on the order of 8 to 10 billion Swiss francs, which is expected to include a further strengthening of the East-West axis.

The goals of ‘inward development before outward development’ and the directive for densification of settlement areas in the revised Spatial Planning Act accord an overwhelming importance to the integrated planning of residential development and rail infrastructure. The reliable operation of the railway infrastructure for passenger traffic is fundamental to the densification of urban areas in the Swiss Central Plateau. If residential development is not to lag behind the expansions of public transport – and this would be the case if many new floor areas were to face insufficient rail transportation capacity – a more

68 Federal Act on the Future Development of Rail Infrastructure bom dated 20 March 2009 (status per 01 September 2009)



Figure 39: Dense typologies with a high degree of development and little reference to the topography
(source: photo A.G. 2014)

in-depth consideration is necessary to achieve an integrated approach. Orienting inward development toward rail-based public transportation makes good sense, because in the long term the lines are tied down locally, making the investments for construction and thus the replacement costs high. Investments in rail-based public transportation also serve as indications of a continuing economic, political, and public interest in the affected areas.

For small- and medium-sized communities, the aforementioned developments – in particular the growth in traffic and the increasing conflict between freight and passenger transportation – are significant in two respects. First, the increasingly negative effects, especially the nighttime noise or fragmentation effects because of noise barriers, will predominantly affect small- and medium-sized communities that lie along the corridors of long-distance passenger routes, without their being able to directly benefit from the positive effects of increased accessibility. The densification at the public transportation stops – in small-sized communities this is sometimes exclusively the station district – will generally tend to

affect a proportionally increasing number of people. Second, their location between the nodes of the long-distance traffic might turn them into mere transit corridors and potential ‘waiting rooms’ for freight trains, which are not given preference over (and must thus wait on) fast long-distance passenger traffic. Existing reserves in settlement areas in small- and medium-sized communities in the ownership of the SBB may be increasingly required for such passing tracks and thus cease to be a potential for inward development.

These observations highlight the fact that planning horizons must be aligned particularly to the problems of the integrated development of rail-bound transportation infrastructure and inward development. Because of the long lead times, space for maneuvering in terms of sites must be assessed and secured early enough to avoid being surprised by adverse effects. This is especially of importance for small- and medium-sized communities, where inward development might focus primarily on the stations of the railway sector, simultaneously making future conflicts worse because of the developments described.

3.2.2 Room for density between quantity and quality

A transformation process built on inner reserves and potentials demands customization. This can open up opportunities for small- and medium-sized communities, because they still possess diverse reserves and thus space for maneuvering. A development concept based on available reserves across community boundaries makes for robust planning in the first place. It is therefore essential for small- and medium-sized communes to have an updatable and problem-oriented overview of their reserves and to plant these in the regional context. In the framework of regional cooperation, accurate knowledge about the quantity and quality of reserves and potentials allows communes to recognize the options available to them and to make coordinated and timely decisions. Reserves thus form the starting point for their future spatial development.

However, purely quantitative assessments are not sufficient in themselves for judging the scope for density. The real question is: Where are thresholds of building density in the respective context? More broadly, it boils down to assessing the appropriateness of building density straddling structural quantity and spatial quality. It is appropriate here to compare communities with a high degree of development in their residential zones and the actually realized typologies in the respective context. As a scale of suitability, a small commune with high degree of development is selected by way of visual example from among the survey of the degree of development of the building zone in the Central Plateau (Appendix III). A high degree of development in residential areas indicates prudent use of land as a resource. The commune studied is located on a steep slope above a wide river plane and features various types of building typologies in its residential zones. The high degree of development of the residential zones (112%) stems from large areas comprising terraced houses (fig. 38, p. 88) as well as a relatively high floor-area ratio (0.4), whilst simultaneously having relatively small sites in the residential zones for detached houses (fig. 39, p. 89).

An evaluation of the appropriateness of these two dense forms of settlement reveals significant differences. Whereas terraced houses with their inclination angle can adjust to the particular topography and, because of the particular arrangement of the buildings in an offset manner, allow a permeability to the surrounding landscape, in contrast the two-story family houses act as closed-off units with their massive retaining structures situated on the slope. This heterogeneous development of individual sites, with a rather high floor-area ratio of 0.4 for the open construction and no concern for the terrain as well as a lack of permeability between building volumes, makes whole areas seem overcrowded. When precisely planned, unobstructed views onto the surrounding landscape are effective design elements that can contribute to the appropriateness of the development while also increasing the building density in the built environment. Building density must always be judged on a case-to-case basis, taking into account the interaction of topography and landscape. What is adequate with respect to structural density entails first and foremost adapting to what is already there and to customizing when adding new volumes. It is impossible to devise generally applicable threshold values in this respect. When densification is an element of inward development, it must be made to measure – especially in small- and medium-sized communes.

3.3 A more in-depth examination using the example of a medium-sized commune

With the enactment of the revised Spatial Planning Act, many small- and medium-sized communes are confronted with the limits of their tried-and-tested procedures. While it used to be possible to fall back on the usual practice of outward development within the framework of local planning revisions, it becomes necessary to adopt appropriate thought patterns and revise the formal instruments at the municipal level. Below I use a current example of a medium-sized commune to illustrate the issues small- and medium-sized communes are facing in the implementation of the minimum strategy of ‘inward before outward development.’

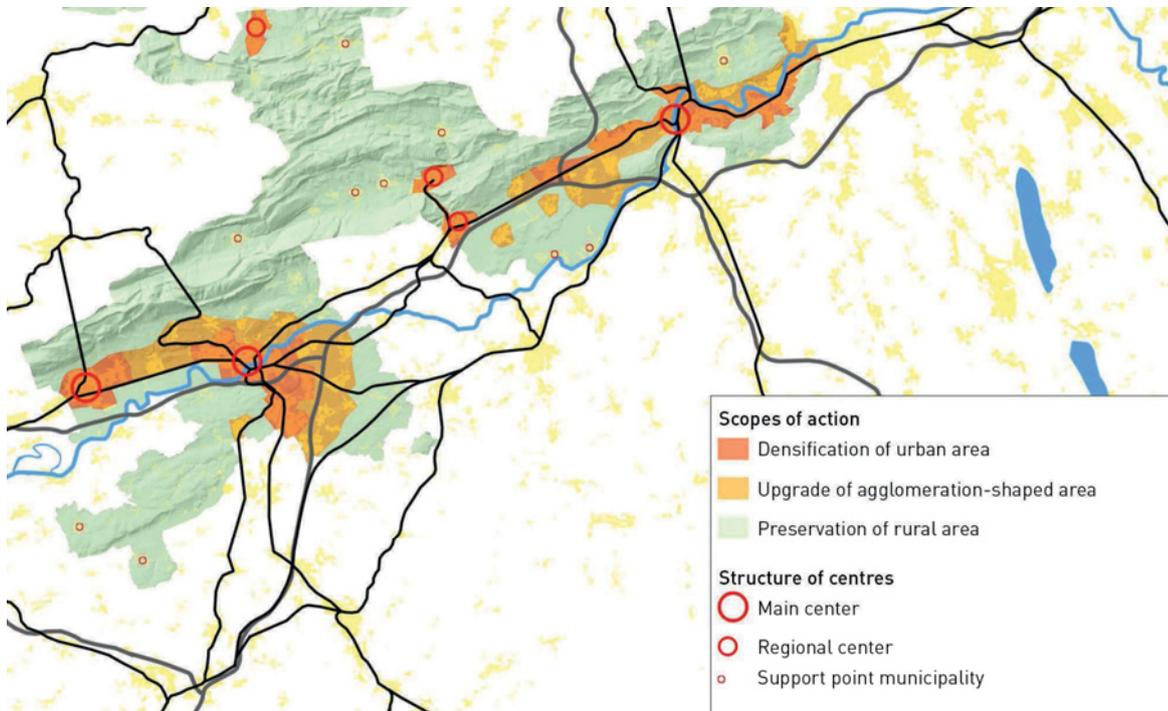


Figure 40: Spatial concept of the Canton of Solothurn: space of action (excerpt) (source: KANTON SOLOTHURN 2014a: 8)

3.3.1 Initial situation for small- and medium-sized communes

With the enactment of the revised Spatial Planning Act and the Spatial Planning Ordinance 2014, the cantons are required to establish operational guidelines for the economic use of land as a resource by appropriately revising their structure plan, which is then subject to approval by the Federal Council by 2019. Particularly the cantons have to define the settlement area for the next 25 years and ensure that the building zones correspond to the expected 'demand' for the next 15 years and are coordinated regionally. In their coordination with the cantons, the federal government established technical guidelines for dimensioning the building zone and determined the overall size of the building zones per canton (UVEK 2014). The quantitative calculations are based on the building zone statistics of 2012, on data from the Federal Statistical Office (BFS) relating to the (median) building area use per capita and employee for 22 types of communities, as well as on the population projections by the BFS. The technical guidelines

provide quantitative specifications for the calculation of residential, mixed, and center zones. Additional guidelines are additionally defined with respect to the work zones. The cantons are free to choose their method for distributing the building zones within their own territory.

The Canton of Solothurn has estimated the construction zone size of the communities in the relevant Draft Settlement Strategy (KANTON SOLOTHURN 2014a) (KANTON SOLOTHURN 2014b). At the end of 2014, the entire settlement area – consisting in the Canton of Solothurn construction and reserve zones – comprised around 9,000 hectares, 8,500 of which are construction zones. The calculation of the 'construction zone needs' to be met by 2030 as part of the revision of the structure plan is oriented toward a 'high' scenario of the canton, based on an increase of around 27,100 people. According to the cantonal estimate, the currently undeveloped residential, mixed, and center zones of 785 hectares have the capacity to hold 37,000 people. The undeveloped commercial and industrial zones⁶⁹ can provide for at least 15,000

⁶⁹ Excluding residential space.

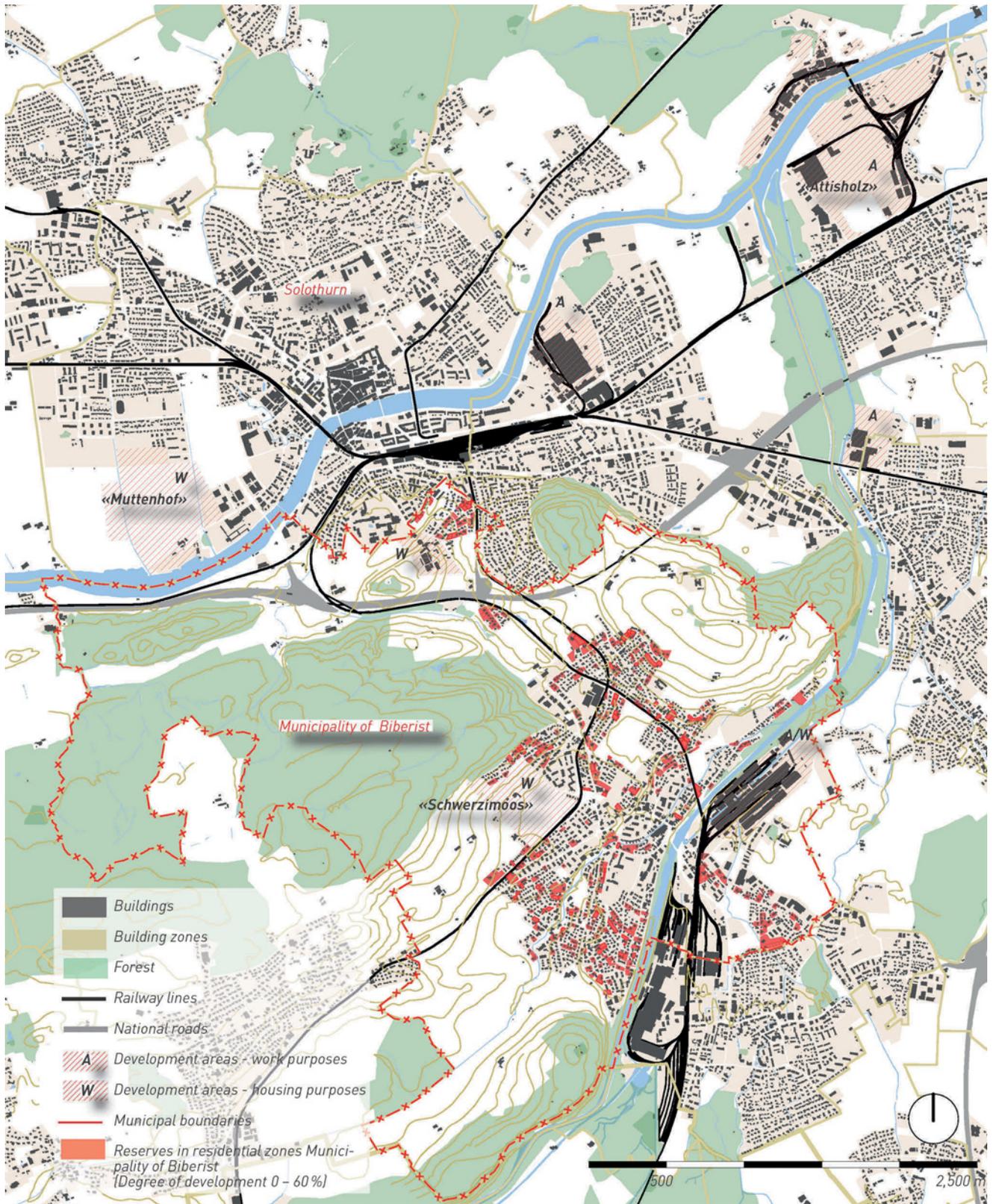


Figure 41: Overview of the commune of Biberist

(source: author's representation, data: swisstopo 2013a, swisstopo 2013b, Kanton Solothurn SO|GIS 2013)

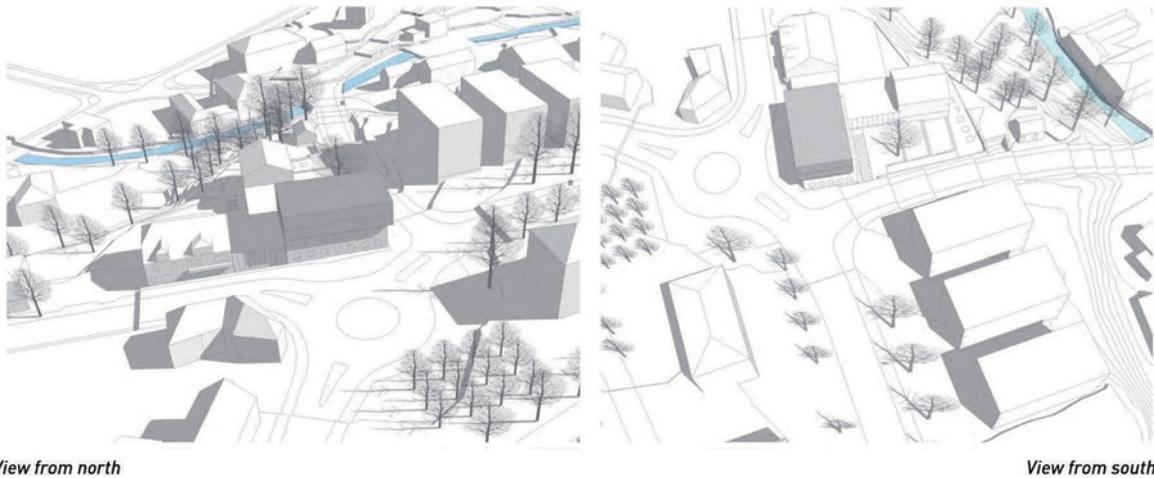


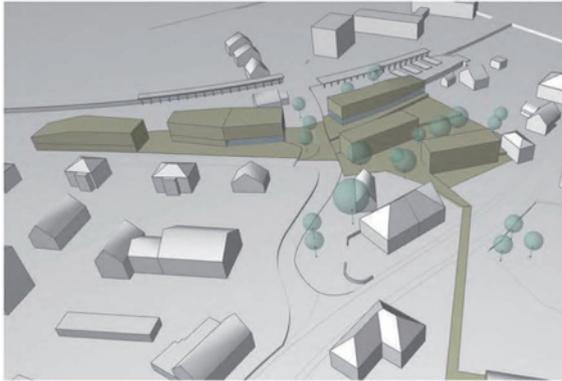
Figure 42: Test design area 'St.Urs' (source: KANTON SOLOTHURN ET AL. 2015)

employees, which is just large enough to accommodate the projected employment growth (KANTON SOLOTHURN 2014a: 4 f.). The existing building zones are thus overall sufficiently large to accommodate the forecast population and employment growth for the next 15 years.

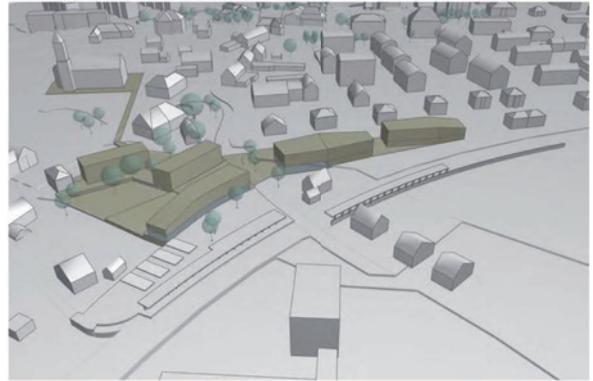
The development strategy (KANTON SOLOTHURN 2014a) defines the scope for action within the canton territory in accordance with its current settlement identity. Accordingly, the communes are allocated either to the urban space, to zones characterized by agglomerations, or to rural space. Here, minimal instructions for future spatial development were articulated (fig. 40, p. 91). The median of the surface requirements per space-user in the residential, mixed, and center zones of the Canton of Solothurn lies at 150 m² in the urban action area, 212 m² in the zones characterized by agglomerations, and on average around 255 m² per capita in rural space. In the draft cantonal development strategy, these figures are called 'density' (KANTON SOLOTHURN 2014a: 4). For future spatial development, it can be seen, among other things, that these density values, especially in the residential zones, must in principle be higher in all areas, that is, in all areas of action achieving at least the median value is desirable. The distribution of the future population in the areas of action is subject to the currently applicable ratios of 58% in the urban zone, 23% in the zones characterized by agglomerations, and 19% in rural space. To support this strategy for developing the field of housing, changes

to the settlement area are being made in the cantonal structure plan in the category 'definite result.' These are projects that are of importance on a cantonal level and that relate to the areas 'Schwerzimoos' in Biberist and 'Muttenhof' in Solothurn with 20 respectively 17 hectares of new settlement area (fig. 41).

The implementation of cantonal structure planning takes place in the context of communal spatial planning. The communes in particular must set down areas for densification in the residential, mixed, and center zones, and define the appropriate measures for a dense and high-quality development. Minimum densities should be specified precisely, in order to increase the median value of the area requirement (KANTON SOLOTHURN 2014a: 6). This applies particularly to those communes that, according to the cantonal analysis (KANTON SOLOTHURN 2014b), have exceedingly large undeveloped building zones, have a below-average use density, or where the projected demand significantly outstrips the building zone area (KANTON SOLOTHURN 2014a: 5). According to the cantonal assessment, this pertains to 43 of 108 communes in the Canton of Solothurn, which now must show how 'the settlement can be compressed internally' (KANTON SOLOTHURN 2014b: 11 f.). All of these communes have fewer than 10,000 inhabitants, about three-quarters even fewer than 2,000. Therefore, they are exclusively small- and medium-sized communes that explicitly need to provide proof for inward development and densification.



View from north



View from south

Figure 43: Test design area ‘RBS railwaystation’ (source: KANTON SOLOTHURN ET AL. 2015)

Like the urban areas, the small- and medium-sized communes in the rural zones and in zones characterized by agglomerations must deal with densification in the sense of population increase, without rezoning new construction zones. Their being aware of the fact that ‘density’ and ‘densification’ must be quantified again in each place and in a location-specific manner means tailoring approaches that contribute to exploring the different spaces for densification in the areas of action.

3.3.2 Pilot procedure village center concept in Biberist

The commune of Biberist is one of those communes that need to provide concrete evidence as to how they intend to deal with a ‘densification of the settlement area’ (fig. 40, p. 91). In addition to extensive floor-space reserves, Biberist, which lies in the wider Solothurn area, also has good access to the rail-bound regional traffic network. The commune is functionally closely linked to the main town of Solothurn and is a member of the community working on a merger project of four communes with the city of Solothurn. These factors reinforce the importance of problem-oriented overviews of the floor area in the built stock, which is explored below using this commune as an example.

According to the present categorization, Biberist is a medium-sized community with its approximately 8,000 inhabitants. It is located south of the cantonal

capital Solothurn, it is connected to it as well as to the urban core of the region surrounding the capital city of Bern by means of two regional transportation lines. Because of its industrial past – the town was long the site of paper and steel industries – there are many small-scale residential buildings dating from the 1950s and 1970s as well as two of the largest industrial sites in Switzerland in the neighboring communes.

This commune is classified as an ‘urban action area’ in accordance with the regional spatial planning concept of the canton, but has below-median population densities in the residential, mixed, and center zones. The assessment of measures to be taken to move toward a more dense use of the construction zones therefore lies with the canton (KANTON SOLOTHURN 2014b:6). At the same time, one of the two projects of cantonal importance for the development of a dense residential district with a high quality of living (‘Schwerzimoos’) is located in the commune.

Within the framework of a pilot project, the Office for Spatial Planning of the canton chose the commune of Biberist to explore the opportunities and possibilities of informal methods for identifying inward development potential. Cooperation between the canton (Office of Spatial Planning and Conservation Office), the commune (building officer, mayor, president of the building committee), and a planning team external to the canton was arranged to explore the possibilities for inward development and densification in built stock, and over the course of several meetings various courses of action were explored for imple-

mentation. A test design was developed, along with hypotheses for possible solutions in the village center between the two regional transportation stops. An integral part of the approach was to develop systematic testing designs in places deemed suitable for increasing building density (fig. 42, p. 93 and fig. 43). Three interim presentations were held, during which the assessment of the situation, the test designs themselves, and the resulting 'inward development concept' were discussed in detail.

3.3.3 Critical evaluation of the pilot procedure

The procedure adopted by the Canton of Solothurn is undoubtedly a problem-oriented approach. It involves exploring possible courses of action for inward development in collaboration with the commune of Biberist, the goal being to arrive at an assessment of which areas would be suitable for a modest increase in structural density (fig. 44, p. 96). The above-mentioned initial problems of removing mobilization obstacles in the built stock and overcoming the lack of acceptance for densification were recognized and indirectly triggered the chosen procedure. Establishing the basic principles for common exploration, clarification, and solution of the problem was delegated to an external planning office in the sense of a third-party expert opinion. The possibility of inward development was explored using test designs in four meetings between the administration, the communal government, and the canton.

Based on the experience gained in the Canton of Solothurn, the following factors were discovered as contributing to the success of a test design in the exploration of inward development potentials:

- The three-dimensional representations of possible variations in densification areas form the basis for approaching the owners. Representations of this type are easily accessible, even for beginners. Initial three-dimensional representations can be hand-drawn sketches that contain the most essential elements and reference parameters (e.g., scale).
- In the test designs, buildings are exclusively represented as abstract volumes with their number of floors. Thus, the essential elements such as the type and extent of usage are discussed as part of the negotiation process toward increasing building density.
- In the course of the process, solutions were discussed that subsequently were justifiably discarded. The rationales for why one variant was preferred and another was discarded serve as arguments for the president of the building committee when discussing the results in the local council.
- The building officer has many years of informal knowledge about the availability of reserves. Thanks to regular contact with many landowners, he is often aware of development intentions even before official requests from the landowners are received by the community. This informal knowledge should be used.
- Accurate and current local knowledge of the external planner for the test design creates a trustful basis between the authorities and the landowners. The municipal representatives believe that 'an external planner is bolder than the local planner.'
- In small-scale residential areas, landowners can be overwhelmed with the question of what development opportunities are available on their sites. The commune needs to approach the landowners early on – before an actual change of ownership – and suggest proposals for inward development. It is crucial to find the most appropriate time for a discussion with the landowners. Contacting them too early may result in discussions being refused.
- The canton expects small- and medium-sized communities to create a 'preconception' of which areas are suitable for inward development and densification and which should be spared in the medium term. Determining the availability and feasibility cannot be the result only of the deliberations; rather, by using a test design, a commune can perform such an assessment of the situation quickly and with a relatively small financial and personnel effort.
- The test design is the vehicle for achieving clarity within a small circle (building administration, building committee, external planners, canton representatives) about the potential opportunities and challenges. On the one hand, this creates trust between the two levels of government; on the other hand, the authority's confidence to see inward development as an opportunity grows in light of the solutions proposed.

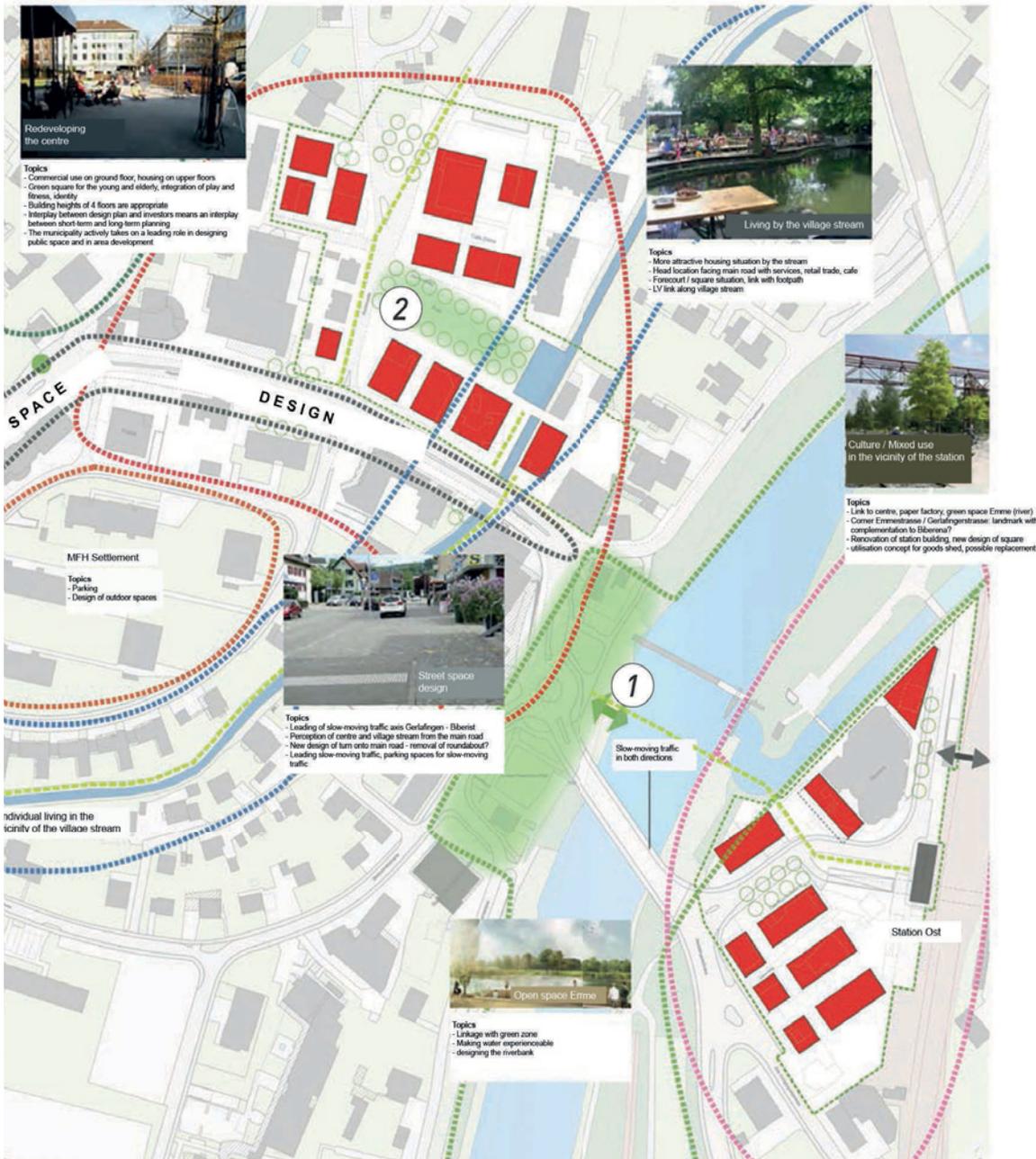
Village center – Ten principles for development

1. For the designated subareas, individual strategies for development can be formulated. These vary from structural change and redensification to conservation of the existing building stock.
2. The autonomy of the subareas can become attractive with defining changes are envisaged. inviting open spaces for high-grade uses.
3. Under-utilized or neglected properties are also opportunities since changes are envisaged. Where there is change, the possibility of participation arises.
4. An attractive network of pedestrian paths, separated from the busy roads represents high quality and motivates to walk short distances, which in turn reduces individual transport.
5. Living in central locations is trendy – Biberist structurally has suitable prerequisites for this.



Figure 44: Test draft for the commune of Biberist (source: KANTON SOLOTHURN ET AL. 2015)

6. In order to create a multifunctional center, a clear-cut strategy, guidelines for investors, and financial participation by the public sector are needed.
7. Envisaged constructional changes move and affect neighbourhoods: participatory procedures with investors and residents are proven instruments, facilitating them to become partners.
8. The construction of underground car parks creates space for designed open spaces which have an identity-shaping effect and as soft factors attract investors and residents.
9. The two water spaces Emme and Dorfbach are unique. The Dorfbach in particular still offers a large potential to be perceived in an enhanced manner.
10. The main road must be transformed into a connective local street space.



- A central question in the test design relates to the thresholds of acceptable building density. A basic requirement for the test design is that it helps to identify these thresholds.
- Another result of test design is the identification of open spaces that should be spared: 'An investor does not deliberately plan well-designed outdoor spaces for the benefit of the community.'
- A key success factor lies in the professional and geographical proximity of the communal authorities and of the canton to the landowners. Nevertheless, the commune should be the one to initiate the dialogue with the landowners.
- Inward development causes the job description of a building officer in a small- or medium-sized community to turn into a 'settlement developer.' This should be taken into account in training.
- The school area planning should be seen as part of inward development. In this case, the commune may act as a landowner and user, and contribute directly to inward development.
- Official representatives of the community generally welcome a common problem-oriented approach relating to the specific case ('designing in a team'). It allows for contributions from the commune to be made which otherwise would not reach the canton via formal channels.

In the pilot process for Biberist, difficulties also arose that can generally be described as stumbling blocks:

- Concretization demands a discussion about details. Typological elements such as roof shapes, window sizes, or the distances between buildings in particular are the subject of long and controversial discussions in the working group.
- The question of the cost for subsequent simultaneous processes lies at the center of the discussions when concluding the test design. Subsequent competitions of ideas with at least four teams are very welcome and considered useful. However, because of the lack of funding by the community, they must be excluded.
- Enabling cooperation beyond communal boundaries to match one another's building zone sizing is deemed extraordinarily difficult. The initial prob-

lems are just too different, and it would first be necessary to establish a cooperation between the authorities.

- For many landowners, a long-term perspective of 10–15 years is too far in the future to create a need for action and making decisions. A decisive factor when initiating a process of transformation is a pending or recent change in ownership.
- From the authorities' perspective, the lack of availability of building land, the fragmented nature of the ownership, and site structure as well as fractious communities of heirs are the greatest factors preventing inward development, at least in the short to medium term. Especially landowners who reside outside the region tend to forego a short-term sale of their properties in favor of a long-term price increase.
- Landowners must be shown the advantages of inward development based on their specific case. Densification must be worthwhile to them. The contributing factors are different from case to case. This makes approaching landowners a resource-intensive task for the commune.
- Inward development in the commune's townscape protection zones is very challenging but in small-sized communities often the norm.
- Knowledge of future users and usages is essential for discussing appropriate typologies. However, this information generally reaches the authorities at a very late stage.

The Canton of Solothurn's approach to testing by means of a pilot process, the usual procedure for the implementation of cantonal structure planning in the communities, is useful and led to important insights. For example, the commune recognized that accurately placing a new bridge over the Emme for pedestrians and nonmotorized traffic allowed most public buildings and facilities such as railway stations, church, grocery stores, schools, and local government to be directly connected to one another⁷⁰. At the same time, it was possible to upgrade public space in previously inhospitable places. Next, it was acknowledged that an important potential area for inward development had previously not been developed because of the lack of availability of individual sites in

70 No. 1 in fig. 44, p. 96.

private hands. Approaching these landowners is now a priority task for the community⁷¹. Finally, it was also established that the commune, being a landowner of sites in the center area, contributes crucially to enhancing the townscape, though this entails coordination with the school area planning⁷². Without the test design, it would also not have become this clear that a larger development area near the railway station could well be subjected to high structural density, as this seems compatible within the context⁷³.

Thanks to the present test design, the community is equipped for systematically commencing discussions with landowners. However, transposing the basic principles of spatial development gained in this informal manner into the formal municipal instruments still remains to be done. A subsequent structured clarification process throughout the whole construction area would be helpful. Knowing which areas are suitable for densification – and which should be preserved – should be the product of an overall view that includes at least infrastructures and open spaces.

The present result of the test proposal now forms the basis for setting a task for a simultaneous process with several teams across communal boundaries.

3.3.4 From test design to competition of ideas

As the present example of a typical community in a typical canton in the Swiss Central Plateau shows, the joint cooperation within the framework of an early test design has the advantage that the relevant authorities can gain a ‘preconception’ of the development opportunities in their locality. However, this forms only the basis for cross-border coordination of future ‘needs’ for building zones, as set out in the revised Spatial Planning Act. It is essential that the subsequent procedure be pursued immediately after the test design across the borders in the context of a simultaneous process – for example, through an idea competition, the aim of which is to convert the insights and recommendations gained via an informal process into formal instruments. In this respect, the third research question now takes on a central role in

the further debate, namely: How to design processes in order to increase the structural densities at the appropriate locations?

3.4 Intermediate conclusion 2: The discussion of densification is a discussion of typology

The three-level exploration depicted in this chapter reveals that building density must always be discussed in terms of context and of scale. While at the supraregional level the questions that arise after the vote on inward development and the capacity of the rail-bound regional traffic are in the foreground, at the regional level existing leeway in the formal instruments is relevant in the form of the degree of development. The clarification process at the local level clearly shows that densification in the built stock can be identified and quantified only by means of an evaluation and negotiation process.

At the site level, density is a question of typology. Densification takes place on each individual site and is a consequence of decisions by the landowners. After the questions ‘where to densify?’ and ‘how much to densify?’, the question of ‘with which typology to densify?’ has now to be introduced into the discussion. In the final analysis, densification does not mean a nationwide increase of theoretical densification figures in the formal municipal instruments, but rather involves a problem-oriented and customized approach at the local level.

The basic question in light of the initial problems – in particular acceptance and mobilization obstacles – is therefore: Which building types with high construction density are suitable as housing for the population of small- and medium-sized communities with their specific lifestyles? This question must be addressed at the beginning of the clarification process for building density.

71 No. 2 in fig. 44, p. 96.

72 No. 3 in fig. 44, p. 96.

73 No. 4 in fig. 44, p. 96.



47°12'13" N 7°32'41" E

CC-BY-NC-SA. Photos taken while playing with density & book with

4 Procedural approach for densification in small- and medium-sized communes

Structural densification as an element of inward development is confronted with the initial problems described at the outset, particularly in small- and medium-sized communes. Structural densification, according to the hypothesis of this work, cannot be achieved solely with formal instruments. Rather, in small- and medium-sized communes more informal procedures are needed that lead to an overhaul of local planning. An increasingly important role is played by designing tailor-made procedures that identify reserves and potentials and that involve the relevant actors at an early stage in the exploration processes. Structural density signifies something different in every location and must be substantiated and clarified by means of tailor-made procedures. Nevertheless, general principles do apply and are transferable to other small- and medium-sized communities in the Swiss Central Plateau. These include differentiating future planning tasks into task types. Complex core tasks form the basis for the strategic concentration of effort by politicians; they indicate where the (chronically) limited resources should be applied. A compass of inward development combines this knowledge and forms the informal preliminary stage prior to moving over to the formal procedure of the 'third-generation' revision of local planning in small- and medium-sized communes.

4.1 Interaction between the formal and the informal instruments

4.1.1 Assessment of formal instruments

Planning instruments have the purpose of managing and regulating the implementation of a planning project (ARL 2005: 635, 785). Formal planning must comply with a procedural process dictated by legislation, which in particular lays down the participation of oth-

er authorities and the general public (ARL 2005: 281). So the instruments that reflect laws and regulations are formal instruments and generally consist of an explanatory text and a corresponding map. In Switzerland, formal planning instruments may be found on all three levels of government. On the federal level, the concepts and sectoral plans show how tasks with a spatial impact are to be handled by declaring the aims pursued and by explaining the prescriptions from the federal government. Yet the spatial concept of Switzerland (BR ET AL. 2012) should not be understood as a federal concept; rather, it is supported and shared by all three levels of government.

The cantonal guiding plans show how activities with spatial relevance are coordinated within the respective canton on all three levels. The text of the guiding plan describes the procedure in terms of space, time, and organization, and contains information on the required financial resources.⁷⁴ Guidelines are officially binding and generally reviewed every 10 years, if necessary revised, and finally approved by the Federal Council.⁷⁵ A guiding plan does not depict a target state, but is a coordination instrument for the desired spatial development.⁷⁶

The projects related to the structural planning exhibit various 'stages of maturity,' depending on their degree of coordination. Therefore, in accordance with the Spatial Planning Ordinance⁷⁷, a guiding plan needs to include three categories:

- 'Preliminary orientation' designates activities with a spatial impact which could significantly influence soil usage and could therefore require coordination. However, they cannot yet be described to the level of detail necessary for any coordination. Rather, they are vague ideas of projects that might have spatial relevance, and that will be further developed should their requirements be confirmed. Preorientation thus serves only as a source of information. Typical examples of preliminary orientation in the cantonal structure plan include

⁷⁴ Art. 6, para. 3 Ordinance on Spatial Planning RPV of 28 June 2000 (status per 1 January 2015).

⁷⁵ Art. 9, para. 3 Spatial Planning Act RPG of 22 June 1979 (status per 1 May 2014).

⁷⁶ Art. 5, para. 1 Ordinance on Spatial Planning RPV of 28 June 2000 (status per 1 January 2015).

⁷⁷ Art. 5, para.2 Ordinance on Spatial Planning RPV of 28 June 2000 (status per 1 January 2015).

designating an as yet mostly undefined planning corridor for the construction of a cantonal street or a tunnel for rail traffic.

- An **'intermediate result'** is a project for which coordination has been initiated but not yet finalized. An intermediate result hence constitutes an option for a possible construction project. It shows the status of the coordination achieved so far and formulates any remaining questions. At the same time, an interim result in the cantonal structure plan shows what measures must be taken in order to achieve timely coordination. This is the case, for example, for the rough route (rail track availability) for a new track in the rail network.
- **'Definite result'** is the highest level of concretization in the cantonal structure plan. Definite results show construction projects that are spatially coordinated and can be processed by means of the usual procedures. This concludes coordination, so that detailed planning becomes imminent. Examples include the completion of a national road or planned track extension for railway transportation.

The coordination levels – definite result, intermediate results, and preliminary orientation – are recorded in the text and map of the cantonal structure plan and are binding for public authorities⁷⁸. The rules for assigning responsibilities for the inclusion of new projects in the three coordination levels vary widely across the cantons. For example, in the Canton of Aargau the governing council (the Executive) introduces preliminary orientation into the structure plan, whereas in the Canton of Solothurn it is the department responsible for spatial planning (i.e., the Department of Construction and Justice) that is responsible for this. In the Canton of Bern, too, the introduction of new content in the category of preliminary orientation does not require a decision by the Bern governing council board (the Executive). On the other hand, introducing definite and intermediate results is the responsibility of the Great Council (legislative, parliament) in the Canton of Aargau, while the governing council (the Executive) is responsible for these two categories in the Canton of Bern.

Notwithstanding the differing responsibilities in the various cantons, particularly the category of 'preliminary orientation' allows the preliminary ideas to be included into the structure plan without any significant political action: Later it is possible to select what should be pursued. In practice, the importance of preliminary orientation tends to be underestimated, although it would offer a way of enquiring more deeply into something that might prove potentially important but as yet only vaguely perceptible (MAURER 1988: 17).

While the cantonal structure plans are binding for the cantons, the communal regulation of the contents of its land-use planning, consisting of the local development plan resp. zoning plan and the building law, are also binding for landowners on the site level. The procedures for establishing communal land-use plans vary from canton to canton according to the provisions in the cantonal building and planning laws.

According to the requirement⁷⁹ for plan coordination, individual regional planning must be accommodated for within the overall space, which in turn must take into account the circumstances and requirements of the individual spaces. Thus, in the course of preparing the planning, this 'principle of counter-current' (ARL 2005: 174) entails the need to ascertain the effects of the planning both top-down and bottom-up. At the same time, the principle of subsidiarity (ARL 2005: 172) demands that decisions be made at the lowest level at which it is factually and materially reasonable and possible to do. The restructuring of financial equalization in 2005 explicitly enshrined the principle of subsidiarity as a political precept in the constitution in Switzerland⁸⁰. The principle of subsidiarity applies not only to the relationship between the cantons and the federal state, but also between cantons and communes as well as equally between the state and society in general. This principle forms essentially the basis for the Swiss system of government, and it is also reflected in planning procedures in the guise of the planning competence of the communes, which are responsible for land-use planning. This competence may be ceded to a higher level only if the local one is unable to adequately resolve the problem on its own (ETH ZÜRICH 2013d: 141).

78 Additionally, for example, in the Canton of Aargau (Art. 5 Ordinance on Spatial Planning RPV AG), in a case of conflict and after weighing up interests, the authorities can keep an area for a rail track available by means of a planning tool that is then also binding for the landowners (planning zone, cantonal, or communal land use plan).

79 Art. 2, Spatial Planning Act RPG, Art. 26 Spatial Planning Act RPG of 22 June 1979 (status per 1 May 2014).

80 Article 5a SFC of 18 April 1999 (status per 18 May 2014).

The results of a formal planning process – anchored at all three levels of government according to the principles of counter-current and of subsidiarity – create planning security for the authorities and legal certainty for the landowners. For spatial planning, this also regulates the type and extent of the use of the sites, ensures accessibility, and defines the development objectives. At the same time, it creates the general conditions necessary to ensure compliance with the decisions of the interested parties. The revised Federal Spatial Planning Act prioritizing inward development is implemented at the lowest level – the site itself – and the interaction must therefore also occur at the next higher level, namely, the regional and cantonal level.

Land-use planning constitutes the most important formal instrument at the communal level. Communities are encouraged to review formal instruments every 10 to 15 years and, if necessary, to adjust them. However, there is only a very limited legal framework regarding the specific timing of the procedure. Thus, for example, cantonal planning and construction laws regulate the deadline for appeals and stipulate that land-use plans be open to the public for at least 30 days after the preliminary cantonal examination. Also, there is no concrete requirement for involving the population in the procedure. The customary procedure in a land-use planning in small- and medium-sized communes provides for two parts (fig. 45, p. 106): The first part concerns the abstract level in the conceptual model, showing the principles of spatial development in maps and text and the municipal council approves these at the end of the process of public intervention and preliminary cantonal examination. This process takes at least three, though generally up to five readings in the relevant commission. As a result, up to 1 year of processing time must be expected in small- and medium-sized communes for this first procedural step. While the general public may suitably participate within the framework of the public intervention, the instrument is passed on to the cantonal authorities for preliminary examination, the latter taking at least 3 and occasionally up to 5 months. Following public intervention, and with the knowledge of the cantonal preliminary examination report, the appropriate commission revises the instrument during further readings. Thus, a pro-

cessing time of 1.5 to 2 years might elapse before the community assembly actually passes the spatial model. The model is binding for public authorities and is therefore the starting point for the subsequent land-use planning procedure, which itself is divided into the following phases: development, public intervention, preliminary examination, public disclosure, negotiations with the parties involved, and approval. In contrast to the spatial model, during the land-use planning procedure, legitimate parties concerned may raise objections in written form. Depending on the outcome of any negotiations with the parties involved, a second public edition of the instrument may prove necessary. This process results in an instrument that is binding for both public authorities and for landowners, and that is again passed by the community assembly. The responsible cantonal authority finally approves the land-use planning. The estimated usual duration allocated to the land-use planning procedure is 2.5 to 3 years. Thus, a total of 5 years can sometimes elapse between the date of the municipal council's decision to revise its local planning until its coming into force and thus the start of planning and legal security for the authorities.

The communities⁸¹ are usually responsible for financing local planning. Small communities have an average budget of CHF 120,000–160,000, while medium-sized communes have CHF 180,000–230,000 available for the revision of local planning⁸² (tab. 12, p. 104). The budget for the local planning revision must be approved by the communal assembly and covers the community expenses including the public disclosure. Expenses arising from objections as well as from a possible revision of the land-use planning – including the second version – must be financed separately, possibly by means of a supplementary credit.

At the community level, the formal procedures for revising local planning have been tried and tested for a number of legislative periods. They have been geared toward enlarging the settlement area but reach their procedural limit with respect to the orientation of future settlement development in the direction of the largely constructed areas.

81 Exceptional contribution from the canton, e.g., the Canton of Aargau 50% for amalgamations, make up approx. 17% for regular revisions.

82 Estimate based on examples from the Cantons of Aargau and Solothurn.

<i>Usual elements of a local planning revision in communes of the Swiss Central Plateau</i>	<i>Small commune < 2,000 inhabitants [CHF]</i>	<i>Medium sized commune 2,000–10,000 inhabitants [CHF]</i>
<i>Preliminary work, compilation of prerequisites, obtaining funding for planning</i>	<i>5,000–10,000</i>	<i>10,000–15,000</i>
<i>Spatial model (site visits, meetings, participation, preliminary assessment, revision, report)</i>	<i>50,000–60,000*</i>	<i>60,000–80,000**</i>
<i>Land use planning (incl. e.g. survey of wooded areas and further clarifications)</i>	<i>60,000–80,000</i>	<i>100,000–120,000</i>
<i>Legislative procedure</i>	<i>5,000–10,000</i>	<i>10,000–15,000</i>
<i>Total (without supplementary credits, without ancillary costs and VAT)</i>	<i>120,000–160,000</i>	<i>180,000–230,000</i>

** Participation only in writing*

*** Participation as large group event (such as workshops etc.)*

Table 12: Average procedure costs for local planning in small and medium sized communes (source: own representation)

4.1.2 Limitations of the formal instruments

It is the great merit of formal instruments and procedures that they provide planning and legal certainty for both authorities and landowners. Nevertheless, when it comes to intricate core tasks they are pushed to their limits. Particularly with spatial model procedures, there is no real engagement with specific problems at the site level. In order to achieve impartial decision-making for spatial development independent of individual interests, planning authorities restrict themselves to an abstract representation of a future vision, generally without sufficient knowledge of the root problems at the site level. However, this approach is limited by the orientation of the spatial development to the largely built-up area. In connection with initial problems of densification – and considering the ‘maxim of the sharper information’⁸³ – it is better to deal with concrete problems as early as possible. Thereafter, the findings can again be fed back into an abstract level. Such a specific clarifying process is generally not provided for at the outset of the formal procedure for local planning revision.

Formal instruments can also be very restrictive if they are applied only for negative planning – to prevent a compromised development – instead of being used for actively designing further development. For

example, certain usage types might be excluded at the municipal level by negative stipulations, which in combination with a strong protection claim, can make transforming built stock very difficult. The strong dependence on the political framework can also be disadvantageous. Depending on the configuration of the relevant authority and the rhythm of the legislative periods at the municipal level, adopting formal instruments may be delayed or deliberately accelerated. The sometimes elevated degree of abstraction also makes public intervention by the population concerned and the landowners more difficult. Moreover, because of the long-term lapse between the start of planning and actual construction, it may be difficult to awaken the interest of the public for spatial planning. Overall, the characteristics of formal instruments, which are essentially geared toward long-term results and continuity, can prove to be more of a hindrance than a help. This is especially the case with respect to the mandate for inward development when transforming existing building stock, since the modes of thought have been restricted to outward development and – because of their decades-long application – have taken strong roots in political culture.

Inward development is more demanding as far as methodology and politics are concerned as well as being more time-consuming and – particularly in

83 See page 50.

Type of task	Features	Design tasks for densification	Procedure	Financing
Routine task	<ul style="list-style-type: none"> • Problem is known • Process is known • Result/solution is known • Long-lasting routines • Predetermined objects and participants 	<ul style="list-style-type: none"> • Closure of gaps between buildings in generally overbuilt area • Infill development of a property in the context of the applicable law (upgrading, extension, added storeys) • Extension of access development 	Planning permission procedure	Landowners
Project task	<ul style="list-style-type: none"> • Problem is known to a large extent • Process is known to a large extent • Aim/solution is known to a large extent • Some routines • Objects and participants known to a large extent • Limited in time 	<ul style="list-style-type: none"> • Drafting a design plan • New construction of bridge for slow traffic • New construction/relocation of railway station • New replacement buildings over several sites and owners 	Planning permission procedure or special use planning	One or several landowners together, project developer, investors
Complex core task	<ul style="list-style-type: none"> • Problem is unknown to a large extent • Process is unknown to a large extent • Aim/solution is unknown to a large extent • Some routines, confusing • Objects and participants partly unknown 	<ul style="list-style-type: none"> • Reutilisation of brown fields • Extension of social and cultural infrastructure • Re-zoning at suitable locations 	Problem-oriented informal procedures prior to special use planning procedure	Commune and canton, landowners of key properties

Table 13: Design tasks and processes for densification (source: own representation)

small- and medium-sized communities – facing larger initial problems⁸⁴ than outward development. These initial problems make it necessary to deal as soon as possible with specific, unsolved problems at the site level. However, the usual course of a revision of local planning specifies starting with a conceptual spatial model at an abstract level and concluding with a strategic political concentration of effort. This represents a major technical challenge for laypersons in a nonprofessional government system with the inherent risk of errors at the very outset of the formal procedure. The consequences of these mistakes, often made because of erroneous assumptions, are revealed only at the stage of public disclosure of the revised land-use plan and may then lead to objections. Furthermore, during the development of the spatial model, there is also no legal requirement for a preliminary orientation of the cantonal authorities about inward development measures. Indeed,

under certain circumstances – for example, if there were no informal preliminary discussions between the communes and the canton – several months of processing the formal instrument can elapse before the latter is passed on to the canton for a preliminary examination.

However, the most severe defect in the formal procedure for the revision of local planning and the instrument for land-use plan in small- and medium-sized communes lies in the lack of any possibility of engaging with complex core tasks. The measures related to inward development in particular are mostly complex core tasks, and only very few tasks can be clarified and resolved with project or routine organizations (tab. 13). The recommendations for action resulting from the formal instrument for the land-use plan focus on the latter two types of tasks. The initial problems associated with densification can be

84 See page 23.

-  Strategic concentration of effort
-  Public information
-  Public participation

Former planning legally binding

Time period in months

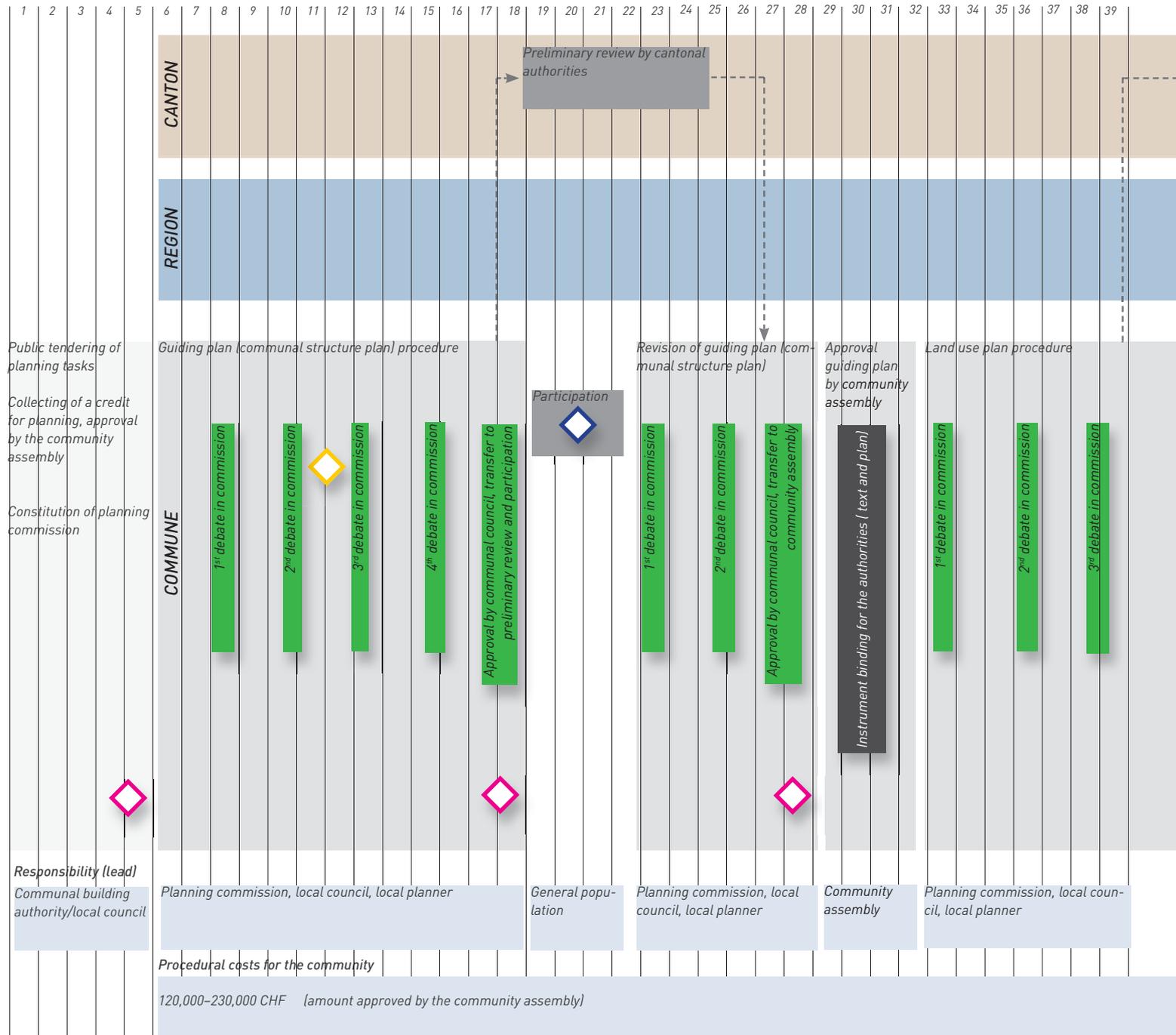
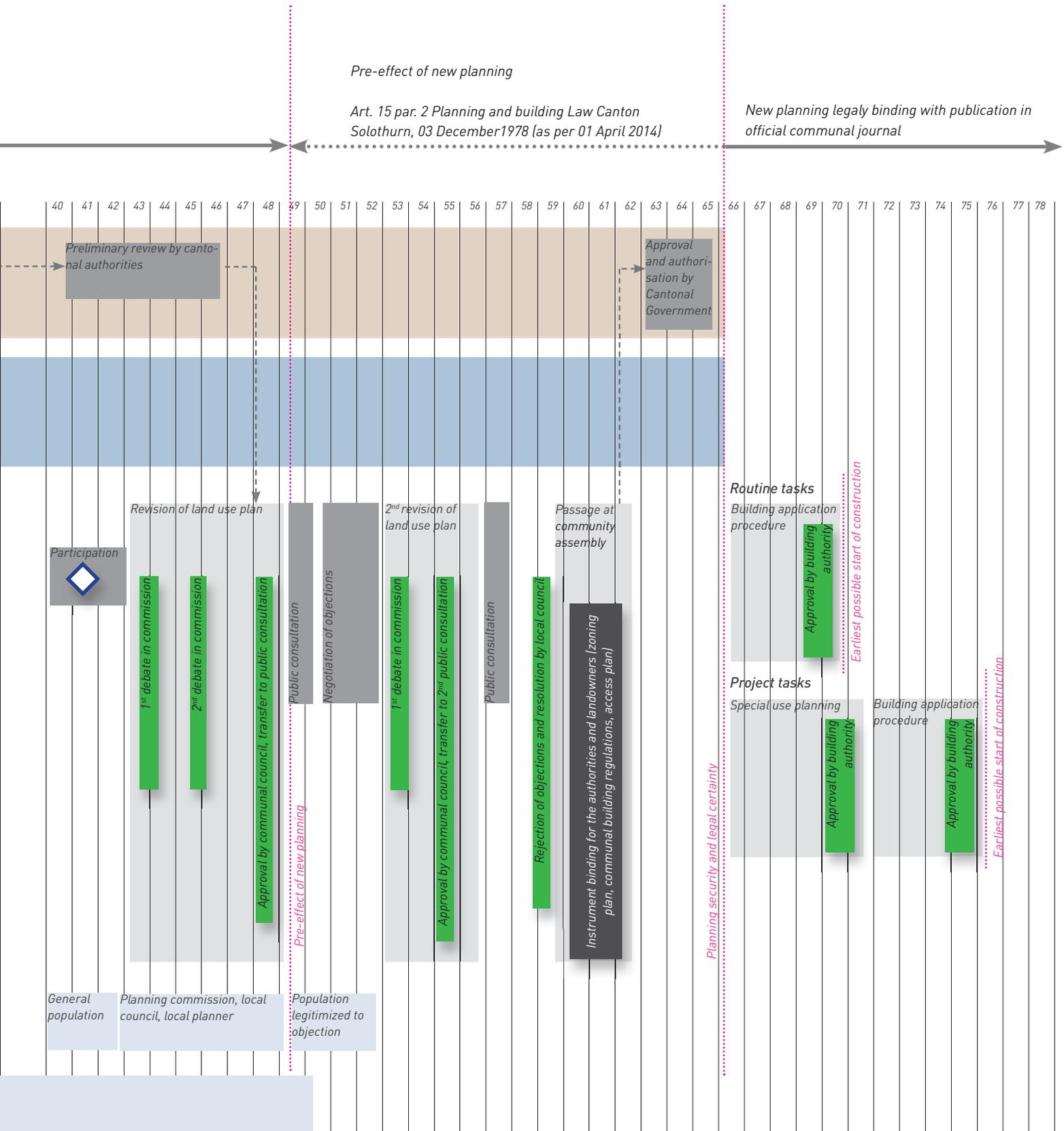


Figure 45: Common procedural organisation in small- and medium-sized communes using the example of the Canton of Solothurn (source: author's representation)



met only by problem-oriented informal procedures. However, the formal planning for both procedures for the spatial model as well as the land-use plan do not provide fixed informal elements for the formal planning process. At the same time – and especially for small- and medium-sized communes – revising the formal instruments represents a considerable financial outlay, which does not permit a time-based and budgetary extension of the usual procedure. There is thus a need for integrating the early examination of complex core tasks into the formal procedure.

4.1.3 Informal planning as a supplement for complex core tasks

According to the revised spatial planning law, the federal government, the cantons, and the communes take measures to guide settlement development internally⁸⁵. Small- and medium-sized communes are more exposed to the initial problems facing inward development and densification than are large communes⁸⁶. In particular, the emphasis of the formal procedures on outward development is traditionally enshrined strongly in the thinking of lay politicians in small- and medium-sized communes. This makes switching from outward to inward development all the more difficult. At the same time, these communities, while having very limited human and financial resources, also possess the largest gross floor-area reserves in their residential areas, which exacerbates the initial problems even more. Following the principle of subsidiarity⁸⁷, the cantonal agencies are required to contribute their knowledge to the design of the process as well as to make a financial contribution to the exploration, clarification, and resolution of the problems related to inward development.

The strategic direction of ‘inward development before outward development’ renders the ways of thinking and the procedures geared toward the expansion of the settlement area obsolete. Small- and medium-sized communes in the catchment area of major core cities as well as the densely developed network of public transportation linked to them have mainly

been benefiting from the long-term need for settlement in the past decades; they have implemented the targeted population growth with an ‘open countryside’ sort of development. Since the middle of the last century, the nonprofessional commissions and political bodies employed for local planning have been coping with their tasks using formal instruments. When the Revised Spatial Planning Act 2014 and the associated demand for densification came into force, the only options for actions remaining for formal instruments were routine procedures on undeveloped sites. The formal instruments do not offer enough useable knowledge for transforming the stock – a complex core task – such as reusing brownfields, rezoning to higher density or to another building zone, etc. Nor do they correspond to a problem-oriented approach, wherein the methods applied should relate to the unsolved difficult tasks and not vice versa. Methods are required that best support the clarification process in order to find possible solutions to the problem. To this end, they must be devised with reference to the initial problems, ‘custom made’ and ‘problem driven’ (SCHOLL 2011:281). Informal procedures should be understood as an addition to – and preliminary work for – the formal procedures, rather than as their replacement. Both types of procedure are needed for implementing the strategic direction toward ‘inward development before outward development.’ The question is: when and with what goal are the informal instruments preferably to be used?

The great advantage of the informal procedures is their adaptability to changing conditions such as the cause, the topic, groups of participants, and spatial reference as well as the possibility of offering problem orientation. Advantageously, the operational and organizational structure can also be adapted ad hoc during the planning process to take into account any new findings (tab. 14). Informal procedures are used to prepare the future execution of the planning result by setting priorities or by scheduling implementation deadlines. These measures can help to improve the forthcoming formal planning process and to shorten its duration (HENCKEL ET AL. 2010:228). The preparation for the formal procedures via informal planning makes the former more robust by initiating the

85 Art. 1 para. 2, let. a. bis.

86 See page 23.

87 See page 102.

	<i>Formal procedures and instruments</i>	<i>Informal procedures and instruments</i>
<i>Planning product</i>	<i>Precise formal brief, generally consisting of text and map</i>	<i>Freely definable for the best possible completion of a task, not exhaustively defined</i>
<i>Perimeter</i>	<i>Administrative units (Confederation, canton, region, community)</i>	<i>Larger interconnected spaces with common problem case, perimeter definition on own initiative</i>
<i>Duration of procedure</i>	<i>Sectoral strategic planning of the Confederation; 4–8 years Structure plan of the cantons; 2–3 years (general revision) Land use planning of the communes; 3–5 years (general revision)</i>	<i>1–2 years (including preparation, without going in-depth)</i>
<i>Process-based organisation</i>	<i>Procedure and deadlines regulated by law or through ordinances</i>	<i>Freely definable for the best possible completion of a task</i>
<i>Organisational structure</i>	<i>Participants and relevant stakeholders are to be involved according to legal basis</i>	<i>Freely definable for the best possible completion of a task</i>
<i>Financing</i>	<i>Clearly regulated (public sector)</i>	<i>Negotiable (cost settlement between the landowners, local authorities, cantons, regions, Confederation, etc.)</i>

Table 14: Comparison of formal and informal procedures and instruments (source: own representation)

dialogue among the stakeholders involved at an early stage, especially for difficult unsolved problems. In this way, differences are resolved earlier rather than later, when encountering objections during the public disclosure. At the same time, since informally developed planning results are not legally binding, there is a risk that they might not even be considered during the subsequent policy-making process, because in the meantime new policy strategies might have been pursued. Informally developed planning results have very little effect if their results are not incorporated into the formal instruments. Nevertheless, informal procedures are the only way to concretely clarify difficult questions about space for leeway and threshold values – such as the capacity for development or the compatibility of building typologies in the existing context. They are an indispensable tool in the framework of the transformation of the built stock. Private landowners should not take the initiative for using informal methods to further the cause of inward development; rather, it is a legal mandate to be tackled by the administration and politicians.

4.2 The concept of space for action

4.2.1 The ‘map of quiet and dynamics’

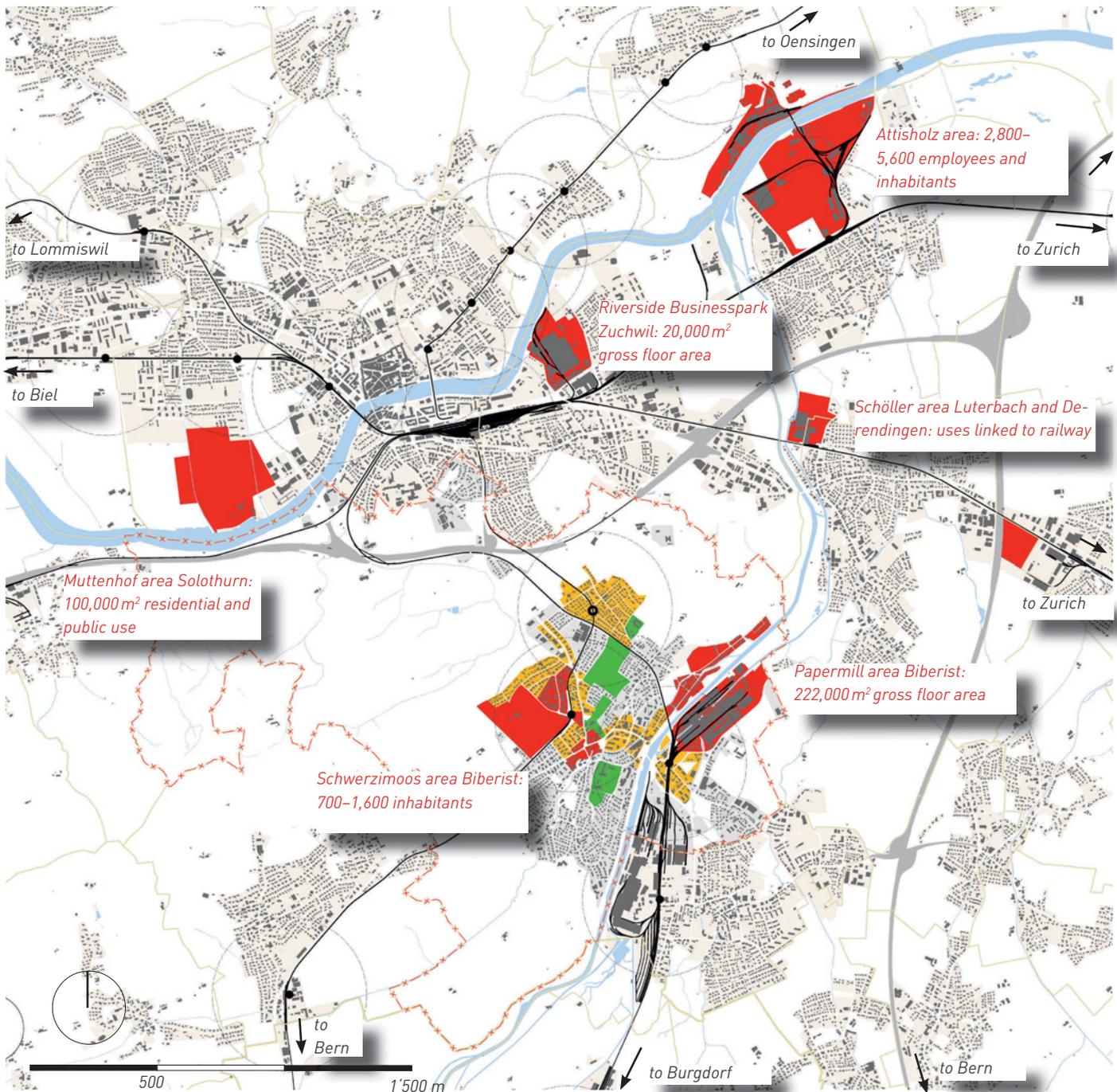
The informal procedure, as a precursor to the formal procedure of the land-use plan, explores the available reserves and potentials within the largely built-up area for future settlement development. Rudimentary test designs help to identify suitable areas for densification on the basis of several criteria.

There are basically four categories, depending on which action is required (fig. 47, p. 111):

- **Let it rest:** Areas with a homogenous typology conforming to an energy-sufficient building standard, such as recently built two-story, single-family neighborhoods, are addressed only in a long-term planning horizon. These areas are thus ‘left alone,’ and construction inquiries are treated as routine tasks.
- **Preservation:** ‘Preservation’ follows another aim by considering these areas as individual case studies. However, this classification does not actually prevent any adaptation of historically grown areas to future requirements, but expresses the fact that the type and extent of use must be incorporated into the existing context. Thus, a slowly evolved village center that confers an identity may, where

- | | | |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------|
| Reorientating | → Complex core task | → Tailor-made procedure |
| Developing further | → Project task | → Project organization with assignment |
| Protecting | → Routine task | → Routine organization with instructions |
| To let rest | → Routine task | → Routine organization with instructions |

- Building zones
- Communal border Biberist



110 **Figure 46: The map of 'calmness and dynamism'**
 [source: author's representation, data: swisstopo 2013a, swisstopo 2013b, Kanton Solothurn SOIGIS 2013]

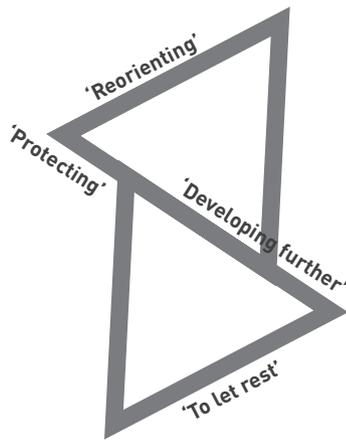
Pieces of wasteland, replacement constructions, special use planning not further pursued, cantonal and communal planning zones, etc.



Building ensembles with a distinctive character for local identity key points, central public spaces, access to waterbodies, open spaces, etc.



Underused areas with older building stock, special use planning, zones with low permissible building density, etc.



Quarters with more recent, privately owned building stock etc.

Figure 47: The four recommendations for action of the inward development guide
(source: author's representation, Foto A.G. 2014)

appropriate, be selectively complemented by new buildings, provided the overall character of the site is preserved.

- **Further development:** This option comprises an active action to transform the existing stock and refers to the area-wide activation of reserves: Wherever there are reserves available in the existing instruments, they should be made actively available.
- **Reorientation:** This option aims at completely transforming interconnected sites, by exploit potentials that have not yet been secured in the formal instrument. The result may be an increase of density values in ground use in clearly defined zones (rezoning to higher density) or further planning efforts for the transformation of brownfields (special land-use planning, rezoning).

The four different recommendations for action are entered into a 'map of quiet and dynamics' (MAURER 1995:45) and form the basis for allocating the task types (fig.46, p. 110).

4.2.2 The compass for inward development

Using the action areas 'let it rest,' 'preservation,' 'further development,' and 'reorientation,' it is now possible to assign the respective task types 'routine task,' 'project task,' and 'core task,' which form the legitimacy for concentrating the financial and human resources on complex core tasks. They follow the regulations on the weighing of interests in Article 3 of the Spatial Planning Regulation⁸⁸.

Like a compass, categorizing the respective action area in the 'map of quiet and dynamics' points toward development, which is useful from the perspective of the total space. The 'inward development compass' is the most important strategic instrument for developing settlements within small- and medium-sized communes. The most important outcomes are broad-based but nevertheless specific recommendations, which in turn form the basis for the subsequent formal procedure. Following this concentration of effort on complex core tasks, the executive au-

thority of small- and medium-sized communes can then debate the medium- to long-term allocation of their financial and human resources. The informal procedure of 'compass for inward development' may also lie at the juncture where delicate discussions are held about the location for compatible and desirable densification – prior to any elaboration of formal instruments. This instrument, binding for the law, delivers a sound basis for arguments for the subsequent discussion on the revision of instruments, which are binding for landowners.

4.3 Reform of the revision of local planning

So, how is the 'inward development compass' to be designed in detail and how can the results be transferred to existing formal procedures?

4.3.1 Informal procedure across boundaries

The process for revising the formal instrument 'land-use plan' is currently geared toward planning and legal security for authorities as well as landowners, while also orientated toward outward development. Accordingly, the land-use plan is useful primarily for project and routine tasks but is inadequate for an analysis of complex core tasks at the outset of the formal procedure.

In order to help establish inward development as a permanent task, informal procedures must be introduced as part of the preparation prior to the formal procedure (fig.48, p.116). In the case of densification, which relies as it does on the availability of reserves and thus on the interest and goodwill of landowners, this preparatory action is vital in order to avoid as much as possible any unwanted effects and unpleasant surprises during the formal procedure.

88 Spatial Planning Ordinance (SPO) of 28 June 2000 (status per 1 January 2015).

The product, the processing perimeter, and the area under consideration as well as the process-based organization all must be accurately determined in the case of informal procedures and tailored to the specific needs of the communes. This calls for an interplay between the factual knowledge of the higher level of the cantons with the local knowledge of the communal lay politicians. The creation of an inward development compass must be done across community boundaries at the regional level. One precondition is the collaboration of multiple communes facing the same problem and perhaps also having interconnected territory for the duration of the informal procedure. This motivates their working jointly on the problems, which in turn enables the coordination of solutions across municipal boundaries in the first place. The result of this cross-border investigation process will eventually find its way into the formal procedures for further processing, which of course occur separately in the communities involved.

It is crucial not to alter too significantly or to completely challenge the basic elements of the formal procedure of the local planning of small- and medium-sized communes. These have been tried and tested over decades and are deeply rooted in the political self-conception of a commune. They are, as it were, well-oiled, practiced procedures that, under certain circumstances, border on 'rituals.' According to Maurer, rituals

'are routines of behaviour associated with emotions, embedded in the social fabrics. [...] Disregarding or even violating them can lead to serious negative consequences, especially for planning' (MAURER 1995:45).

Shortening the formal procedure creates a scope for the prior informal procedure without inciting too much change in the respective communal traditions and rituals.

The special-interest association – the usually strong networks in geographically connected small- and medium-sized communes – can be the initial body to prompt cooperation. As the experiences of the test planning in Riedholz-Luterbach (KANTON SOLOTHURN/ARE 2013) or the idea competition Limmattal (ETH ZÜRICH ET AL 2014b) show, failed large development projects or traffic problems with a national

impact can also spark intercommunal cooperation. Such spatially relevant cross-border problems must be used as triggers for the implementation of informal procedures.

4.3.2 Preliminary work

The material preliminary work for creating a tailor-made informal procedure for densification in small- and medium-sized communes includes, on the one hand, securing the finances and, on the other hand, formulating a task for exploring, clarifying, and resolving the initial problems. Further necessary is a site-specific overview of the gross floor-area reserves of the participating communes (fig.32, p. 80). The communes apply for the necessary planning credits for the procedures independently from the voters and establish a nonpermanent commission for the duration of both the informal and the formal procedures. The cantons must co-finance the informal procedure, upon request from the municipal authorities, provided the latter can supply the organizational structure and process-based organization as well as a joint declaration of intent for intercommunal cooperation. The canton is usually responsible for tendering the informal procedure planning services in the context of a prequalification. A committee consisting of cantonal stakeholders, construction managers, and municipal councilors of the communes involved decides on the allocation of the planning services to a private office in the context of the informal procedure.

The most important basis for the informal procedure is the task. It is developed under the overall control of the canton in cooperation with the designated stakeholders from the communes and the private planning office. It is used to elucidate the organizational structure and process-based organization as well as the key questions (tab.15, p.115). A private planning office examines these key questions during a practical test run of the task. The objective of the element practical test is twofold: It enquires into the relevance and formulation of the key questions, the goal being to bring any deficiencies to light. At the same time, the scope and quality of the basic data provided can be evaluated. A further result of the practical test consists in concrete formulation of the documents to be submitted, by checking the contents and scale

of the plans as well as of the perimeters under consideration. The final part of the preparatory work to be carried out by the cantons includes surveying the gross floor-area reserves in the current land-use plans. The cantons have both the expertise to present such surveys and have access to the necessary basic data such as the official registry information as well as the Federal Building and Housing Register.

4.3.3 Elements of the task

The settlement areas of small- and medium-sized communes in the Swiss Central Plateau consists of, on average, only 50 to 170 hectares (BFS 2013a). This is a great advantage for the exploratory process in the informal procedure because the investigation area can for the most part be recorded within a day and is generally visually as a whole. At the same time, any questions about all the communes arising from the common problems must be formulated (tab. 15).

Inward development is far more than simply increasing the number of units for working and living. Traffic development as well as safeguarding open spaces and areas for public use also form part of it. The ratio of the traffic areas and the building and installations areas of the communes, such as schools, work yards, municipal administration, retirement homes, and the like, is not insignificant and increases along with inward development. Before beginning the formal land-use plan procedure, members of the administration and of the executive body must share a common understanding of which areas are suitable for inward development and densification – and which should be safeguarded for the next generation. For this reason, the preliminary informal procedure should clarify what the consequences of densifying the capacity of existing infrastructures would be. This makes it possible to avoid redundancies and to use synergies in the intermunicipal network. Not all things are useful everywhere.

The task to be solved by the informal procedure concerns the quantification of reserves and potentials in the largely built-up area. Since it is impossible to fully mobilize all of the considerable existing reserves in the built stock of small- and medium-sized communes, further possibilities for residential development must be sought. These may be found in the potentials of the building areas, those floor areas that have not yet been secured by planning law, and in suitable places for increasing building densities. Then, the discussion of key questions arising in the areas of settlement, open space, transportation, and energy forms the basis for the decision-making process in the formal land-use plan procedure. The most important key questions are identifying space for leeway in the existing formal instruments, identifying areas that are suitable for mobilizing potentials and further planning requirements for the expansion of the infrastructure as a result of densification. As a counterpoint to the densification of the constructed area, the following question must be considered: Which areas within the largely built-up area constitute valuable free spaces that, although assigned to a building zone and denoted with values of density, should not be developed in the short and medium term. With densification of the surrounding built stock in particular, these spaces offer valuable, integrated compensation areas. Densification also relies on having good access to public transportation. During the informal preliminary work on the land-use plan procedure, the potentials of the residential development should be compared to the capacities of the existing transportation infrastructure to generate findings for the further need for action with regard to an expansion of capacities. The final key question concerns highlighting the existing buildings about to undergo immediate energy renovation. A comprehensive survey can – within a reasonable timeframe – lead to an overview, which in turn provides information on the need for action in different areas and may influence the priorities set.

<i>Elements of the problem definition</i>	
1. Cause and aim	<i>Request for vote from the revised Spatial Planning Act (commune-canton). Implementation of the strategic direction 'inward development'. Identification of tasks for inward development. Selection of a motivated preferential option for determining. Densification areas defined beyond the municipal boundaries.</i>
2. Task	<i>Investigation of the reserves and potentials within the mainly built-up area capable of securing the long-term demand for floor area for living, working, and infrastructure. Clarification of the different focus areas of the communities. involved, on the basis of the specific spatial circumstances (where to live, where to work). Investigation of the central spatial conflicts and the possibilities for their solution. Identification of the need for action to accompany densification. Proposal for immediate measures.</i>
3. Key questions	
<i>Residential stock</i>	<i>What quantities do the existing settlements offer for densification? What use is appropriate in which location? Where are the settlement boundaries appropriate? What upgrades are to be planned in the infrastructure? Which sites in the existing building zones are suitable for re-zoning?</i>
<i>Free spaces</i>	<i>Which unbuilt or under-used areas within the mainly built-up area are to be kept free from buildings in the long term?</i>
<i>Traffic</i>	<i>Where and how can the development of the settlement be better matched to the range of public transport services?</i>
<i>Energy</i>	<i>Which buildings are in need of an energy upgrade?</i>
4. Triage	<i>Which areas are to be attributed to which of the four recommendations for action of the inward development compass? Which properties are key properties?</i>
5. Perimeter	<i>The perimeter under consideration extends across the mainly over-built area of the communities involved. The perimeter under consideration comprises at least the agglomeration. In the in-depth perimeter, essential elements should be represented by way of example.</i>

Table 15: Essential elements of the problem definition for the compass for inward development (source: own representation)

At the end of the inward development compass, the decision is made which areas can be assigned to which of the four options⁸⁹. At the same time, key properties become apparent which could act as light-house projects, i.e., as good examples to create momentum for moving from outward to inward development.

As indicated at the beginning of the paper, density has a different meaning for every different location and cannot be universally quantified. This clearly emphasizes the importance of the informal cross-communal test run with concrete test designs.

⁸⁹ See page 109.

-  Strategic concentration of effort
-  Public information
-  Public participation
-  Approach to land-owners

Former planning legally binding

time period in months

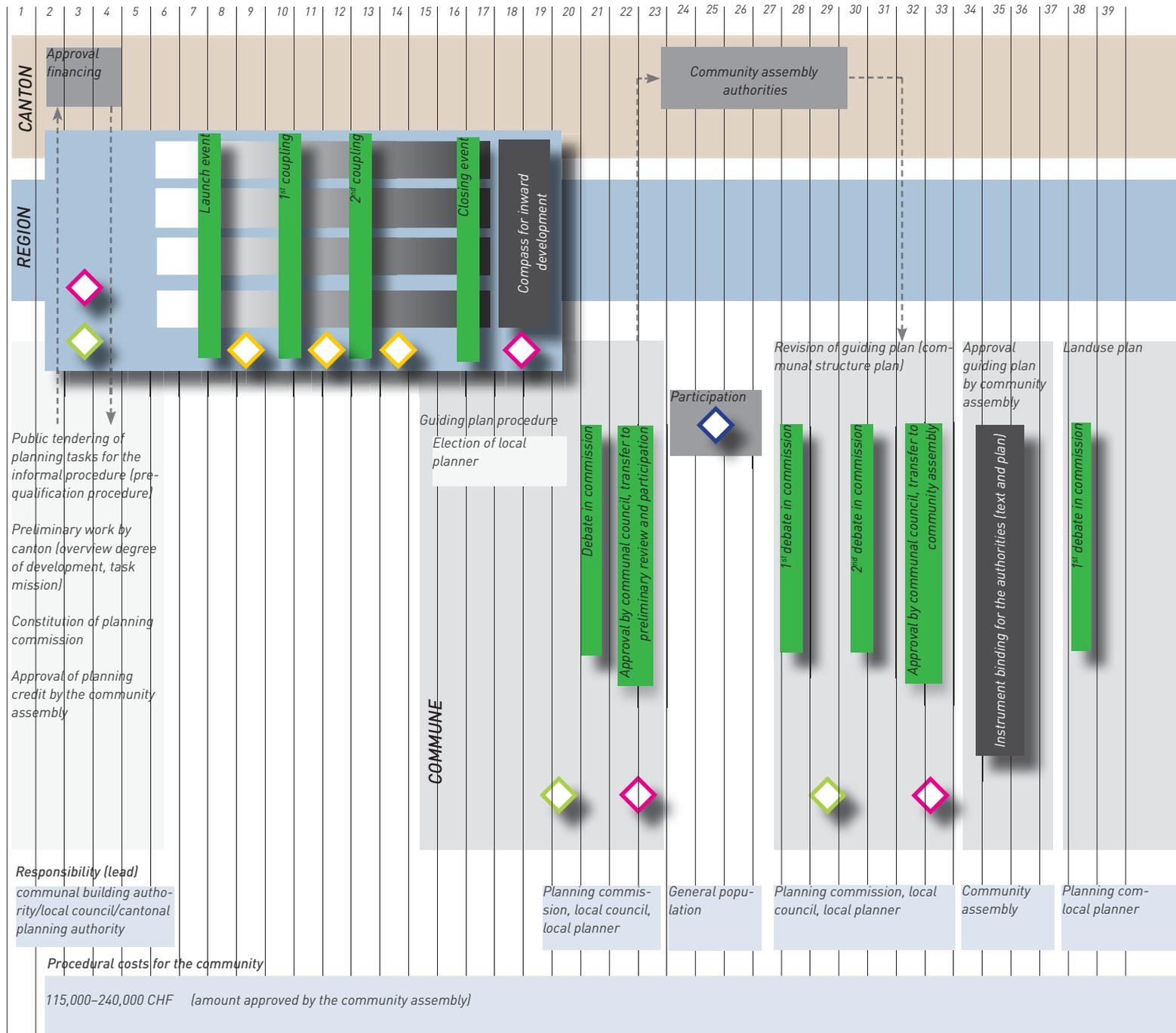


Figure 48: Prototypical procedural organization 'local planning revision of the third generation' in small- and medium-sized communes using the example of the Canton of Solothurn (source: author's representation)

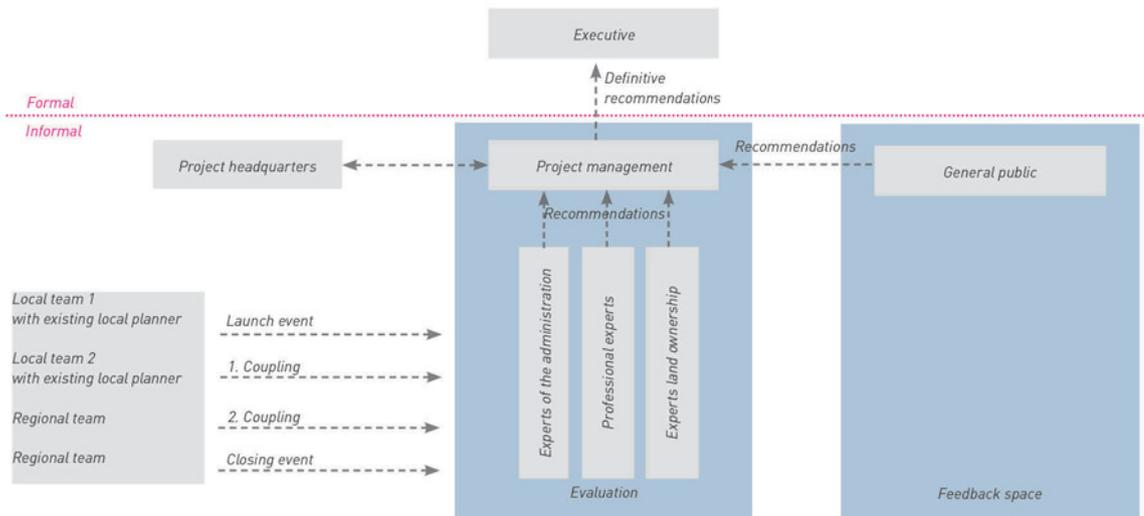


Figure 49: Organizational structure of the informal procedure 'compass for inward development' (source: author's representation)

4.3.4 Organizational structure

As with the task, a generally applicable organizational structure cannot be specified for the procedure. Nevertheless, it is useful to observe a few, albeit essential, principles.

Since densification in small- and medium-sized communes is increasingly facing problems of acceptance, it is of great importance that municipal representatives – if necessary – act as intermediaries between the commune and the landowners. It is thus useful to integrate the heads of the planning commission into the project management group (fig. 49, tab. 16). Ideally, a chairman and two deputies are elected from this group, ensuring the continuity of the process over the processing time of 1 to 1.5 years. Project management and expert groups together form the steering committee, chaired by a member of the planning committee of a commune. The chairperson is chosen by a show of hands in a simple electoral procedure to achieve the greatest possible support and commitment within the steering committee. The democratic legitimization process reflects the clear differentiation of roles.

Three expert groups with different focal areas lend their support to the project management. The administrative experts are important sources of 'insider

knowledge.' Especially in small- and medium-sized communes, the building administrators and district secretaries have a broad knowledge of current trends within the communes, because they represent the first contact persons for landowners and thus are very well aware of the latter's intentions. Often, the district secretaries themselves live in the communes in question, are involved in clubs and public life, and thanks to this network are able to 'hear the grass grow,' i.e., to recognize a landowner's intention to build before the latter even submits an official preliminary request to the commune. Very small communes are generally unable to provide sufficient manpower for construction management, which is why they commission a private planning office for that purpose. Consequently, in such cases the representatives of the planning offices are given a seat on the expert committee.

The second group of specialists consists of experts from fields relevant to completing the specific task. It may be advantageous to leave the assessment of typological questions to architects and landscape architects, while other experts offer an 'outsider's view' into the areas of transportation or real-estate economics. It may be useful to involve an expert in a role of a devil's advocate to offer a different view to the parties involved in the process through 'interjections.' Above all, this reduces the risk of an early anchoring

<i>Role</i>	<i>Task</i>	<i>Members</i>	<i>Number of participants</i>
<i>Project management</i>	<i>Administration of the procedure, formulation of recommendations, chair of the steering committee</i>	<i>President of the planning commission of the communes (1 chair, 2 deputies)</i>	<i>3–5</i>
<i>Experts from the administration</i>	<i>Contribution of current administrative knowledge, 'view from inside'</i>	<i>Building authority of the communes, regional planner of the canton, competence center for monument conservation, transport, landscape, social affairs (age, schools, integration), representatives of the cantonal committees for the protection of historical sites and landscape</i>	<i>10–12</i>
<i>Professional experts</i>	<i>Contribution of current special knowledge, 'view from outside'</i>	<i>Experts in architecture, spatial planning, landscape, transport, energy, real estate economics, sociology, environment, art, etc.</i>	<i>4–6</i>
<i>Real-estate experts</i>	<i>Contribution of view from inside, formulation of the initial problem</i>	<i>Owners of key properties, associations, stakeholders, 'opinion leaders' in the communities</i>	<i>4–6</i>
<i>Teams</i>	<i>Development of test design</i>	<i>Interdisciplinary planning teams from the fields of architecture, landscape architecture, transport management, economy and possibly art</i>	<i>10–12</i>
<i>Project control</i>	<i>Executive committee of the project management</i>	<i>Preparation of the documents, contact interface between commune and canton, documentation and technical support</i>	<i>2–3</i>
<i>Executive</i>	<i>Transfer of the recommendations into the formal instrument 'land-use plan'</i>	<i>Presidents of communal council</i>	<i>5–6</i>
<i>Public</i>	<i>Discussion of the designs in separate fora, transmission of recommendations</i>	<i>Interested population upon invitation by the communal council</i>	<i>20–30 per community</i>

Table 16: Stakeholders and their role in the context of the compass for inward development (source: own representation)

effect⁹⁰. This task is preferably carried out by an artist who helps to create new visions of well-known places and the surrounding landscape. A further possibility is to offer regular inspections of areas that have crystallized into key places during the process.

The third group of experts is composed of representatives of the 'insider view,' preferably the owners of already-known key properties or other opinion leaders in the communes. Their task is to appraise the steering committee regarding the concrete problems in their community or on their key properties. This is one way to access the knowledge available to neither the administration nor the experts. At the same time, it allows the intentions of individual landowners to be recognized at an early stage or to be only worked out jointly.

A core component of working on the inward development compass consists of creating test designs by competing teams. These are compulsorily made up of people from different disciplines. Since identifying and quantifying reserves and potentials should be carried out in the informal process, it is logical to entrust the leadership to a specialist who is particularly familiar with the design of buildings and their placement in an existing context. Architects with good judgment and practical knowledge in spatial planning – who know the local or national laws and guidelines – fit the bill particularly well, ensuring illustrations and concrete discussions of the proposals within the existing settlement area. When assembling the teams, take care that a nationally oriented planning team is represented in addition to two locally and one regionally based teams. Contributions from other parts of the country can reveal new perspectives

⁹⁰ See page 59.

on long-standing problems, which in turn can help to clarify matters, especially in the case of ambiguous initial situations. Teams with representatives from local planning offices must include at least two of the local planners currently active in the communes. This gives them the opportunity to contribute to the commune their accumulated knowledge from years, sometimes decades of living in the commune. On the other hand, these planners face competition from new teams, which can increase the quality of the contributions. A 'windfall' effect from the informal preliminary procedure to the formal procedure allows choosing the new local planner entrusted with the formal local planning revision from among the ranks of involved planners. That person is already familiar with the subject area beyond municipal boundaries and can contribute to shortening the formal procedure. Once again, the communes would benefit from cross-municipal synergies, and the knowledge accumulated during the informal process can be used further. The prospect of a follow-up mandate in the formal procedure and the associated remuneration are motivating factors for participation during the informal preliminary stage, but may necessitate adjustments to the legal basis for public procurement and the tendering ordinance.

The steering committee and the teams receive support before, during, and after the informal procedure by an executive committee. It remains the main contact for the numerous participants between the joint events and is responsible for documenting the decisions and the distribution of the necessary documents. It may be required to consult further experts during the procedure, to make further inquiries, or to respond to the requests of the teams. At the same time, it must comply with the costs approved for the informal procedure and manage the budget in consultation with several communes. For a project-coordinating body it is imperative to offer timely and level-appropriate support to the steering committee and the project management in particular, so that everyone involved can concentrate entirely on exercising their respective role.

The interface between the informal process of the inward development compass and the start of the formal land-use planning process consists of the

recommendations, which are jointly developed by the steering committee and given their final formulation by the project management. The minimum (constitutive) element of the recommendations is the area-specific allocation of the need for action to the various types of activity and thus to the scope for action⁹¹. The communal executive, primarily the president of the local council, participates in the process, receives the recommendations, and can then delegate this task to other executive policymakers, if technically expedient

Finally, the public is a further participant involved in the procedure for elaborating the inward development compass. This group consists of interested residents of the communes involved who are notified by the executive in advance and invited to participate in public events ('echo chamber').

4.3.5 Process-based organization

The design of a customized process-based organization for developing an inward development compass for small- and medium-sized communes aims to create the proper conditions for an unbiased examination of concrete solutions within the steering committee. At the same time, the teams must receive specific recommendations for future work. This can succeed only if the stakeholders' roles have been clearly defined and the organization of the process provides a structure as well as allowing for sufficient flexibility to adapt to changing conditions. Accompanying a large group of 40–50 participants requires careful preparation, an adequate setting, and a reliable project support operating in the background.

During the entire process, four joint events ('couplings') should take place (fig. 50), where all participants are present and in the same room. This allows the participants to simultaneously engage with the progress of the project, receive the same information first hand, and exchange arguments in a 'point – counterpoint' structure. Because all participants are present in the same room at the same time, the tasks, the evolving work focus areas, and other framework conditions may need to be adjusted ad hoc, based on

91 See page 109.

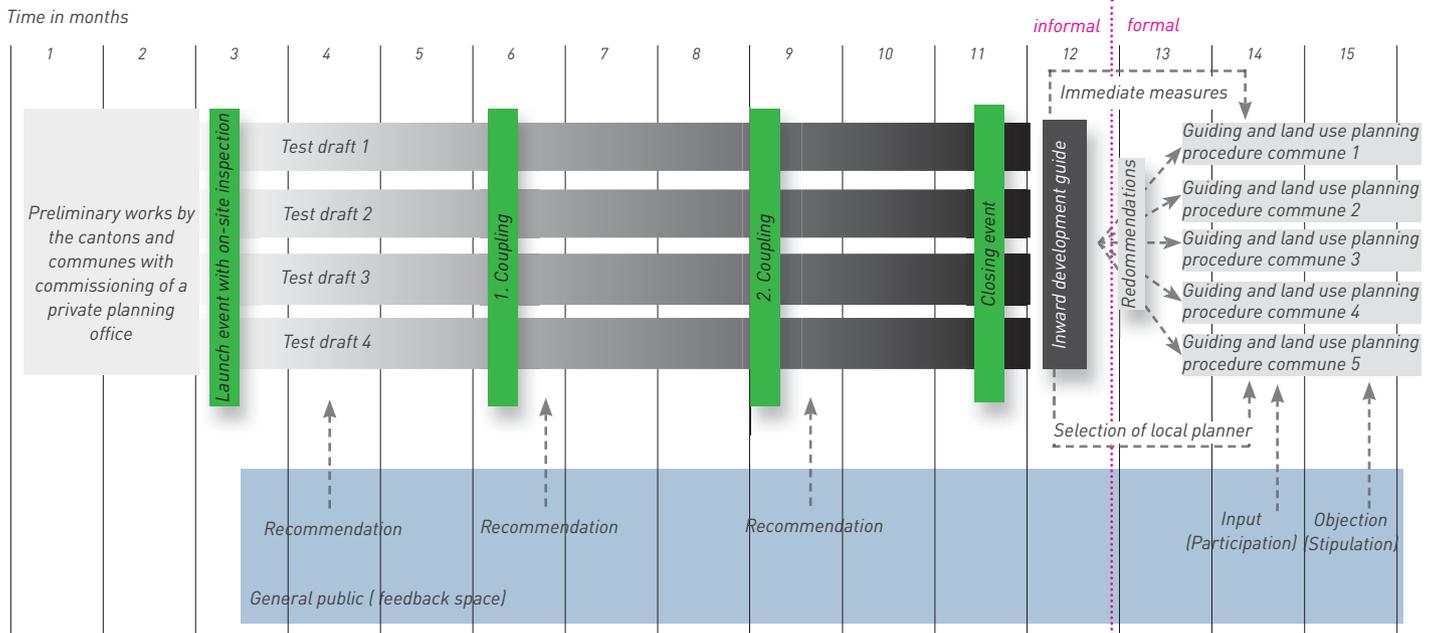


Figure 50: Operational structure of the informal procedure 'compass for inward development' (source: author's representation)

mutual consent. Each of these four events is accompanied by an external moderator ensuring an unbiased discussion of the proposals and proper conduct of the proceedings.

Working on the task takes place in three phases, each with a different core focus. As a prelude to the procedure, during the inaugural meeting, the chair of the steering committee is confirmed by an electoral procedure. Also, during the kick-off event, the process steps, the target, and the differentiation of roles are explained to all the participants. The teams and the municipal stakeholders involved in the procedure undertake a joint inspection of the terrain. The kick-off event is preferably held at a location meaningful to the participating communes and forms the logistical base for further events. The municipal hall, a sports arena, a school classroom, or a room in a building of some local enterprise, among others, can fulfil this function in small- and medium-sized communes.

At the end of each phase, the teams' concrete ideas are noted and discussed at the joint event – the 'coupling.' The events essentially comprise three parts: the information provided by the teams about the current state of the task, the discussion of the test designs, and the preparation and adoption of the recommendations to the teams regarding further action.

The recommendations of the steering committee are recorded by the project management after the events and commented upon if necessary.

During the informal procedure, immediately following the two couplings, the general public has the opportunity to comment on the test designs submitted. Much attention must be paid to the setting and the moderation of this 'echo room.' The interested public should be encouraged to voice their opinions as early as possible in the procedure and not to wait to raise their objections later at the public display. The cooperation of the individual community members and, in particular, of further landowners in the echo room must be stimulated at an early stage and the significance of their contribution made clear to the participants at the beginning of the process. Participation in the informal process serves to elicit the participants' concerns, which in turn increases the chances of mobilizing reserves and potentials. In a moderated process, the public can state their recommendations, which again are recorded by the project management in an appropriate form. Together with the recommendations of the steering committee, these are submitted to the municipal authorities for approval. They are then communicated to the teams and all members of the steering committee. This approach necessitates coordinating the dates of the couplings with those of

<i>Element</i>	<i>Contents</i>	<i>Costs [CHF]</i>
1. Preliminary work	<i>Development of cost estimate for the procedure, obtaining of internal authorizations</i>	<i>3,000–4,000</i>
	<i>Development of task definition, compilation of basic principles</i>	<i>20,000–30,000</i>
	<i>Practical test for task through external agency</i>	<i>8,000–12,000</i>
	<i>Site-specific overview of the degree of development, 3D representation</i>	<i>7,000–10,000</i>
2. Prequalification	<i>Tendering of information procedure</i>	<i>2,000–3,000</i>
	<i>Awarding</i>	<i>2,000–3,000</i>
3. Execution	<i>Professional fees four planning teams</i>	<i>220,000–240,000</i>
	<i>Professional fees steering committee (4–5 experts, 6–8 days)</i>	<i>60,000–80,000</i>
	<i>Managing four events</i>	<i>8,000–10,000</i>
	<i>Project management, monitoring of procedure</i>	<i>60,000–70,000</i>
4. Various	<i>Room rental</i>	<i>0</i>
	<i>Ancillary costs (printing, exhibition, communication, catering, etc.)</i>	<i>3,000–4,000</i>
	<i>Reserve</i>	<i>7,000–14,000</i>
Total costs of procedure (without expenses and VAT)		400,000–480,000*

* for a group of 5–6 communities

Table 17: Cost estimate for the procedure of ‘compass for inward development’ (source: own representation)

the meetings of the municipal council as well as the rapid delivery and rapid dispatch of the documents by the project management.

These three rounds ensure a high degree of relevance for the results: Unresolved questions at the first meeting may be resolved during the second meeting, etc. While the political decision-makers themselves make the actual decisions between the events, proper preparation of the decisions – as is customary between administration and politics – can be delegated.

4.3.6 Financial needs

When 5–6 communes join forces and 3–4 competing teams work on the task, the procedural costs generally amount to around 500,000 Swiss francs (tab. 17). These costs must be approved by public vote for each commune as part of the overall costs for revising the formal instruments.

The financing of the informal preliminary procedure is ensured by reducing the extent of the formal procedure, through cooperation in the association of communes, through contributions by the canton, as

well as by levies on a planning surplus by the communes (tab. 18). Particularly two important prerequisites keep the costs for small- and medium-sized communes at an acceptable level: reducing the time necessary for the formal procedure and ensuring cooperation in the network during the informal preliminary stage. In the case of medium-sized communes, significant cost savings appear in this process by eliminating the expensive participation event as part of the participation in the spatial model. Instead, direct participation – a moderated large group event in three rounds – now takes place during the course of the informal procedure in the communal association. Just as in small communes, participation in land-use planning is now possible only in written form. Since it is possible to decrease the number of meetings quite significantly, the procedural costs for the spatial model in particular are reduced for small communes. The basic framework conditions are explored during the informal preliminary phase, spatial conflicts are resolved, and, where necessary, certain tasks are already complete as emergency measures. A further cost-reducing ‘windfall’ effect from the informal preliminary stage is the appointment of the local planner from among the competing teams who has already acquired the necessary local knowledge, is familiar with the stakeholders involved and their planning

<i>Elements of a 'Local planning revision of the third generation'</i>	<i>Canton [CHF]</i>	<i>Small commune <2,000 inhabitants [CHF]</i>	<i>Medium sized commune 2,000–10,000 inhabitants [CHF]</i>
<i>Preliminary work, compilation of the basic principles, obtaining planning credits, formulating the task</i>	<i>15,000–25,000</i>	<i>5,000–10,000</i>	<i>10,000–15,000</i>
<i>'Inner development compass' across 5–6 communities [total costs of procedure]</i>	<i>120,000–130,000</i>	<i>je 35,000–40,000</i>	<i>je 70,000–80,000</i>
<i>Spatial model concept (site visit, meetings, written participation, preliminary examination, review, report)</i>	<i>0</i>	<i>20,000–30,000</i>	<i>30,000–40,000*</i>
<i>Land use planning (incl. survey of wooded areas and further clarifications)</i>	<i>0</i>	<i>60,000–80,000</i>	<i>100,000–120,000</i>
<i>Regulatory process</i>	<i>0</i>	<i>5,000–10,000</i>	<i>10,000–15,000</i>
<i>Total 1 (without ancillary costs and VAT)</i>		<i>125,000–170,000</i>	<i>220,000–270,000</i>
<i>Absorption of added value -20% for potentials (re-zoning)</i>	<i>0</i>	<i>- 10,000–20,000</i>	<i>- 20,000–30,000</i>
<i>Total 2 (without ancillary costs and VAT)</i>	<i>135,000–155,000</i>	<i>115,000–150,000</i>	<i>200,000–240,000</i>
	<i>*</i>	<i>**</i>	<i>**</i>

** for a group of 5–6 communities*

*** per commune in a group of 5–6*

Table 18: Procedure costs for a 'local planning revision of the third generation' in small- and medium-sized communes
(source: own representation)

culture, and has directly prepared the planning necessary for the formal procedure – which leads to substantial savings of both time and costs.

The financial contribution of each commune to a common informal procedure is preferably based on the size of its existing settlement area. In the Swiss central Plateau Region, small communes have average settlement areas of 50 hectares, while in medium-sized communes the areas may be three times that size (BFS 2013a). It is therefore justified that small communes contribute only half as much to the informal preliminary stage as medium-sized communes. Linking their contribution to the extension of the settlement area furthermore acts as a financial incentive for communes not to enlarge their settlement areas.

The financial participation of the cantons in the informal run-up to the local planning revisions is calculated on the basis of the costs for the site-specific surveys of development status, based on the definition of the task as well as the tender for the planning services for the inward development compass. The cantons do not incur any additional expenses in

the subsequent formal procedure of local planning in communes compared to the usual practice, which is why these amounts are not included in the cost estimate.

Finally, when implementing the revised land-use planning, the individual communes can claim planning surplus values vis-à-vis the property owners by reclaiming some of the added levy for new zoning. The Federal Spatial Planning Law includes compensation for planning advantages by landowners⁹². The levy to be absorbed consists of at least 20 percent of the planning added value, and the amount is due when the land is developed or sold. In their planning and construction laws the cantons may set a higher percentage. During local planning revision, absorption of added value must also be stipulated for rezoning and rezoning to a higher level in the communal regulations, in order to provide additional incentives for the renewal of the already built structures with higher structural densities. Landowners with such potentials are thus becoming ever more important. Part of the gains from absorption of the added value could be reinvested in the local planning revision.

92 Art.5 Spatial Planning Law (RPG) of 22 June 1979 (status per 1 May 2014).

The combination of these three cost-saving measures – working in a communal network, shortening the duration of the formal procedure, and absorbing added value – allows procedural costs of a ‘third-generation local planning’ (tab. 18, p. 123) not to rise substantially above those of the usual planning procedure (tab. 12, p. 104). This contributes to building confidence between the public vote (the people) and politicians, which creates a sound basis for a robust planning.

4.4 Success factors

The experiences gained from the test planning ‘Riedholz-Luterbach’ (ETH ZÜRICH 2013e), the competition ‘Perspective of the Spatial Development Limmattal PeRL’ (ETH ZÜRICH ET AL 2014b), and the test design for the village center concept of Biberist (KANTON SOLOTHURN ET AL 2015) served as models for determining the decisive success factors for the inward development compass. These are articulated and elaborated upon below for small- and medium-sized communes.

4.4.1 Descriptive survey of reserves

The starting point for structural densification is a survey to show how many gross floor-area reserves are present in the formal instruments and are therefore (theoretically) available for densification. Registries simply showing the undeveloped settlement areas are not adequate. Clear and concrete information is necessary to achieve a problem-oriented survey.

Three-dimensional representations enable a vivid quantification of both the built stock and the reserves (fig. 51), based on an overview at the site-level of the degree of development (fig. 32, p. 80). The great advantage of three-dimensional representations of the reserves is the ability to detect large discrepancies in the permissible structural density and the actually realized structural density in a single representation and to easily recognize local clusters. Furthermore, these surveys can be established across several communes.

Visual clarity is one of the prerequisites for mobilizing reserves. Three-dimensional representations – the first important step toward sensitization – raises the landowners’ awareness of the scope of action. Furthermore, a concrete vividness of such reserves may encourage adjoining landowners to collaborate – or it at least allows patterns to be recognized across entire districts. Only through visualization of the gross floor-area reserves in the built environment and the assessment thereof can planning assign the task types to the construction and design tasks and thus to create space for action.

4.4.2 Competition of ideas in small- and medium-sized communes

By definition, the use of informal proceedings is not restricted solely to urban space. Rather, they constitute procedures for all clarification processes, which are equally applicable in rural or urban areas. A ‘competition of ideas’ lies at the heart of all quality assurance: Only by weighing different possibilities – by simultaneously checking and discarding several choices – can a preferred option be chosen.

Particularly in small- and medium-sized communes, where considerable reserves are met by an overall lesser degree of acceptance for structural density, does the presentation of several basic options form an important basis for discussion. Early concretization raises the awareness of possible questions, which can subsequently be dealt with over a number of rounds and which arise only as objections during the official disclosure to the public.

Only a view from the outside makes it possible to deal unbiasedly with the built stock. Often, ‘business myopia’ makes people blind to the qualities, or habits, take replace critical reflection. Conflicts of interests are elicited only by means of concretization, which should be done as early as possible during the planning process. Test designs by competing teams constitute, as it were, the ‘humus’ on which small and middle communes can thrive – a shift in thought pattern from outward to inward development.

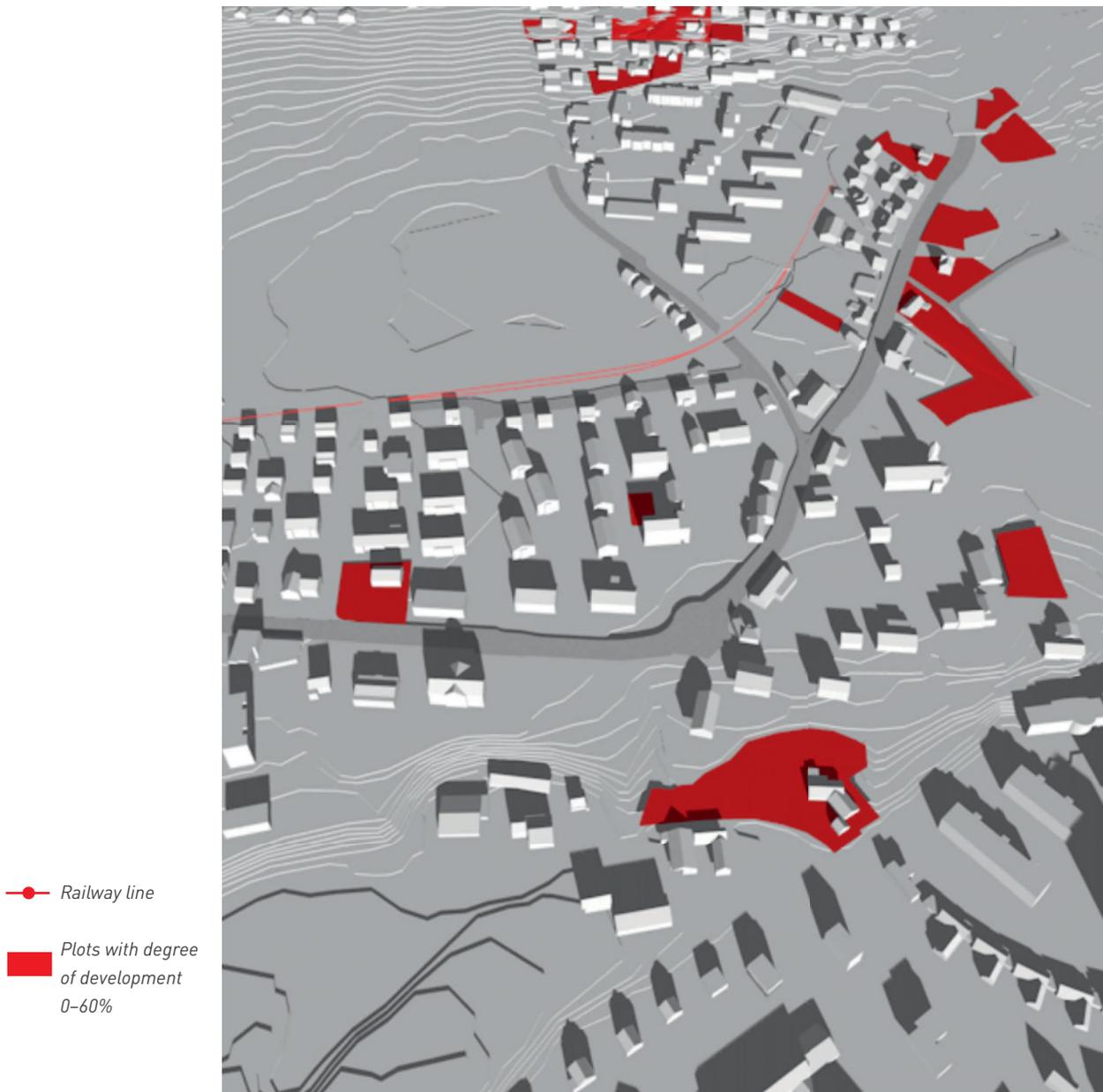


Figure 51: Illustrative overview of floor area reserves in the community of Biberist (extract)

[source: own representation. Data: Canton Solothurn SO!GIS 2013, current zone plan and building regulations of the commune of Biberist, status per 2013]

4.4.3 Early contact by politicians with landowners

The graphic overview of the gross floor-area reserves of built stock and the test designs submitted by the teams identify additional potentials while laying the groundwork for systematically approaching landown-

ers. Addressing landowners serves to identify any potential conflicts of interest at an early stage and to raise the awareness among this important group of stakeholders for the importance of mobilizing reserves. Approaching landowners is the 'Achilles heel' of the informal process of the inward development compass because, to a much larger degree than for

outward development, inward development is dependent on the willingness of the landowners to agree to mobilizing the theoretical reserves available in land-use planning. If the administrative representatives are unable to nurture the readiness of the owners of key sites to mobilize the reserves secured by building law in the largely constructed area, the planning result will remain stuck at an abstract level and the concrete solution will be postponed to the subsequent revision cycle 10 to 15 years later.

As the sample from a typical commune in the Swiss central Plateau Region demonstrated, most reserves are held by private individuals living in the commune itself or in the region⁹³. In small- and medium-sized communes, more so than in large ones, exchanges between landowners and authorities tend to be through personal contact. Executive politicians are the ambassadors for inward development and local planning, and it is up to them to approach the landowners at an early stage and to sensitize and motivate them to implement the principles of inward development – even before the informal procedure has started, namely, as soon as the basics are in place. First to be addressed are landowners of sites that have a low degree of development, that lie in the vicinity of public transportation stops, and that are situated at locations pivotal to the identity of the settlement area.

Exactly how and by whom owners should be approached depends on the local planning culture and political constellations within the communes.

4.4.4 Immediate measures

Immediate measures form a significant part of the recommendations resulting from the informal process. They are the symbolic bridge between the present and the future. Especially in the case of spatial planning, with its long periods of delay, they can form the symbolic prelude to the subsequent formal process and thus stimulate acceptance for inward development and densification. They also contribute to the motivation of the population to participate in the subsequent process. Priority should be given to measures affecting public space. Since the commune

usually owns public road spaces, these areas are suitable as locations for lighthouse or flagship projects – individual projects powerful enough to initiate further projects by other participants. These include, for example, expanding and upgrading historical networks of footpaths or making landmarks more visible through selective clearing. Still or flowing waters are also identifying elements of many communes in the central Plateau Region. Enhancing the appeal of a district by providing access to local recreation within walking distance from areas of high densification serves as a beacon that may provide the catalyst for a complete shift toward inward development. In order to ensure the financing of immediate measures, the corresponding funds must be secured in the communes' budget planning in a timely manner.

4.5 Stumbling blocks

4.5.1 The voters' willingness to finance

Inward development is technically more challenging and financially more complex than outward development. Inward development in small- and medium-sized communes can succeed only if the finances for the informal procedure exist, and if the latter is designed as a prelude to the formal procedure in the course of a local planning revision. The informal element should not be perceived merely as an 'optional extra,' but as a 'compulsory element' of any local planning revision.

The informal procedure is carried out within the network of communes, whereas the formal procedure takes place separately in each commune. Unlike the procedure with formal instruments, the advantages of the informal prelude still must be clearly communicated to the voters. At the same time, any possible further financial expenditures must be explained and justified. At this juncture, the network connecting several communes might be of assistance in finding arguments for a common, recognized problem. And finally, in small- and medium-sized communes, the voters at the municipal assembly usually decide by a show of hands to accept or reject a proposed for

93 See page 79.

expanding a credit line. For informal procedures, it is important to garner majorities by the executive branch before the community meetings, and acceptance must be created by providing clear information. For this purpose, too, the communes' network offers the promise of experienced solidarity.

4.5.2 Limits of the nonprofessional government system

Building committees in small- and medium-sized communes often reach their professional limits when faced with the increasing requirements of spatial planning (LADNER ET AL. 2013: 6). It is an extraordinary challenge for politicians in the Swiss nonprofessional government system⁹⁴ to deal with demanding questions of spatial development and the future of the community – all in their spare time and in addition to their professional activity. The nonprofessional government system depends very strongly on participants who are committed to quality development. Their identification with their commune, their resilient social networks, and their solid local knowledge are all of vital importance for local planning. Good local planning means knowing a location very well, which holds true for both the members of a planning committee and for the local planner.

However, the demographic evolution in small- and medium-sized communes may also present an opportunity for the nonprofessional government system. The prospect of supporting their communes at postretirement age may be a motivation for retirees to become involved in local planning commissions, and to use their vast experience to help shape the future of the next generation, while simultaneously being challenged professionally and socially. This development also reflects the increasing need for retirees to spend the third phase of life in the place where they have lived their active working life – where they can contribute to further strengthening the nonprofessional government system. Older citizens could thus become ambassadors for spatial planning, able to explain abstract facts for the population while increasing the acceptance of the need for further financial resources. In times of strained financial budgets,

however, older people tend to be more amenable to healthcare spending during municipal meetings than financing spatial planning and education, making it all the more important to groom ambassadors for spatial planning among the older electorate.

This development means communes must strive to allow people to grow old in their community in order to secure the nonprofessional government system. The systematic mobilization of individual additional housing units on unused sites with spatial planning measures would be a low-threshold opportunity to make local aging possible.

4.5.3 Synchronization of the information procedures

If inward development is to become the norm and outward development the exception, the informal procedure 'inward development compass' should be introduced as a permanent feature to the scope of the local planning revisions in both small- and medium-sized communes. The land-use planning of the communes usually must be revised every 10 to 15 years. The situation in the Canton of Solothurn, for example, shows that every small- and medium-sized commune wanted to await the implementation of the Revised Spatial Planning Act of Spring 2014 (fig. 52, p. 128), so that today they are all lagging behind the 15-year revision cycle, in part considerably so. This constellation could provide a unique starting point for local planning revision across municipal boundaries. In the case of a cross-commune coordination of the dimensioning of building zones, this revision rhythm must be synchronized at least for the informal preliminary stage. The formal procedure for land-use planning again is subject to a community-specific process, something that cannot be scheduled in advance because of possible objections during the public disclosure. A common rhythm for the revision of the formal instruments for land-use planning also assists in the regular updating of the survey of reserves and potentials. Structuring local planning into short-term successive partial revisions might impede an integrated planning of settlement and infrastructure.

94 See page 70.

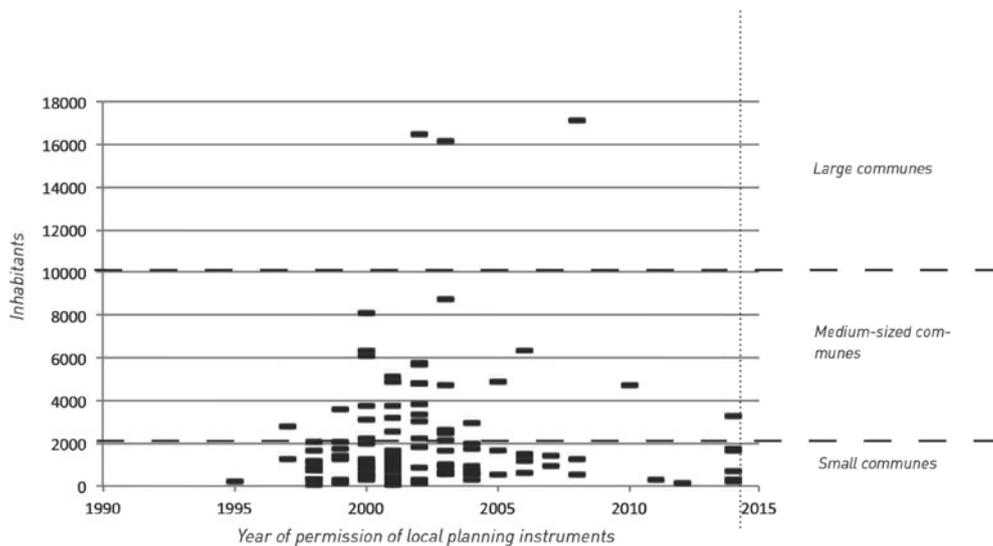


Figure 52: Current status of local planning permissions in the communes of the Canton of Solothurn (source: own representation; data: Local Planning Office Canton Solothurn, as per 30.04.2014)

The strategy of outward development foresaw revising the formal instruments being carried out once the depletion of the reserves for the development of settlements had become apparent and correspondingly the settlement area needed to be expanded. Inward development, however, is an ongoing task that can no longer be implemented by simply resorting to increasing the settlement area surface. A regular revision rhythm leads to a permanent engagement with the reserves and potentials available for the future development of settlements. A revision cycle of three to four legislative periods of 4 years each (fig. 53) would be advantageous. For example, at the start of an administrative term, the newly elected lay committee would need to be introduced to the informal procedure and matters of spatial planning within the framework of the inward development compass. This would also acquaint the committee with the concrete cross-municipal problems. In today's usual procedure in most locations, the committee composed of laypersons would commence immediately with the abstract conceptual model on an abstract general level, while being ignorant of the crucial problem.

'Rest phases' should be provided between these planning phases, in which planning consistency applies and the lay politicians can also devote themselves to other business activities. With this approach, the planning process passes back and forth between concretization and abstraction, between specific and general, between informal and formal.

4.6 Translation of results into formal instruments

4.6.1 Room for density in internal development zones

One of the goals of inward development is to increase the number of units for housing and work in the largely built-up area. A general quantification is not possible, but should be identified only in concrete cases by means of clarification processes. By using triage within the framework of the inward development compass, the minimum action is to designate areas that are suitable for structural densification. Four different strategic directions entail four different levels of densification. While 'letting it rest' and 'preservation' allow the mobilization of only very few additional stories, the action option 'further development' can be used to negotiate a site-specific, compatible level of densification. The scope for action with the option 'reorientation,' on the other hand, is designed to make full use of the space for density and, if necessary, to allow a significant increase in densification compared to the neighboring districts. In a small commune with a predominantly open architecture stemming from the historical development as a ribbon village, the scope for density will be more limited than in a commune where the bulk of building substance owes its existence to investments during the industrialization phase, manifest in closed construction and large-volume buildings.

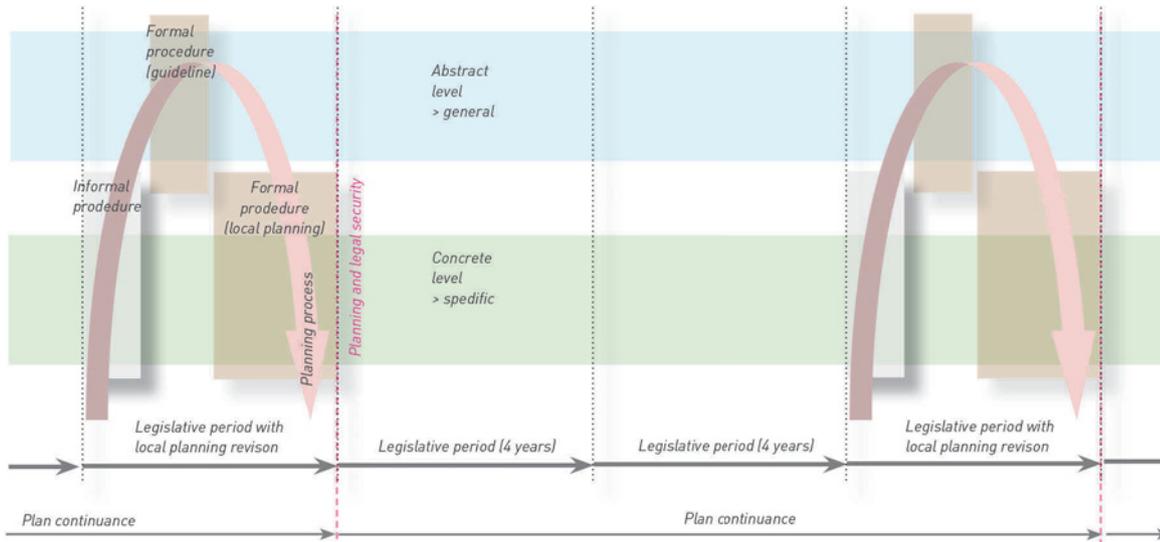


Figure 53: The planning process between concretization and abstraction (source: author's representation)

Here, the importance of distinguishing between 'reserves' and 'potentials'⁹⁵ is clearly evident. Reserves, secured by building law, are floor areas that can theoretically be developed at short notice and without additional planning efforts. The achievable structural density depends primarily on the measure of the density ratio in land-use planning. By contrast, potentials allow the realization of higher structural densities than stipulated in current land utilization; they are, however, available only in the medium- to long-term since additional planning efforts are needed to quantify and legalize them. In order to offer legal certainty to the owners of the sites with potential, it is necessary to determine the minimum measure of overlapping zone in land-use planning. Following the example of the Cantons of St. Gallen or Glarus, which provide 'development areas' or 'densification zones' in their cantonal planning and building laws⁹⁶, corresponding overlapping 'inward development zones' should be determined within the scope of land-use planning, which the cantonal building and planning laws need to provide. Alternatively, the communes are at liberty to ensure inward development zones that are binding for landowners by means of special land-use planning beyond current land utilization. For example, the Canton of Bern, with its Planning

Obligation Zone⁹⁷, already provides ways to designate 'zones with a planning obligation' within within a perimeter of existing building zones. This is particularly important for local development, should it not be possible to simply decree the necessary regulations in the land utilization regulations. To this end, the planning purpose, type, and extent of use as well as design principles must be specified in the communal land utilization regulations. These elements are included in the recommendations of the informal procedure and will be incorporated into the purpose article of the new zone. Likewise, a range for structural density and essential typological elements for dense construction can be defined therein. Thus, space is provided for increasing the density values in the formal instruments.

⁹⁵ See page 14.

⁹⁶ See page 6.

⁹⁷ Art. 73 para. 2 Building Law of the Canton of Bern dated 9 June 1985, version of 18 June 1997.

4.6.2 Element in the cantonal structure plan

The cantonal structure plan, enshrined in the Federal Law on Spatial Planning, offers Switzerland the instruments that can be used to describe not only the principles of desirable spatial development, but also – and above all – those projects to be coordinated, according to their degree of maturity⁹⁸. From such surveys, one can identify spatial conflicts earlier and possibly start to resolve them in a timely manner. With the implementation of the Revised Spatial Planning Act and the strategic direction toward inward development, usable densities may increase in a few concentrated places because of high demand and good accessibility by public transportation. The inclusion of locally determined inward development zones as an element of preorientation into the cantonal guidelines would allow the identification of regional priorities for inward development. As a result, any risks of conflicts with the infrastructure capacity, especially transportation infrastructure, can be identified at an early stage. The preorientation in the structure plan can give rise to ways to gradually adapt the capacity of the infrastructures to the increase in structural densities. In return, it allows a regional coordination of the settlement development with the extension of the infrastructure.

sive efforts and being supported by lay politicians. An essential element of this conviction work is the graphic depiction of reserves and potentials shown in test designs of dense typologies at the appropriate localities. In the debate about density and densification, the crux of the matter is concretization.

Put succinctly: Density must be worth it. For landowners or users, there must be some added value through densification, for which they are prepared to invest their time and financial resources. For successful acquisition processes, informal procedures are expedient in the revision of formal instruments. Wishes for development must originate with existing and future users. It must be made plausible why an increase in densities is useful to them. This is most likely achieved by using test designs that address local problems in the course of tailor-made informal procedures. This combination of the formal and the informal, the abstract and concrete, of necessity and freedom, using well-known process sequences and integrating new elements, contributes to confidence building as well as serving as the 'humus' for growing something new.

4.7 Intermediate conclusion 3: densification requires concretization

Densification requires individual case consideration of the respective site. The landowners and the potential investors usually show the strongest interest for a further development of the site – in addition to the commune with its legal mandate for inward development. Only elaborating a concrete project produces a realistic assessment of the reserves, on which basis the appropriate process can be initiated. In the context of informal procedures, the concrete test designs from competing teams can help to counter initial problems that lead to the forfeiture of density in small- and medium-sized communes. This approach consists primarily of planners undertaking persua-

98 See page 101.



47°17'16" N 7°42'39" E



47°16'10" N 7°41'47" E

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5 Landscape of transformation – the Swiss Central Plateau

The implementation of the revised Spatial Planning Act, with its provisions for inward development and densification, poses different challenges for the three conurbations of Switzerland. Fueled by developments in demography, energy, or finance, the initial problems will manifest themselves most clearly in the particular area that plays a leading role for both the expansion of public transportation as well as the increase of the Swiss population: the Swiss Central Plateau. Following the land-intensive settlement growth of the past decades, the current concentration of the settlement development in the existing building stock creates new issues: How will existing main settlement areas cope with the transformation without losing their much-cited qualities? How much room for decision-making should remain for the next generation? These questions yield insights into possible perspectives for the Swiss Central Plateau in terms of implementing the minimum strategy of 'inward development before outward development' and the necessary concomitant transformation process. In the future, small- and medium-sized communes will play a more prominent role than ever before. The concept of 'little in many places rather than lots in a few places' offers small- and medium-sized communes fresh opportunities for a moderate development and numerous possibilities for kick-starting the process of transformation in the main settlement areas of Switzerland by changing thinking patterns.

5.1 Conclusions for inward development

Inward development in Switzerland's main area of settlement is possible, but politicians and spatial planners must pay special attention to small- and medium-sized communes and invest in informal procedures. This potentially yields new prospects for future actions and further decisions to enable inward development to become the norm and a permanent task in all main settlement areas of Switzerland.

5.1.1 The deconstruction of density

Density is an abstract quantity, a dimensionless ratio that displays the same units as inhabitants or floor area per site area. Quantifying structural density with a density ratio merely means making real estate property manageable under public law. Structural density is thus the vehicle for ensuring that the guarantee of property ownership is anchored in the Federal Constitution.⁹⁹ It is determined through democratically negotiated guidelines (building regulations, binding for both authorities and land owners) and is secured by land as a resource (land use zoning, binding for both authorities and land owners).

As the surveys in the Swiss Central Plateau have shown, considerable gross floor-area reserves are theoretically available for structural densification, particularly in small- and medium-sized communes. The existing instruments for spatial planning provide planning and legal certainty. At the same time, the considerable reserves available in many places indicate that the current law is often not fully being exercised. Regardless of the size of the sites, the typologies in the residential zones of small- and medium-sized communes are similar in size in relation to their floor areas. With an increase in site size, the building volumes are often not extended by a further residential unit, but rather the theoretically allowed floor areas will be forfeited and thus stockpiled as reserves.

These surveys show that the discussion surrounding density needs to become also a discussion about typologies. What would the value be for small- and medium-sized communes to invest substantially in the revision of the formal instruments in order to increase the site ratio without a concurrent change in typology and without exhausting the permissible structural densities? Which typologies with high densities best fit the living environment of small- and medium-sized communes? The fundamental, guiding question for densification as an element of inward development cannot be 'What density ratio do we want?' but 'Which typologies are compatible and

⁹⁹ Art. 26 of the Constitution of the Swiss Confederation of 18 April 1999 (status per 18 May 2014).

acceptable? This question must be clarified early on, in the preliminary stages of the revision of the formal instruments, since density cannot be prescribed by a top-down process. Density is created within the admissible space that is generated by the quantitative threshold values and the desired spatial qualities. Density is the result of a bottom-up clarification process, based on specific local circumstances and is initiated jointly by communes and landowners. Differences in scales and typological changes are manageable equally well in a rural settlement structure as in urban agglomerations. Density has come to the village and is no longer just an urban phenomenon.

Regarding the location and its context as a starting point for inward development, it also becomes evident that 'dense' in a rural context must be expressed in lower ratios than in the urban environment, and indeed 'dense' has a different meaning at every individual location. The space available for density must be reassessed with each new task. The discussion about structural density is therefore, at its core, a discussion about scope and threshold values at the site level.

Structural densification is an element of inward development; vice versa, inward development always accompanies structural densification. One can assume that living space use per capita will increase in the future, on the one hand, because the rising standard of living in society is also reflected in the increase of the per capita living space, and on the other hand, because a rapidly growing elderly population tends to claim more living space per capita than do families or young adults. Most communes also hold the view that the number of their inhabitants should at the very least not decline. Structural densification will therefore be necessary to maintain the current level of population. Financial considerations also make structural densification an integral part of inward development. The estimates of the costs for the proceedings have shown that the additional expenditure for procedures related to inward development can be made financially viable for the communes by putting levies on the added value achieved by rezoning to a higher density. Thus, it would be nearly impossible to finance inward development without structural densification.

A concurrent advantage of this dependency of inward development on structural densification lies in its many potential allies: shorter distances to be covered

by an aging population thanks to density, a decrease in infrastructure connection costs for the individual units, lower maintenance costs for the public sector as well as more appropriate open spaces thanks to more density.

Any argument for densification based solely on design will necessarily fall on deaf ears in the daily political life of small- and medium-sized communes. Likewise, any discussion focusing solely on density values has become futile.

5.1.2 Emancipation of small- and medium-sized communes

The overwhelming majority of the communes in the Swiss Central Plateau – 93% of which are small- and medium-sized communes – forfeits structural density, although the current law would allow it. As the in-depth surveys showed, there are usually only few gross floor-area reserves per site, but these are sufficiently large to provide additional units for working and living on the same site. The total gross floor-area reserves are relevant to the Central Plateau. In addition, around two-thirds of the total settlement area reserves are located in residential, mixed, and working areas in small- and medium-sized communes.

In light of the demographic trend toward an aging population, together with dwindling financial resources for spatial planning in the communes, it becomes obvious that the mobilization of reserves for small units in the built stock should be prioritized. For example, after retirement an aging population might continue to live in the community in which they may have spent a large part of their working lives and with which they are socially well linked. A family house that has become too big for a one-person household could be upgraded to include a self-contained flat, thus increasing the structural density.

Such measures, however, must emanate from a community-wide strategy for inward development, so that forces can be joined and any necessary increase in the infrastructure can be planned in good time.

This also makes it clear that this strategy will have a regional effect and must be discussed at the national level because of the large number of small- and medium-sized communes in the Swiss Central Plateau.

Many small interventions in many small- and medium-sized communes will have regional ripple effects; the many regional effects will create a national impact, which will necessitate getting involved with higher-level concepts and the federal sectorial plan. Spatial planning needs to include the future task of engaging more with the skills and needs of small- and medium-sized communes. In return, these communes need to gain a clear understanding of their own strengths and possibilities.

It is also a task of the lay politicians to provide specialist knowledge and human resources in support of the emancipation process of small- and medium-sized communes. The transformation of an existing settlement area requires that both experts and laypersons develop empathy for this area, be interested in the people living there, and be very familiar with the existing formal instruments. In contrast to outward development, planning for inward development does not start from scratch in an uninhabited landscape in the absence of building regulations. Only by seeing regular exploration and assessment of the largely constructed area as a permanent task can spatial planning tailor intelligent informal procedures as a core element for transformation processes in small- and medium-sized communes.

5.1.3 Densification requires informal procedures

Inward development and densification in small- and medium-sized communes often faces low acceptance, while implementation thereof is equally hindered by a low mobilization rate of their vast reserves. The results show that successful inward development at an early stage requires an informal approach, and that densification requires clarity. The landowners must early on be made aware of the available space available on their sites and the expected timeline for a transformation. However, these issues are not part of the usual procedure during the revision of the formal instruments. Yet, particularly if they pertain to uncertainties, low acceptance, or skepticism about change, these questions should be explored at an early stage in a structured clarification process, since inward development and densification in small- and medium-sized communes are very vul-

nerable to such interactions and ultimately depend on acceptance by the population. Informal procedures reveal such uncertainties and refusals without demanding a single, ultimate solution.

5.2 The concept of ‘little in many places rather than too much in few places’

5.2.1 Changing thinking patterns in the main settlement areas of Switzerland

In most communes of the Swiss Central Plateau, considerable space reserves are secured in the formal instruments, whereas structural densification tends to be met with skepticism. These reserves have in common the fact that they are spread over the entire territory in a net-like manner, and most are easily accessible by public transportation. This is a specific quality of large parts of the Swiss Central Plateau and a competitive location advantage over the metropolitan regions, including those of other European countries. However, a lack of a change in thinking patterns regarding local planning – combined with the increasing demand for floor area in small- and medium-sized communes, the ready availability of building land, and low institutional monitoring – could result in those settlement areas being picked to be developed that have structural densities below the permissible ratio. Thus, the tendency toward a land-intensive spread of settlement expansion outside of large cities would increase – a process that would be virtually impossible to reverse in the long term.

The turnaround from outward to inward development, and thus the rejection of land-intensive growth of settlement areas in small- and medium-sized communes, is therefore essential for a robust development of the entire main settlement areas in Switzerland.

5.2.2 Differentiation of the minimum strategy 'inward development before outward development'

One possible scenario for decentralized population growth in Switzerland, in view of its available reserves, might consist of a moderate increase in the building density in small- and medium-sized communes and in places within easy reach of public railway transportation. Structural interventions would be concentrated on many small measures within the built-up areas with higher structural densities than the surrounding built stock. In view of the large number of small- and medium-sized communes in the main settlement area of Switzerland, this issue is of national concern. A spatial development concept for the Swiss Central Plateau with the tenet of 'little in many places rather than lots in few places' for developing buildings both for living and working purposes constitutes a very dependable form of settlement (fig. 54). It is aimed at many smaller stakeholders and measures, rather than encouraging further large investments for urban development and transportation infrastructure in the large cities.

The concept of 'little in many places rather than too much in few places' would further differentiate the current strategy of 'inward development before outward development' and would its effects to unfold for the entire main settlement area of Switzerland as a transformation landscape. This would also be in line with the spatial concept of Switzerland, which pursues the strategy of 'creating space for action and strengthening the polycentric network of cities and communes.'

In contrast to the large cities, where space for greater density must often be created through the expansion of infrastructure involving major planning efforts, small- and medium-sized communes benefit from their already good development and accessibility and from the small institutional need for the mobilization of reserves. Seen especially against the backdrop of the emerging energy and continuing financial crisis, the intensification of small-scale inward development and the resulting improved utilization of infrastructure – in particular public transportation outside the core cities of the metropolitan areas – could be a much more vigorous approach.

5.2.3 Decentralized development rather than overconcentration in cities

The concept of 'little in many places rather than lots in few places' that complements the minimum strategy 'inward development before outside development' is meant to express the fact that the large cities of Switzerland should not be developed above certain thresholds. Concentrating the majority of all building and population growth in the few large cities of the central part of the country might lead to a centralization with undesirable effects. Already today, daily traffic jams and overstretched public transportation systems between the agglomerations and the large cities are an unwelcome feature in the everyday life of the inhabitants of the Swiss Central Plateau. In the long term, the entire transportation system in the main settlement area of Switzerland might be compromised, weakening the Swiss Central Plateau in the competition to attract businesses and private households.

With the projected increase in the traffic volume of rail-freight transportation as well as increasing passenger volume in long-distance passenger services, conflicts will escalate because of the discrimination against the one and the preference for the other type of transportation service. It therefore seems hardly advisable to funnel the projected population growth further into a few large cities and to greatly increase their structural density. This would also necessitate a change in the traffic infrastructure within the cities, as in many places the current system has obviously reached its capacity limit. The construction of new, more efficient transportation links within cities in the form of new underground networks and high-speed rail links between the metropolitan regions would be necessary to develop population and floor-area growth in large cities. Conversely, the concept of 'little in many places rather than lots in few places' would make better use of the existing capacities in regional transportation. Conflicts arising because of too much concentration in the cities could be reduced, and the operation of the entire national transportation infrastructure could be stabilized.

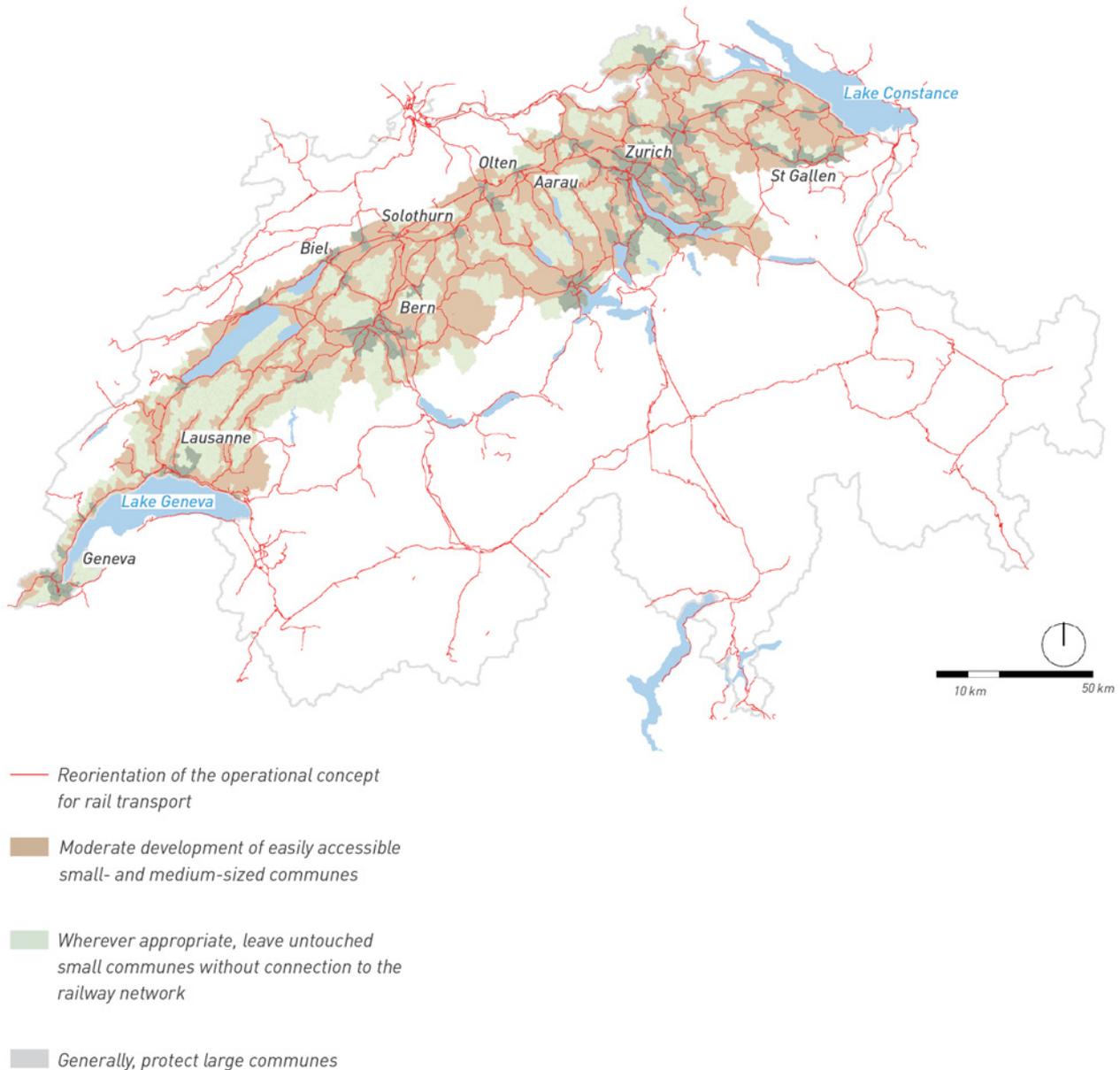


Figure 54: The concept 'little in many places rather than too much in few places'
(source: own representation, data: swisstopo 2013a, swisstopo 2013b)

5.2.4 New operational concepts of public transport

However, the concept of 'little in many places rather than lots in few places' also presumes a rethinking of the operational concepts of public transportation in order to connect the additional floor area in small- and medium-sized communes in a secure, fast, and cost-effective manner. Small- and medium-sized communes are well-advised to concern themselves not only with inward development and densification, but also with questions of capacity in rail-bound passenger transportation to avoid increasing the building density at the expense of a rising road-traffic volume. Yet current and future operating concepts in public transportation are not aimed at providing regional transportation for a dense network of small- and medium-sized communes, but rather focus on reducing the time for long-distance travel between major cities. Implementing the concept, however, would necessitate an integrated coordination of the capacities of regional transportation, long-distance transportation, and freight traffic. The radially oriented traffic concepts now directed toward the large cities would no longer correspond to developments in the Central Plateau. Rather, tangential connections would become increasingly important in a polycentric and decentralized Switzerland. The discussion about unbundling routes for freight and passenger traffic should also be pursued.

5.2.5 Tailored building tasks

Inward development calls for tailored rather than standard solutions – including by planning architects and executing entrepreneurs. The concept of 'little in many places rather than lots in few places' demands specific typologies, by which means the space for density can be utilized. Carefully attuned buildings make it possible to strengthen the various identities of villagescapes grown over decades and at the same time increase the structural densities to a specific threshold. There are local differences for these thresholds, and they must be tailored accordingly. In many places, exact 'intarsia' must be designed into the existing settlement structure, instead of building

individual objects with high structural densities in a few places. The associated construction and planning tasks in small- and medium-sized communes place high demands on specialists from architecture and spatial planning.

For small- and medium-sized communes, it is furthermore of great importance to cultivate their differences in the villagescapes in order to strengthen their specific (and valuable) identities. The topographical circumstances – valleys and plateaus – provide Switzerland in particular with closed spatial identities and the opportunity to prevail in location competitions: Strengthening existing qualities and nuancing differences effectively prevents the emergence of locations with globally comparable appearances.

5.2.6 The nonprofessional government system as an opportunity

Inward development requires longer planning times than outward development and a more comprehensive coordination effort with the administration and the landowner in the surrounding built stock. These conditions will not attract the attention of investors aiming to create as much floor area as possible with bulky buildings in the shortest possible time. Rather, small- and medium-sized enterprises are necessary, with locally networked enterprises and if possible direct access to the executive level; this can further intensify the process and thus help create identification with inward development. In order to secure future markets for the local construction industry, it would be advisable to invest in the informal preliminary work to the revision of local planning. The networked knowledge of local characteristics in the nonprofessional government system of small- and medium-sized communes provides a good basis for this.

The task of the lay politicians is to insist on the quality requirements necessary for the transformation process, since future planning tasks will be extraordinarily demanding.

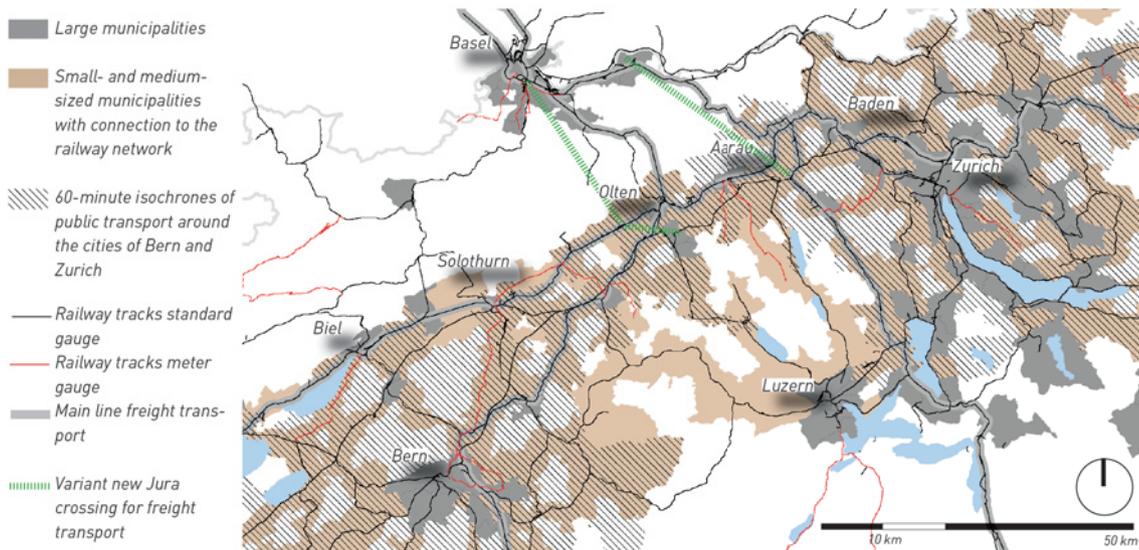


Figure 55: The Swiss Central Plateau with various options for a new Jura crossing for rail freight transport (source: own representation, data: swisstopo 2013a, swisstopo 2013b)

5.2.7 Room for the transformation process

The concept of 'little in many places rather than lots in few places' could remain valid for many generations to come. While the space for densification begins with the reserves in the formal instruments and ends with the specific location compatibility, its development is mapped out by the operating concepts of the public transportation system, which determines the possible space for density on the existing rail network.

An astute networking of a decentralized, moderately growing Switzerland in small- and medium-sized communes thus also poses an enormous challenge at the federal level. It requires policies and spatial planning to much more intensely address the initial problems associated with structural density in small- and medium-sized communes. In this way, the concept of 'little in many places rather than lots in few places' will affect the national level and transform the main settlement area of Switzerland into a transformation landscape.

5.2.8 The Central Plateau – an area of national importance?

The extensive need for coordination of inward development on the Swiss Central Plateau arises from conflicts between rail transportation geared toward stops in the public transportation network and the settlement development in small- and medium-sized communes. The ensuing unresolved issues become especially evident in the area between Baden and Biel (fig. 55). These strategies overlap, such as those formulated in the spatial concept of Switzerland as guidelines for all planning actions at the three levels of the state, and the rail infrastructure is faced with future strains and expansions, the effects of which are still difficult to assess for settlement development.

The Swiss Central Plateau encompasses the intersections of the transit axes of the national road network as well as the most important corridor for the trans-Alpine freight transportation and domestic goods traffic. At the same time, there is a dense network of divergent track widths in this area, a relic of the transportation requirements of numerous companies during the industrialization period. Because of the industrial past, the administrative units of the Central Plateau are characterized by their small size

and an equally small property structure. It is striking how many small- and medium-sized communes still exist in this area. This fact, along with the many reserves for inward development, necessitates a dense network of regional rail transportation options in order to secure vigorous and long-lasting solutions.

The projected strong increase in rail-freight transportation, both the trans-European and domestic traffic, raises the question as to whether and how regional transportation could be displaced by freight traffic in the Central Plateau area. This looming conflict will presumably also have an impact on the operation of the rail system from and to the metropolitan areas of Switzerland, since the main traffic links between three of the four major metropolitan areas of Switzerland cross the Central Plateau:

'Given the limited resources, future expansion will face the question whether investments should be channelled into the acceleration of passenger traffic or into the relief of settlement areas from freight traffic. Securing and expanding the capacities for regional transportation is important, as is a certain degree of management of the settlement development, because a disorderly settlement development can put a strain on the interregional road network in the Central Plateau and thus seriously interfere with the connections to metropolitan areas' [ETH ZÜRICH 2014c:34].

The architect and spatial planner Franz Oswald even regards the center of the Central Plateau as the nucleus for a far-reaching transformational process, which could spread throughout the entire Central Plateau. However, he also questions whether the available instruments for this transformation process are sufficient:

'Because the proposed new restructuring goes far beyond the historically set limits, there is little chance of it being successfully developed further for future tasks and requirements by means of the current instruments, limited as the latter are in a too narrow territorial municipal autonomy. With an open horizon of the future, the designs for the long-lasting reconstruction must assume both physical and temporal dimensions.' [OSWALD 2005:342].

It is precisely here that the question 'Where to densify?' is crucial. On the one hand, the small- and medium-sized communes in the Central Plateau have substantial reserves for inward development, and they would be in the position to face the future problems caused by conflicts between regional and freight transportation in a differentiated manner. On the other hand, this area is also the hotbed for problems of acceptance, an absence of proper thinking patterns, and obstacles to mobilization.

The competition for the passenger traffic routes and the potential increase in noise pollution of the adjacent settlement areas raises an issue important to spatial planning: Is it useful (and wise) to increase the structural densities in areas affected currently or in the future by the negative effects of rail transportation and thus to both exacerbate the conflicts between local residents and freight transportation and to expose more housing units to freight traffic noise? This conflict may intensify in the future, as the planned expansion of the railway infrastructure and increase in capacity for passenger transportation would benefit the already densely populated Swiss Central Plateau most, which at the same time is the focus of the rerouting of trans-Alpine freight transportation (fig.54, p.137). Which route the new trans-Jura crossing takes as a gateway for the two Swiss trans-Alpine crossings for freight transportation is therefore of great importance, both for the possible space available for passenger traffic and to exclude those areas as possible mid-term candidates for an increase in structural density because of the likelihood of future noise pollution.

Oswald's postulate for the Central Plateau as the starting point of this transformation process thus becomes topical again. Exploring, clarifying, and solving the space-related problems associated with this transformation presumes the presence of initiatives in a bottom-up approach transcending administrative boundaries. At the same time, according to the Spatial Concept Switzerland, such space lies 'in between,' that is, it has no explicit space holder, no official guiding plan, and therefore no planning rhythm. The deliberation on a new trans-Jura freight traffic route East or West of Olten (BÄCHTOLD ET AL 2012, ETH ZÜRICH 2015) could be a mutually recognized problem that might motivate such cooperation. A problem-oriented approach is necessary and crucial,

especially in this area. A follow-on cooperation between the Confederation, the cantons, and the communes will form the basis for ensuring stability for the entire rail system in Switzerland.

5.3 Recommendations for practice

5.3.1 Third-generation local planning revision

As outlined above, it is of crucial importance for small- and medium-sized communes in the main settlement area of Switzerland to entertain an idea of the possible distribution of structural density in the commune prior to adoption of any formal procedures for the land-use plan. It is necessary to know which areas will be suitable – in the inward development compass: the ‘options’ of ‘further development’ and ‘reorientation’ – as well as the areas which should be protected (‘preservation’) and finally which, with a view toward the next generation, are not the subject of a planning process (‘letting it rest’)¹⁰⁰. The usual procedure of reclassifying arable land as building land during a formal procedure has become obsolete. Rather, the conditions of use and the site ratios valid within the building zones must be derived from the specific location. As detailed above, this is done by means of an informal procedure as a preliminary step toward a shortened formal procedure.

For small- and medium-sized communes, this procedure represents a divergence from the usual approach and may be designated as ‘third-generation local planning revision’ in line with the ‘third-generation planning model,’ which is particularly effective in the preparation and orientation of planning in the run-up to formal procedures¹⁰¹.

The first generation of planners was involved in setting up planning instruments in the communes through the 1970s. First-generation land-use planning was then established, and the building areas were clearly separated from the nonbuilding areas by means of a zoning plan. The second generation

of planning instruments focused mainly on outward development. The original local planning was adjusted to the ‘15-year requirement’ based on the projections of population growth, which de facto always amounted to expanding the building zones. Following the implementation of the first spatial planning act – in Switzerland only as of 1980 – the procedures in small- and medium-sized communes were aligned accordingly, and the instruments were revised along the usual cycle of 10–15 years. This meant securing the demand-driven supply of building land under planning laws. Finally, with the coming into force of the revised Spatial Planning Act of 2014, a change in thinking patterns became necessary in order to ensure the success of the minimum strategy ‘inward development before outward development’ in small- and medium-sized communes. It is vital to reject the existing demand-driven approach to a supply-oriented one. Outward development must remain the exception and inward development the rule as well as a continual task. In the future, the critical factor will be not only the amount of settlement area reserves a commune can muster to compete with neighboring communes, but crucially the extent of gross floor-area reserves and the topographical and spatial qualities it offers.

The financial burden for implementing the revised procedure varies greatly for individual cantons (Appendix Table A4). For example, in the Canton of Vaud, this would be about six times higher than in the Canton of Geneva, because the former, with its 190 communes, has by far the highest number of small communes in the Central Plateau. In the Cantons of Bern and Aargau, too, comparatively large investments would be needed for the ‘third-generation local planning,’ again because of the large number of small- and medium-sized communes.

The assessment in the individual cantons allows us to formulate a trend for the entire Central Plateau (tab.19, p.142). In around 1,300 communes, land-use planning must be revised in the coming years against the backdrop of the new spatial planning act and the guiding plan to be adopted by 2019. The informal preliminary procedure prior to the formal procedures – the ‘inward development compass’ – would

¹⁰⁰ See page 109.

¹⁰¹ See page 45.

Central Plateau	
Number of small communes in the Central Plateau (GRAMS 2015: 205f.)	778
Number of medium-sized communes in the Central Plateau (GRAMS 2015: 205f.)	493
Yearly procedure costs for the informal preliminary procedure for the local planning revision ('Inward development compass') for cantons* [CHF]	3–4 million
Yearly procedure costs for the informal preliminary procedure for the local planning revision ('Inward development compass') for cantons as well as small- and medium-sized communes* [CHF]	9–12 million
Yearly procedure costs for the usual local planning revision for small- and medium-sized communes* [CHF]	18–24 million
Yearly procedure costs** for the 'Third Generation Local Planning Revision' for small- and medium-sized communes* [CHF]	20–27 million
Difference in the procedure costs between the usual local planning revision and the 'Third Generation Local Planning Revision'**	+11–13%
Yearly construction investments*** in the cantons 2013 [BFS 2014d] [CHF]	43 billion
Yearly procedure costs for the 'Inward development compass' in% of the construction investments 2013 [costs for cantons as well as small- and medium-sized communes]	0.02–0.03%

* rhythm of the local planning revisions 10–15 years

** without using contributions from the levy on the added value from the re-zoning

*** investments in the entire canton territory in buildings for supply, disposal, transport and communication, education and research, healthcare, culture and leisure, agriculture and forestry, industry, trade, services, residential

Table 19: Estimate of the yearly procedure costs of a 'Third Generation Local Planning Revision' for the Central Plateau
[source: own representation [Appendix Table A4]]

cost the cantons and communes about 9 to 12 million Swiss Francs per year. That is at least 10% above the costs of normal local planning revision. These additional costs could be absorbed by systematically levying the added value of the rezoning.

However, it is necessary to put these costs into perspective and correlate them with the construction investment in the individual cantons: Wherever there is a need for heavy investment in local planning, there is also heavy construction going on. With annual construction investments of around CHF 43 billion for the entire Swiss Central Plateau, the procedural costs of adapting land-use planning in the small- and medium-sized communes would amount to only a fraction thereof – well below 1%. In fact, this sum appears to be exceptionally low, especially with the prospect of mobilizing around 20–25 millionm² of gross floor-area reserves in small- and medium-sized communes with a roughly estimated property value of CHF 80–100 billion¹⁰².

The implementation of the revision of the Spatial Planning Act thus entails the increasing responsibility of small- and medium-sized communes for a high-quality inward development throughout the entire Central Plateau. The Federal Councilor responsible for spatial planning has called on small- and medium-sized communes to formulate their concerns and to seek cooperation especially at the municipal level:

'This is a difficult path, and cooperation between planning authorities and authorizing bodies [...] is required, also with potential investors and with owners who should collaborate, over longer planning periods, on the development of larger areas. [...] To think and plan within the familiar limits is probably the wrong approach. [...] We have to try, with new approaches, to tackle the need for space and for land, and to develop the Switzerland of tomorrow with a higher perspective, with coordination, and cooperation at the municipal level. Cooperation in regional planning is imperative. You must also consider

102 See Table 11, p. 73.

whether you might not share a body for a number of planning applications, rather than every commune handling everything by itself. Cooperation is very useful here, and if communes are able to deal with the more strategic issues, with controversial questions, then I believe it is also useful for the development and for the really important questions. [...] The execution and implementation of spatial planning remains the responsibility of the cantons. The concerns of the cities and communes are nevertheless important (Association of Municipalities, 2014).'

In accordance with the countercurrent and subsidiarity principles, inward development is a task for which all three levels of government are equally responsible. It is therefore necessary to examine whether the extra costs arising from the intensified planning efforts under the revised spatial planning act (roughly 9 to 12 million CHF for the inward development compass in the main settlement area of Switzerland) shouldn't be borne equally by all three levels of government. This would amount to overall costs of CHF 3 to 4 million for the Confederation, while the costs for the cantons and communes would be calculated based on their population. Thus, in the Canton of Bern, for example, around CHF 7–10 per inhabitant would have to be paid by the small or medium-sized communes for the development of the inward development compass. For the Canton of Zurich, the contribution to the inward development compass would be correspondingly lower because of the smaller number of small- and medium-sized communes, amounting to between 6 and 8 CHF per inhabitant. The same amount per inhabitant would then be borne by the small- and medium-sized communes themselves. It should be examined how the inward development could be taken into account in the distribution formula for the calculation of the financial compensation between the cantons. This would guarantee implementation of the subsidiarity principle, and simultaneously a major objective of the new regional policy would be achieved, one that would indirectly help to maintain decentralized settlement in Switzerland and reduce regional disparities.

5.3.2 Early involvement of property developers in informal procedures

With a change of thinking patterns in local planning, which is then geared toward inward development rather than outward development, planning and legal certainty will occur only in the medium term after 4–6 years. This timeframe at least will be necessary to adapt the formal instruments to the changed legal framework. Nevertheless, spatial planning should not contribute to the prevention of developments. Already at the beginning of the informal preliminary stage, it is reasonable to involve stakeholders who are committed to the later implementation of the inward development on the site level. They can become important allies in the process, and the joint work on the inward development compass allows trust to be built and an understanding to be gained for the way the different parties involved think.

Institutional investors and professionally organized landowners are interested in mobilizing land use reserves on the existing sites for business reasons in order to increase the returns for the landowners. These companies specialize in the development of areas with complex general conditions. In order to meet the high building requirements in small- and medium-sized communes, a commune should involve these stakeholders in the exploration process, who will raise economic issues at an early stage of planning, without affecting the recommendations based on their vested interests.

This cooperation requires both a solid expertise and a willingness to enter together into an early clarification process for the difficult, unsolved problems of inward development. Although their jargon and methods vary widely, the parties concerned can reach a consensus by addressing the perceived common problem and working on informal procedures. Different stakeholders with different backgrounds and expert knowledge engage in a common learning process that yields results that are neither 'right' nor 'wrong.' A 'winner' does not emerge from such a procedure. However, together they can offer recommendations that may prove resilient and lead to commitment over the further planning phase. This eases the relationship between authorities and investors at an early planning phase and shifts the focus of cooperation to the work at hand.

5.4 Recommendations for teaching

5.4.1 The task as a key element in project-oriented teaching

Tailored informal procedures form the basis for the quality of the formal tools that build upon them. They are thus crucial to the implementation of the minimum strategy of 'inward development before outward development.' But it also sets a high standard for planning, which in turn has consequences for the teaching of spatial planning.

Stakeholders in spatial planning are constantly confronted with uncertainties. It is not advisable to base spatial development strategies solely on forecasts 'calculated' with methods that are difficult to fathom. Nor does it make sense to 'interpolate' the future from a linear continuation of historical development. Rather, solid spatial planning must design potential futures and become the source of ideas. In particular, test designs for concrete tasks can contribute to the acceptance of structural density in small- and medium-sized communes at an early stage of the planning process. They become an important vehicle for implementing inward development. It is therefore recommended that the study of spatial planning be geared even more toward project planning. Designing, in the sense of forming hypotheses and trying to refute them, must be a central subject of such training. A spatial planning concept always involves a process proposal, which in turn requires knowledge. Therefore, testing a hypothesis before representatives from the field – ideally the actual stakeholders in the task – is the silver bullet of spatial planning studies. By getting acquainted with the arguments of all the parties involved, spatial planners are simultaneously training themselves in argumentation and in adopting different points of view, be it at a local, regional, or supraregional level. In the course of their training, future spatial planners need to practice advising politicians and thus becoming acquainted firsthand with the real voices of other important stakeholders. Preparation for implementation should be included in the curriculum.

If indeed inward development is to become the norm in the daily business of planning, planners must increasingly also become the initiators, presenters, and managers of space, and initiating concrete development processes. It is the task of spatial planning to appropriately guide the future development of a space by using suitable forms of cooperation; project tasks in teaching constitute an important didactic vehicle to this end.

A spatial planner must voice ideas about possible future conditions and remain resolute even in light of resistance stemming from the prevailing political conditions. The planner becomes the 'advocate of space' above and beyond all legislative periods. Hence, instruction not only imparts specialist knowledge, but has a further important goal: It bolsters confidence in one's abilities and judgment, and it fosters the ability to deal with resistance and criticism encountered over longer periods of time. Likewise, a certain enthusiasm must be instilled. Because of the long delays in spatial planning – the first tangible results may be visible only after 10–15 years – the fascination for a task (and even more the fascination for seeking possible solutions) must become a personal prerequisite for any future spatial planner. These skills are honed in the course of the project-based studies.

This recommendation also makes it clear that, with the advent of inward development, the requirements for instructors will change and increase significantly. They, too, are increasingly becoming 'coaches'; they must lead the way as role models during the learning process and with their experience and enthusiasm encourage students to learn from the concrete spatial problems. At the same time, study projects must be prioritized and the necessary resources must be allocated for their preparation and examination. Experiences from past student research papers in MAS spatial planning of the ETH Zurich show that the task should preferably be developed in three runs and subsequently be tested by an interdisciplinary (teaching) team to reveal any contradictions and gaps. Learning through projects focused on inward development must increasingly attend to the early development and testing of the task as a key element in project-oriented teaching.

5.4.2 Imparting knowledge through experimental simulations

Inward development requires customizing the process, and densification calls for a case-by-case evaluation on the site level. Such concretization places high demands on planning experts.

Today, these tasks are carried out by private planning offices that have often not been trained for the complexity of the core tasks and for designing informal processes. A planning office dealing with inward development and densification must be able to create test designs and simple spatial sketches to address both policymakers and landowners in a very early phase. Planners must make the local initial problems easy to grasp and understand and should have knowledge of the process design.

Overarching goals of spatial planning and particular interests of landowners tend to clash at the site level especially in urban planning in small- and medium-sized communes. Experts must be willing and able to recognize these conflicts and address them at an early stage. In regional planning, these conflicts occur later (or not at all), since it operates at a higher level of abstraction. Operationalizing the structure plan into basic instruments that are binding for landowners is far more difficult. At the same time, transferring the informally gained recommendations into the formal procedures is the Achilles heel of all inward development. Should this transfer fail, most of the recommendations from the informal preliminary run would remain ineffective.

Implementing inward development in small- and medium-sized communes means making local planning the 'supreme discipline' of spatial planning. A core skill of budding specialists in spatial planning lies in exploring, clarifying, and solving the problems on the site-level while simultaneously integrating them into the overall strategy. To impart this skill, it is necessary to consult actual procedures, which can then be adapted as 'experimental simulations' for study projects.

Experimental simulations are thought experiments that contain sequences of situations and are systematically prepared, carried out, and evaluated by means of a screenplay (MAURER 1995: 64). Key players of the actual procedure should actively participate in this process. By imitating the process of real procedures, such training situations develop the basic possibilities of decision-making and action, using the existing knowledge of the students for effective communication and cooperation in a problem-oriented manner.

Experimental situations to increase knowledge informing future actions in small- and medium-sized communes involve political representatives and selected landowners in addition to the planning officers of the administration. This practice might even take place in a real setting in the communes, where the planning committee meetings normally take place. A further discussion with the interested population on the results of study projects such as these could serve as a 'litmus test' for a subsequent revision of local planning or as a test of the task for the 'inward development compass.'¹⁰³ Students engaging with existing problems on the site level would help to intensify the training in the discipline of spatial planning. Such an approach is taken, for example, in the MAS program in spatial planning at the ETH Zurich, where future spatial planners train. The results of such experimental simulations, such as test planning procedures, conceptual competitions, or spatial development concepts, are promising and help to constantly improve learning in spatial planning at university level and adapt it to the real-life practice.

¹⁰³ See page 112.

5.5 Further need for research

5.5.1 Regional scopes and thresholds

If the concept of 'little in many places rather lots in few places' is to have its full impact, more large-scale considerations are necessary which show reserves and potentials beyond municipal and cantonal boundaries and relate them to the capacities of public transportation. Such systematically recorded, explicitly large-scale surveys do not exist in Switzerland at all.

Public-rail transportation is the strategic backbone of the settlement development in Switzerland. Previous investigations show that almost two-thirds of the small- and medium-sized communes of the Central Plateau have access to this system. Trajectory-related surveys on the capacity of regional transportation are needed in order to assess in which of the small- and medium-sized communes – against the background of the existing rail systems – inward development should be stepped up. It would also be of interest to gauge the extent to which the operation of public transportation might be adapted to counter the described route conflicts between freight and passenger rail traffic at an early stage, while nevertheless tapping into the mobilized reserves.

Urgent research is needed in this regard, for instance, for the lines affected by a future new Jura crossing for the Alpine freight transportation. This includes especially the routes Zurich – Baden – Aarau and further along the South side of the arc formed by the Jura mountains between Olten and Biel. Possible route conflicts between freight and regional rail transportation could worsen the development and accessibility of the reserves in small- and medium-sized communes. Such investigations could become urgent in the medium term, particularly in the Central Plateau, with its current dense network of rail infrastructure and the above-average number of small administrative units compared to the rest of Switzerland.

5.5.2 Methods for approaching owners

Having the local authorities approach landowners both in the informal and formal procedures is a decisive element that may trigger the breakthrough of inward development. It is a severely neglected method for mobilizing the reserves and potentials, and considerable research is still needed in Switzerland – especially in Switzerland, where private individuals own the majority of buildings for residential use, are useful methods necessary.

Nonprofessional politicians are often very much involved in the public and social life of a community – particularly in small- and medium-sized communes – and are important ambassadors for advocating inward development vis-à-vis the landowners. Having political representatives approach the landowners at an early stage signals the importance of inward development in a commune. Spatial planning is a matter of policy advising, and inward development is a matter of utmost importance at the highest level. Addressing landowners early and personally is the first step toward investigating the development potential on their sites, which may then lead to a strong participation of the landowners in the informal and formal procedures. This also strengthens the network of relations between private landowners and public authorities, which in turn represents a solid starting point for future procedures. There is in Switzerland still a substantial need for research as to the methods, the timing, and the form for addressing landowners.

5.5.3 Illustrative overviews of gross floor-area reserves

With the Raum⁺ method of the ETH Zurich and in cooperation with the communes, problem-oriented surveys can be carried out on the reserves of settlement area in the existing built stock (ETH ZÜRICH 2010). Postdensification potentials are recorded and then verified in the context of surveying meetings with the municipal authorities. However, this does not represent a systematic survey of individual properties, but rather of individual districts deemed underdeveloped by the authorities or connected sites with a low degree of development. While a systematic preliminary survey of the gap sites and the internal and outward development potentials by Raum⁺ (GIS analysis and

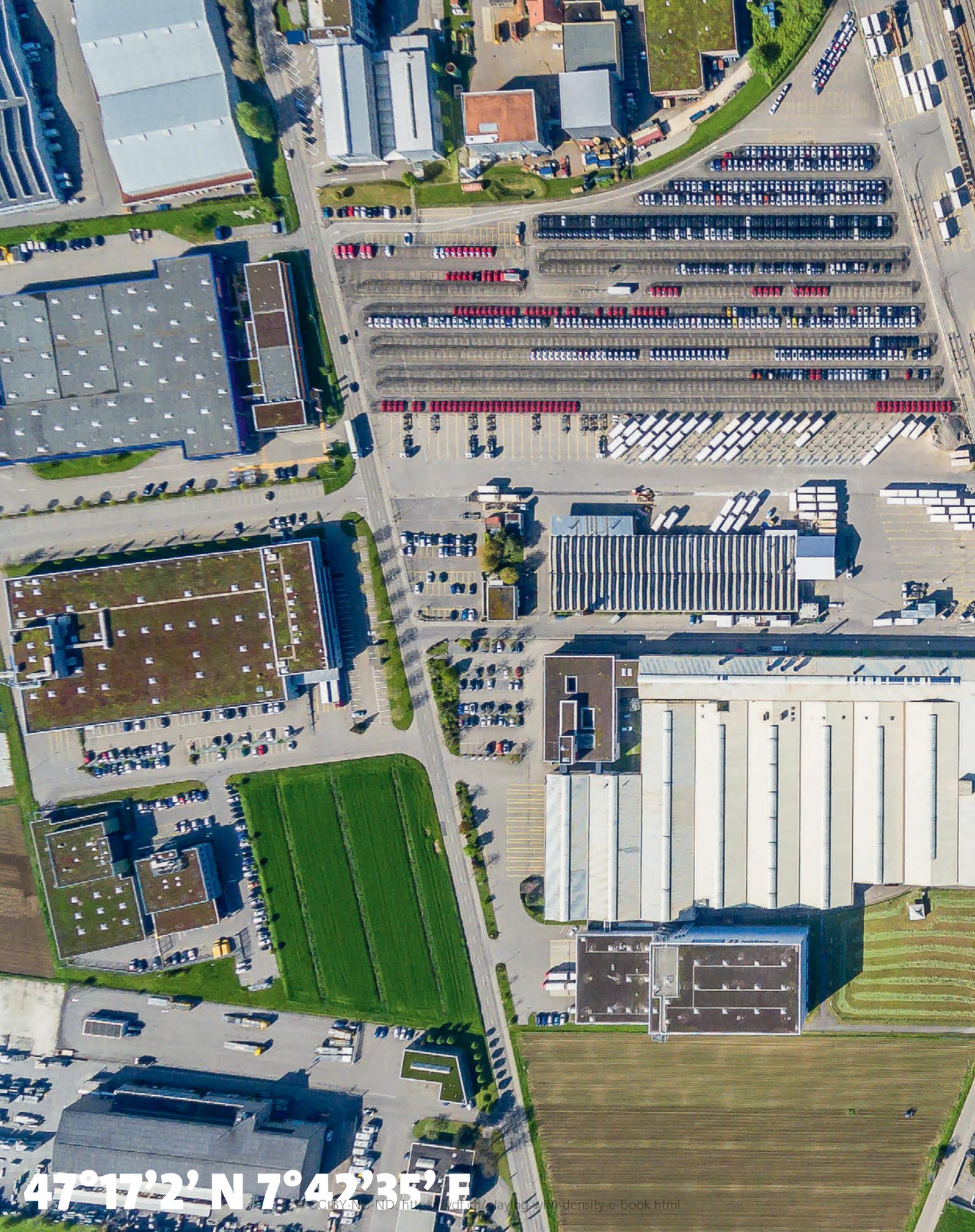
aerial photo analysis) exists, the information on the degree of development is derived either from the cantons nor is it based on estimates gathered from interviews with the communes. The only sources for the true quantification of reserves in areas with a low degree of development are the observations by communes or the estimates by the cantons. In order to record the relevant communal building reserves secured by building law, it is necessary to include the third dimension: taking stock of the built environment by taking stock of the floor area.

The fact that the proportion of gross floor-area reserves in built-up residential areas of small- and medium-sized communes is greater than in undeveloped sites (density forfeiture) shows their relevance and indicates that these should be included in surveys.

However, these estimates for the degree of development are possible only if the permissible density ratios are comprised in the survey. These figures are defined in the municipal land-use plans, and only in exceptional cases are they incorporated into the overview of zoning plans at the cantonal level. When surveying the reserves secured by building law on a municipal level with the method Raum⁺, it would therefore be sensible to include the sites with density ratios in the survey. For example, the map with the degree of development¹⁰⁴ on the site level could become part of the presurvey, and the gross floor-area reserves could be made plausible in discussions within the commune. However, more time should be devoted to this preparatory work than is currently devoted to the GIS and aerial photo analysis.

Taking a progressively updated stock of the floor area rather than of a settlement surface would generate a three-dimensional impression of the volume of the reserves, which in turn would constitute a constantly available vehicle for approaching landowners.

104 See figure 32, p. 80.



47°17'2" N 7°42'35" E





47°10'58' N 7°33'18' E

Epilogue

Has the dissonance between wanting, teaching, and doing as described by Thomas Sieverts been resolved? Probably not. People will only commit to inward development once they feel comfortable in densely built areas.

The realization that solidarity and taking the initiative are vital pillars of effective spatial planning must emerge from society. Spatial planning can contribute to this aim. Planners have to explain the often complex procedures using plain language; otherwise voters will quite simply equate 'densification' with 'confinedness' and reject inward development on the basis of to them incomprehensible problems.

How do you build in a dense way for a population that rather not live in a densely built environment? For inward development, there is no political voice that would be closest to the landowners than the voice of the planners and architects. The number of current members of the Federal Parliament with a background in planning can currently be counted on the fingers of one hand. If inward development is to become the norm, planning must go in search of the concretely feasible and tackle their hard and, to outsiders, seemingly thankless work on an abstract and hence political level. Here, experts must promote those areas not in the focus of economic or social interests, but which are home to more than half of all Swiss residents: small and medium-sized communities.

The present work is addressed to people in the non-professional government system who are concerned about their community and make decisions in favour of the next generation – or not, in the worst case. These people are required ex officio to plan in time to provide living space for a community of up to 10,000 people in order to be prepared for future developments. This is an extremely challenging task. It is therefore all the more important that the benefits of a problem-oriented approach be recognized and transferred by experts to the planning and building

commissions or municipal councils. Non professional politicians are often sympathetic ambassadors for their own municipality. Spatial planning can support them in their endeavours to visualise the spatial development of their communes for the coming generation, with problem-oriented surveys and the design of tailor-made procedures.

Zurich and Biel, September 2018

Anita Grams

Glossary

<i>English</i>	<i>Definition</i>
<i>Building density</i>	<i>Ratio of the actually implemented gross floor area to the applicable plot area.</i>
<i>Building zone</i>	<i>Land which is suitable for building on and is largely built-on or is expected to be required and developed within 15 years (ARE 2015).</i>
<i>Change of land use</i>	<i>Change of land use can be understood in its wider sense in cases where a plot is assigned to a different zone type. Frequently, however, the term is used in its narrower sense, in cases where a plot from one building zone is assigned to another building zone (or, at most, from one non building zone to another non building zone) (SB 2015).</i>
<i>Competition of ideas</i>	<i>Informal procedure for exploring, clarifying, and solving complex tasks, whose solutions involve all three state levels (especially in spaces of national importance).</i>
<i>Degree of development (Performance level of the building zone)</i>	<i>Ratio of the actually implemented use to the theoretically permissible use, usually expressed in percent of implemented gross floor area (GFA) to the legally permissible GFA (SB 2015).</i>
<i>Densification</i>	<i>Increase in built-up floor areas while the plot area remains constant.</i>
<i>Floor area</i>	<i>Ground plan area, enclosed and covered on all sides, of accessible floors, including constructional areas (SIA 2006: 6).</i>
<i>Floor area ratio</i>	<i>Ratio of the sum of the gross floor areas to the applicable land area. The use indicator defines the maximum permissible construction of a plot (see 'permissible building density').</i>
<i>Gap site</i>	<i>Individual unbuilt-on plots of 200–2,000 m² which directly adjoin built-on land and as a rule are already developed and have a relatively small area (ETH ZÜRICH 2014a).</i>
<i>Gross floor area (GFA)</i>	<i>Sum of all above-ground and below-ground floor areas serving or utilizable for residential or commercial purposes, including wall cross-sections (SB 2015).</i>
<i>Inward development</i>	<i>Raising the number of units for working and residential purposes within a largely built-up area, with simultaneous extension of the infrastructure required for high settlement quality.</i>
<i>Land use plan</i>	<i>Plot-level land-use framework plan, binding on landowners, for the separation of building areas and non building areas.</i>
<i>Land-use planning</i>	<i>Plot-level definition of the purpose, location, and degree of land use, binding on landowners (ARE 2015).</i>
<i>Largely built-up area</i>	<i>Cohesive settlement area, including gap sites (Art. 15 lit. a RPG). Area in which existing buildings represent a cohesive built-form and which, due to building spacing, infrastructure, and the type and utilisation of buildings, have the character of a settlement (SB 2015).</i>
<i>Militia system of governance (Non professional government)</i>	<i>Delegation of public offices to private persons, who carry them out on a part-time basis.</i>
<i>Outward development</i>	<i>Utilization of new settlement areas outside a largely built up area.</i>
<i>Participation (Public intervention)</i>	<i>Informing and participation of concerned persons as well as the general public prior to a planning resolution.</i>
<i>Permissible building density (Legally allowed density)</i>	<i>Ratio of the gross floor area permissible by building law to the applicable plot area.</i>
<i>Potential</i>	<i>Floor areas, as yet unsecured in terms of planning law, which derive from a balancing of interests.</i>

<i>Deutsch</i>	<i>Français</i>	<i>Italiano</i>
<i>Dichte, bauliche</i>	<i>densité construite</i>	<i>densità costruita</i>
<i>Bauzone</i>	<i>zone à bâtir</i>	<i>zona edificabile</i>
<i>Umzonung</i>	<i>changement d'affectation</i>	<i>cambiamento di destinazione</i>
<i>Ideenkonkurrenz</i>	<i>concurrence des idées</i>	<i>competizione de idea</i>
<i>Ausbaugrad</i>	<i>taux d'utilisation/degré de saturation</i>	<i>tasso di utilizzazione/grado di utilizzazione</i>
<i>Verdichtung</i>	<i>la densification</i>	<i>densificazione</i>
<i>Geschossfläche</i>	<i>surface de plancher</i>	<i>superficie di piano</i>
<i>Ausnutzungsziffer (AZ)</i>	<i>coefficient d'utilisation/indice d'utilisation du sol (IUS)</i>	<i>indice di sfruttamento/coefficiente d'utilizzazione (CU)</i>
<i>Baulücke</i>	<i>parcelle non construite en milieu bâti / dent creuse</i>	<i>vuoto d'edificazione/terreno libero da costruzioni in contesto edificato</i>
<i>Bruttogeschossfläche (BGF)</i>	<i>surface brute au plancher</i>	<i>superficie lorda per piano</i>
<i>Innenentwicklung</i>	<i>développement vers l'intérieur</i>	<i>sviluppo centripeto</i>
<i>Zonenplan</i>	<i>le plan de zones</i>	<i>il piano delle zone</i>
<i>Nutzungsplanung</i>	<i>elaboration des plans d'affectation</i>	<i>pianificazione dell'utilizzazione</i>
<i>überbautes Gebiet</i>	<i>terrain largement bâti</i>	<i>comprendorio già largamente edificato</i>
<i>Milizsystem</i>	<i>le système de milice</i>	<i>Il sistema della milizia</i>
<i>Aussenentwicklung</i>	<i>développement vers l'extérieur</i>	<i>sviluppo centrifugo</i>
<i>Mitwirkung</i>	<i>participation</i>	<i>partecipazione</i>
<i>Dichte, zulässige bauliche</i>	<i>densité legale</i>	<i>densità giuridicamente lecita</i>
<i>Potenzial</i>	<i>potenciel</i>	<i>potenziale</i>

English	Definition
<i>Reserve</i>	<i>Floor area which is secured in terms of planning law but as yet unrealized.</i>
<i>Rezoning to higher density</i>	<i>Creation of the legal prerequisites for densification. Rezoning to higher density thus does not correspond to the moment where constructional densification takes place (building construction), but the act of creating the legal prerequisites for it (change of land-use planning); depending on the context, a change in zonal assignment may also be meant, which results in an enhancement in value without enabling more intensive use (SB 2015).</i>
<i>Rezoning to non-building zone</i>	<i>Change in designation of a plot from a building zone to a non building zone (SB 2015).</i>
<i>Settlement area</i>	<i>Sum total of areas, consisting of building areas, industrial areas, supply and disposal facilities, excavation and landfill areas, construction sites, recreation facilities, and green spaces as well as traffic areas (BFS 2013a).</i>
<i>Space-user</i>	<i>Sum of inhabitants (permanent residents) and employed persons (full-time equivalents).</i>
<i>Special land-use planning</i>	<i>Planning directive procedure for detailed specification of land-use planning in a specific, clearly demarcated area. Special land-use plans secure access (development plans), for example, and further specify envisaged building and utilization (design plans).</i>
<i>Structure plan</i>	<i>Instrument which describes the activities required for the implementation of the envisaged spatial order, and which defines the framework for their mutual coordination in a manner that is binding on authorities (ARE 2015).</i>
<i>Surplus value compensation</i>	<i>Financial compensation for significant advantages and disadvantages arising due to planning (surplus value).</i>
<i>Test draft (Test design)</i>	<i>Informal, fast, and cost-effective method for exploring strategic information on inward development ('quick test'), resulting in illustrative overviews which include evidence (SCHNEPPER 2012: 189).</i>
<i>Test planning procedure</i>	<i>Informal procedure for exploring, clarifying, and solving complex tasks, whose solution usually is of strategic importance for the development of the respective space.</i>
<i>Zoning</i>	<i>Assignment of a plot to a building zone (SB 2015).</i>

<i>Deutsch</i>	<i>Français</i>	<i>Italiano</i>
<i>Reserve</i>	<i>réserve</i>	<i>riserva</i>
<i>Aufzonung</i>	<i>changement d'affectation</i>	<i>cambiamento di destinazione</i>
<i>Auszonung</i>	<i>déclassement</i>	<i>dezonamento</i>
<i>Siedlungsfläche</i>	<i>la surface des territoires urbanisés</i>	<i>la superficie d'insediamento</i>
<i>Raumnutzer</i>	<i>utilisateur du territoire</i>	<i>utente del territorio</i>
<i>Sondernutzungsplanung</i>	<i>établissement d'un plan d'affectation spécial</i>	<i>elaborazione del piano di utilizzazione speciale</i>
<i>Richtplan</i>	<i>le plan directeur</i>	<i>il piano direttore</i>
<i>Mehrwertausgleich (Ausgleich von Planungsmehrwerten)</i>	<i>compensation des avantages résultant de mesures d'aménagement</i>	<i>compensazione degli vantaggi derivanti da pianificazioni</i>
<i>Testentwurf</i>	<i>le projet test</i>	<i>progetto test</i>
<i>Testplanungsverfahren</i>	<i>la planification test</i>	<i>pianificazione test</i>
<i>Einzonung</i>	<i>le classement en zone à bâtir</i>	<i>il azzonamento</i>

Appendix

I Method for precise area-wise estimation of floor-area reserves and the degree of development in the residential zones of the Swiss Plateau

I.I Objective

The envisaged outcome of the procedure is a quantitative estimation of the floor-area reserves and the degree of development in the residential zones within existing land-use planning in the Swiss Plateau. The results should be displayed in categories in terms of small-, medium-, and large-sized communes. The key figures ascertained should also be transferable to communes without data, to permit comparisons and estimations on larger interrelated spaces beyond municipal boundaries. For presentation purposes, the degree of development is suitable as a measure of the actual utilization intensity in the residential zones.

I.II Definitions

The degree of development denotes the ratio of the actually implemented floor areas to the permissible floor areas as per building law:

$$\text{Degree of development } D [\%] = \frac{FA^{\text{built}}}{GFA^{\text{permissible}} * c} * 100$$

FA^{built}	Actually realized floor area on the plot [m ²]
$GFA^{\text{permissible}}$	Maximum gross floor area permissible by building law [m ²]
c	Correction factor 1.15

The floor areas implemented in the plots pertain exclusively to the above-ground building parts, which is why this value cannot be used for converting into the floor area indicator, as per IVHB (IOHB 2013: Appendix 2).

I.III Data sources and data processing

The objective is to use the most generalized data possible from the highest possible political level which displays high homogeneity and allows for comparability in larger, interrelated spaces. The framework of the pilot study showed that particularly the nationwide data on built volumes neither qualitatively nor quantitatively met the demanded requirements, and that the surveys, moreover, dated too far back in time¹. Finally, cantonal data were used for the estimations, which suffice qualitatively and represent spaces typical of the Swiss Plateau. This includes the data basis from the Cantons of Aargau, Lucerne, and Zug.

The programs Excel, SPSS (Statistics program by IBM), and FME (Feature Manipulation Engine) were used for processing purposes².

The first pilot experiments on methodology took place from November 2011 to October 2012. The final examination was carried out from November 2012 to December 2013.

1 swisstopo (2010): swissBUILDINGS3D 1.0 and swisstopo (2004): highly precise digital surface model DOM.

2 FME is a GIS software of the company Safe Software. It functions like the model builder in ArcGIS, while the advantage, however, particularly lies in faster calculation, which was necessary for the large amount of data. The change from ArcGIS to FME therefore took place rather early on, though ArcGIS continued to be used for examining and presenting the results.

a. Actually built floor areas

The building areas of the official cantonal survey (2013) form the basis for displaying the actually built floor areas³. The federal government provided the official survey data of all communes, which were digitally updated in 2013. Because the same surveying method was used, a high degree of homogeneity is ensured. Since, however, some communes (especially in the Canton of Aargau) don't yet have digital official survey plans, these communes are absent from the estimation. The data of the commune of Willisau (2013) were absent in the cantonal and national set of data because of a merger, which is also why they were directly obtained from the commune. This allowed the number of control samples to be increased by a medium-sized commune typical for the Swiss Plateau.

The number of floors of buildings is recorded in the Switzerland-wide Federal Register of Buildings and Dwellings (RBD). This register contains the most important basic data on buildings with residential use, which is directly reported to the federal government by the municipal and cantonal authorities. The advantage of these data lies in their homogeneity and topicality (quarterly update). Every building and every flat have a nationwide, distinct, and unique identification number, the so-called Federal Identifier for Buildings (EGID), to which the number of floors can, in turn, be assigned. A geo-referenced evaluation is possible from the database set using x and y coordinates⁴. Buildings without residential use can likewise be recorded in the register, though for these buildings there is no obligation to either admit or update them, as per the RBD regulation. This can lead to a distinct falsification of results in mixed zones, since floors cannot be assigned to the building areas in the mixed zones because of missing specifications. Moreover, a spot check control of the data quality showed large

differences between individual communes within mixed zones. For this reason, we did not integrate the mixed zones into the estimation. The RBD data were subsequently combined with the floor plan areas of the official survey buildings⁵, and the number of floors (from the RBD data) was multiplied by the floor plan areas of the buildings.

b. Permissible gross floor area

The gross floor areas permissible in land-use planning are ascertained by multiplying the applicable plot area with the density indicator. Only those communes that have the usage indicator recorded as a density indicator in the zoning plans were included in the estimation. The geometries of the building zones are taken from the data set Bauzonen Schweiz (harmonisiert) [Building Zones in Switzerland (Harmonized)] of the ARE. This is based on the geodata on building zones available in the cantonal specialist departments for spatial planning on 1 January 2012. The cantonal zone types were generalized in accordance with the 'minimal geodata model for land-use planning' and assigned to one of the nine main uses within the building zones⁶. In most communes, the areas depicted in the residential zones extend over several plots and street-facing plots. For this reason and for the purpose of estimation, they were multiplied by a factor of 0.85, in order to reflect deductions for public access. Doing this produces an approximation of the applicable plot area.

The usage indicator in the residential zones, defined by building law, is taken from the land-use plans, as recorded by the cantonal spatial planning departments. A written enquiry, addressed to the relevant experts in the cantons in April 2013, showed that only 6 of the 26 cantons (LU, ZG, ZH, AG, SG, VD) had integrated density indicators in their land-use plans. An examination of the data from the Canton of St. Gallen

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- 3 Polygons with an area of < 30 m² are removed, since there is a high probability that these are not residential buildings (auxiliary buildings, garages, garden sheds, etc.).
 - 4 A few buildings (approximately 2,000) without coordinates are omitted. Buildings that have not been added to the degree of development of the residential zones (garages, stations) are filtered out of the RBD data by means of an attribute.
 - 5 Some buildings from the official survey data retained the EGID assigned to them as an attribute, in which case the number of floors can be assigned with the aid of a join. If the official survey data do not have an EGID, a spatial cut is carried out. Since not all RBD points lie within a building, the RBD points lying outside a building must be brought close to the next possible building (> 35 m²) by doing a neighbor search. In the officially surveyed buildings without RBD data (or vice versa), the procedure is as follows: If the RBD points are more up-to-date than the officially surveyed buildings (no officially surveyed buildings yet) and the RBD points have a ground-plan area (attribute value), they are used for the subsequent calculation. Officially surveyed buildings that are larger than 50 m² but that fail to have an RBD point are assigned a floor number of '1.'
 - 6 Residential zones, work zones, mixed zones, central zones, zones for public uses, restricted building zones, tourism and leisure zones, traffic zones within building zones, other building zones.

showed that these are estimated values in tabulated form. In the Canton of Vaud, not all communes work with the usage indicator, and the mixed zones are not clearly declared. Reworking the data would only lead to low yields, while requiring considerable effort. Moreover, many building polygons turned out to be incorrect. For these reasons, the use of data from the Cantons of St. Gallen and Vaud was dispensed with. The data from the Canton of Zurich are available in excellent quality, though the canton displays no representative composition of small-, medium-, and large-sized communes in the Swiss Plateau. Integrating this data into the estimation would presumably exert an overwhelming influence on the outcome, which is why this canton was likewise factored out. Finally, the overview zonal plans of the Cantons of Aargau (2013), Zug (2013), and Lucerne (2013) were used for the purpose of estimation.

Since different densities on differently sized areas are applied for the residential zones within the communes, the next step would involve estimating an average, area-weighted usage indicator for each commune⁷. To this end, the density indicator of the residential zones is extracted for each commune. The extracted area-weighted usage indicators, typical for each commune, are added to the zonal areas of the harmonized building zones in Switzerland. Multiplication of the area-weighted usage indicators with the zonal areas, which are reduced by the access areas, leads to the gross floor area permissible by building law.

c. Correction factor

In order for the permissible gross floor areas to be compared with the actually implemented net floor areas, they must be converted into floor areas using a correction factor. In most cantonal planning and building laws, ancillary and functional areas (stairwells, winter gardens, or laundries, for example) are not added to the set use and hence also not to the gross floor area, though in the data of the official survey they are represented in building areas. The net floor areas from the official survey data are, therefore, larger than the gross floor areas from the land-use plans. Accordingly, the gross floor areas are multiplied by a factor of 1.15. This +15% factor is a rather generous value, but since the building ar-

reas from the official survey data tend to be too large (projecting building parts and balconies, for example, are also depicted as part of the floor area), this value does seem justified.

I.IV Final arithmetic operations

The first step involved multiplying the gross floor area with the above-mentioned correction factor of 1.15. For estimating the degree of development, the two values calculated above must be combined and converted into percentage values.

I.V Estimation of the floor area reserves in the Swiss Plateau

Doing the evaluations by commune permits ascertainment of median values per inhabitant for small-, medium-, and large-sized communes (Tab.A2). (Median means half of the communes have a higher value, and the other half a lower value per inhabitant than the median value.) These values enable an estimation for the entire Swiss Plateau (Tab.5). When generating median values, only those communes are considered which still have floor-area reserves expressed in terms of a degree of development of under 100%.

I.VI Discussing the methodology

The above-stated methodology and the subsequent results must be understood as rough estimation or approximation and should not be compared on a municipal level in terms of a precise calculation containing individual ascertainment. The objective was to assess the settlement stock by degree of development of the residential zones in small-, medium-, and large-sized communes in the Swiss Plateau – and to search for possible regularities. Finally, the data from those cantons were used which comprehensively list a density indicator in their overview zonal plans (4 of 26), which have official survey data available, and

7 Area weighting of the cantonal zonal plans was carried out in SPSS.

which simultaneously update the Register of Buildings and Dwellings in sufficient quality (240 of 329 communes).

The communes in the Cantons of Aargau, Lucerne, and Zug can be described as being representative for the main settlement area of Switzerland. These three cantons have neither exclusively urban settlement patterns nor are they fully agrarian. For this reason, for estimation purposes it seems permissible to formulate a tendency for the entire Swiss Plateau using the floor-area reserves per person in the three municipal categories as found in the population figures. Nevertheless, remember that the breadth of the samples is relatively small (240 examined communes out of some 1,400 communes in the Swiss Plateau). Yet this, as it were, represents the only set of data available on larger, contiguous spaces in Switzerland which can be compared.

In its most basic features, this approach is comparable to the LUBAT method developed by the Canton of Lucerne to secure the holding capacity of building zones in preparation for spatial planning revisions. The present method, however, allows a comparative representation that transcends cantonal boundaries by making use of data sources on a federal level. As such, the results, too, can be presented in a cantonal boundary-transcending manner (fig. A1)⁸.

8 Fig. A1 depicts the degree of development of residential and mixed zones. In the quantitative estimation (Tab. A1 and A2) and because of the stated reasons, only the degree of development of residential zones was considered.

I.VII Results

BFS- No.	Name of community	Canton	Pop.	Permissible floor areas in residential zones [m ²]	Built floor areas in residential zones [m ²]	Floor area reserves in residential zones [m ²]	Floor area reserves in residential zones per inhabitant [m ²]	Degree of develop- ment of residential zones [%]
4307	Full-Reuenthal	AG	802	84,537	33,167	51,370	64	39
4184	Mettauertal	AG	1,914	212,139	87,210	124,929	65	41
4136	Holziken	AG	1,258	135,848	60,937	74,911	60	45
4004	Densbüren	AG	694	67,152	30,509	36,643	53	45
4172	Münchwilen (AG)	AG	893	116,489	55,758	60,731	68	48
4288	Wiliberg	AG	170	19,520	9,386	10,134	60	48
4275	Kirchleerau	AG	760	68,998	33,181	35,817	47	48
4167	Hornussen	AG	870	66,981	32,345	34,636	40	48
4106	Mönthal	AG	401	36,409	17,778	18,631	46	49
4096	Effingen	AG	581	60,578	29,722	30,856	53	49
4161	Eiken	AG	2,136	244,120	120,365	123,755	58	49
4283	Safenwil	AG	3,551	477,278	236,308	240,970	68	50
1096	Pfeffikon	LU	725	82,968	41,491	41,477	57	50
4115	Schinznach-Dorf	AG	1,735	142,631	71,680	70,951	41	50
1142	Roggliwil	LU	617	28,478	14,426	14,052	23	51
4173	Oberhof	AG	586	37,347	18,969	18,378	31	51
4310	Koblentz	AG	1,605	148,481	76,144	72,337	45	51
4170	Laufenburg	AG	3,268	256,998	132,965	124,033	38	52
4138	Leutwil	AG	741	46,444	24,277	22,167	30	52
4256	Obermumpf	AG	1,000	95,194	49,864	45,330	45	52
4169	Kaisten	AG	2,567	284,365	150,275	134,090	52	53
4133	Burg (AG)	AG	993	112,216	60,046	52,170	53	54
1022	Altwis	LU	411	17,035	9,116	7,919	19	54
4227	Bettwil	AG	538	53,911	28,860	25,051	47	54
4166	Herznach	AG	1,392	149,093	81,984	67,109	48	55
4139	Menziken	AG	5,630	534,356	295,898	238,458	42	55
4228	Boswil	AG	2,553	154,513	85,778	68,735	27	56
4277	Moosleerau	AG	877	58,071	32,408	25,663	29	56
4137	Leimbach (AG)	AG	445	54,670	30,535	24,135	54	56
4091	Auenstein	AG	1,531	172,118	96,517	75,601	49	56
1041	Schongau	LU	913	36,199	20,442	15,757	17	56
4135	Gontenschwil	AG	2,077	192,105	109,772	82,333	40	57
4117	Thalheim (AG)	AG	748	41,053	23,498	17,555	23	57

Table A1: Estimated degree of development and floor area reserves of the residential zones in selected communes in the cantons LU, ZG, AG (2012) [source: author's representation, data: swisstopo 2013a, swisstopo 2013b, cantonal spatial planning departments, INFOPLAN-ARE 2012, BFS 2013d, AGIS Canton of Aargau 2013, Grundbuch- und Vermessungsamt [Land registry and surveyor's office] Canton of Zug 2013, rawi Canton of Luzern 2013]

<i>BFS- No.</i>	<i>Name of community</i>	<i>Canton</i>	<i>Pop.</i>	<i>Permissible floor areas in residential zones [m²]</i>	<i>Built floor areas in residential zones [m²]</i>	<i>Floor area reserves in residential zones [m²]</i>	<i>Floor area reserves in residential zones per inhabitant [m²]</i>	<i>Degree of develop- ment of residential zones [%]</i>
4076	Sarmenstorf	AG	2,534	199,208	115,331	83,877	33	58
4113	Scherz	AG	642	41,445	24,010	17,435	27	58
4105	Mandach	AG	310	11,834	6,882	4,952	16	58
4006	Gränichen	AG	7,163	630,596	366,863	263,733	37	58
4031	Künten	AG	1,622	146,751	85,404	61,347	38	58
4147	Zetzwil	AG	1,274	148,418	86,511	61,907	49	58
4141	Reinach (AG)	AG	8,063	646,442	379,858	266,584	33	59
4182	Wölflinswil	AG	988	73,094	42,973	30,121	30	59
1021	Aesch (LU)	LU	1,009	51,928	30,582	21,346	21	59
4131	Beinwil am See	AG	2,944	381,328	227,231	154,097	52	60
4046	Wohlenschwil	AG	1,458	73,568	44,204	29,364	20	60
4181	Wittnau	AG	1,161	101,042	61,027	40,015	34	60
4145	Teufenthal (AG)	AG	1,583	155,870	94,926	60,944	38	61
1003	Escholzmatt	LU	3,134	111,218	67,777	43,441	14	61
4079	Unterlunkhofen	AG	1,277	96,332	58,925	37,407	29	61
4165	Gipf-Oberfrick	AG	3,349	302,517	186,274	116,243	35	62
4094	Bözen	AG	743	54,256	34,007	20,249	27	63
4276	Kölliken	AG	4,262	376,115	236,153	139,962	33	63
4077	Tägerig	AG	1,375	94,140	59,235	34,905	25	63
4192	Boniswil	AG	1,392	112,181	70,855	41,326	30	63
1006	Marbach (LU)	LU	1,212	50,265	31,979	18,286	15	64
4203	Möriken- Wildeg	AG	4,209	316,637	202,132	114,505	27	64
4177	Sisseln	AG	1,461	143,066	91,494	51,572	35	64
1126	Ebersecken	LU	415	5,135	3,298	1,837	4	64
4005	Erlinsbach (AG)	AG	3,762	481,298	309,710	171,588	46	64
4120	Veltheim (AG)	AG	1,415	146,281	96,544	49,737	35	66
4163	Frick	AG	5,050	450,818	298,870	151,948	30	66
4195	Egliswil	AG	1,332	101,734	67,567	34,167	26	66
1138	Ohmstal	LU	307	9,147	6,101	3,046	10	67
4140	Oberkulm	AG	2,491	173,251	115,627	57,624	23	67
4114	Schinznach-Bad	AG	1,183	91,422	61,911	29,511	25	68
4183	Zeihen	AG	1,060	80,439	54,625	25,814	24	68

BFS- No.	Name of community	Canton	Pop.	Permissible floor areas in residential zones [m ²]	Built floor areas in residential zones [m ²]	Floor area reserves in residential zones [m ²]	Floor area reserves in residential zones per inhabitant [m ²]	Degree of develop- ment of residential zones [%]
1025	Ermensee	LU	874	51,566	35,365	16,201	19	69
4132	Birrwil	AG	968	108,793	74,750	34,043	35	69
4112	Rüfenach	AG	874	58,433	40,371	18,062	21	69
1002	Entlebuch	LU	3,296	147,183	102,293	44,890	14	70
4201	Lenzburg	AG	8,626	593,865	413,723	180,142	21	70
4003	Buchs (AG)	AG	7,262	516,127	360,097	156,030	21	70
4093	Birrhard	AG	663	50,031	34,933	15,098	23	70
4223	Auw	AG	1,782	113,133	79,193	33,940	19	70
4134	Dürrenäsch	AG	1,198	133,118	93,186	39,932	33	70
4210	Staufen	AG	2,585	223,422	157,013	66,409	26	70
4082	Wohlen (AG)	AG	14,879	1,076,598	757,831	318,767	21	70
4229	Bünzen	AG	1,009	67,032	47,297	19,735	20	71
4099	Habsburg	AG	414	32,887	23,210	9,677	23	71
4193	Brunegg	AG	683	63,469	44,813	18,656	27	71
1005	Hasle (LU)	LU	1,751	74,566	52,741	21,825	12	71
4008	Küttigen	AG	5,866	545,987	386,908	159,079	27	71
4007	Hirschthal	AG	1,493	133,071	94,431	38,640	26	71
1135	Luthern	LU	1,327	23,096	16,394	6,702	5	71
1007	Romoos	LU	695	8,370	5,959	2,411	3	71
4253	Magden	AG	3,790	331,390	236,251	95,139	25	71
4274	Brittnau	AG	3,777	325,880	232,486	93,394	25	71
1122	Altbüron	LU	951	48,153	34,560	13,593	14	72
1121	Alberswil	LU	590	38,834	27,878	10,956	19	72
4064	Büttikon	AG	949	63,146	45,447	17,699	19	72
4200	Hunzenschwil	AG	3,413	278,419	201,199	77,220	23	72
4069	Hermet- schwil-Staffeln	AG	1,133	102,846	74,668	28,178	25	73
4144	Schöftland	AG	3,895	316,619	230,077	86,542	22	73
4289	Zofingen	AG	10,824	818,433	596,045	222,388	21	73
4196	Fahrwangen	AG	1,964	132,692	96,884	35,808	18	73
4315	Rekingen (AG)	AG	979	74,230	54,297	19,933	20	73
4202	Meisterschwanden	AG	2,695	278,285	203,667	74,618	28	73
4313	Leuggern	AG	2,099	139,809	102,328	37,481	18	73
4065	Dottikon	AG	3571	266,125	195,106	71,019	20	73
4320	Tegerfelden	AG	1,071	64,529	47,417	17,112	16	73
4316	Rietheim	AG	766	52,845	38,852	13,993	18	74
4078	Uezwil	AG	428	29,783	21,929	7,854	18	74
4240	Waltenschwil	AG	2,592	172,916	127,704	45,212	17	74
4122	Villnachern	AG	1,529	118,803	87,801	31,002	20	74

<i>BFS- No.</i>	<i>Name of community</i>	<i>Canton</i>	<i>Pop.</i>	<i>Permissible floor areas in residential zones [m²]</i>	<i>Built floor areas in residential zones [m²]</i>	<i>Floor area reserves in residential zones [m²]</i>	<i>Floor area reserves in residential zones per inhabitant [m²]</i>	<i>Degree of develop- ment of residential zones [%]</i>
4146	Unterkulm	AG	2,848	198,197	147,129	51,068	18	74
4308	Kaiserstuhl	AG	403	9,120	6,793	2,327	6	74
4282	Rothrist	AG	8,198	696,151	520,069	176,082	21	75
4068	Hägglingen	AG	2,312	206,393	154,358	52,035	23	75
4107	Mülligen	AG	1,035	34,420	25,823	8,597	8	75
4028	Freienwil	AG	942	64,148	48,265	15,883	17	75
4271	Aarburg	AG	7,193	422,857	318,992	103,865	14	75
1143	Schötz	LU	3,557	215,161	162,726	52,435	15	76
1145	Ufhusen	LU	847	18,219	13,792	4,427	5	76
1136	Menznau	LU	2,870	150,464	114,000	36,464	13	76
4072	Niederwil (AG)	AG	2,441	193,545	146,730	46,815	19	76
1132	Hergiswil bei Willisau	LU	1,831	42,479	32,241	10,238	6	76
4100	Hausen (AG)	AG	3,117	235,050	178,876	56,174	18	76
4321	Unterenzingen	AG	367	24,958	19,075	5,883	16	76
4111	Riniken	AG	1,464	111,088	85,204	25,884	18	77
4305	Endingen	AG	2,036	163,982	126,238	37,744	19	77
1147	Wikon	LU	1,416	90,003	69,306	20,697	15	77
4104	Lupfig	AG	2,189	128,681	99,455	29,226	13	77
4285	Strengelbach	AG	4,660	278,782	216,477	62,305	13	78
1082	Büron	LU	2,211	148,681	115,921	32,760	15	78
1032	Hohenrain	LU	2,418	73,666	57,839	15,827	7	79
1091	Mauensee	LU	1,161	69,653	54,717	14,936	13	79
4238	Rottenschwil	AG	783	41,602	32,941	861	11	79
1139	Pfaffnau	LU	2,245	114,253	90,612	23,641	11	79
1150	Zell (LU)	LU	2,001	114,349	90,870	23,479	12	79
1100	Schlierbach	LU	755	28,029	22,335	5,694	8	80
1008	Schüpfheim	LU	4,053	144,919	115,517	29,402	7	80
1009	Werthenstein	LU	1,967	69,216	55,206	14,010	7	80
4009	Muhen	AG	3,688	294,545	235,054	59,491	16	80
4041	Stetten (AG)	AG	1,758	162,747	131,240	31,507	18	81
4207	Schafisheim	AG	2,837	223,791	180,523	43,268	15	81
4033	Mellingen	AG	4,748	250,523	203,072	47,451	10	81
4303	Böttstein	AG	3,684	199,703	162,162	37,541	10	81
1066	Schwarzenberg	LU	1,676	118,369	96,175	22,194	13	81
4010	Oberentfelden	AG	7,663	531,065	432,104	98,961	13	81
4012	Suhr	AG	9,673	651,041	531,215	119,826	12	82
4032	Mägenwil	AG	2,041	105,734	86,756	18,978	9	82
4048	Würenlos	AG	5,850	421,934	346,920	75,014	13	82

BFS- No.	Name of community	Canton	Pop.	Permissible floor areas in residential zones [m ²]	Built floor areas in residential zones [m ²]	Floor area reserves in residential zones [m ²]	Floor area reserves in residential zones per inhabitant [m ²]	Degree of develop- ment of residential zones [%]
4318	Schneisingen	AG	1,329	75,295	62,281	13,014	10	83
1039	Römerswil	LU	1,632	50,602	41,918	8,684	5	83
4280	Oftringen	AG	12,939	772,691	643,315	129,376	10	83
4204	Niederlenz	AG	4,333	336,932	280,861	56,071	13	83
4037	Oberrohrdorf	AG	3,929	351,816	294,275	57,541	15	84
1086	Grosswangen	LU	3,074	117,336	98,193	19,143	6	84
4209	Seon	AG	4,795	309,417	259,167	50,250	10	84
4121	Villigen	AG	2,028	126,229	105,892	20,337	10	84
4230	Buttwil	AG	1,174	69,678	59,093	10,585	9	85
4073	Oberlunkhofen	AG	1,956	159,062	135,504	23,558	12	85
4236	Muri (AG)	AG	7,246	446,023	381,728	64,295	9	86
1095	Oberkirch	LU	3,808	135,647	116,429	19,218	5	86
1092	Neudorf	LU	1,233	54,675	47,029	7,646	6	86
4075	Rudolfstet- ten-Friedlisberg	AG	4,319	286,064	246,326	39,738	9	86
4042	Turgi	AG	2,937	121,789	105,136	16,653	6	86
4080	Villmergen	AG	6,448	396,480	343,623	52,857	8	87
1140	Reiden	LU	6,650	311,937	271,399	40,538	6	87
1146	Wauwil	LU	1,859	123,978	108,335	15,643	8	87
4199	Holderbank (AG)	AG	1,001	81,909	72,034	9,875	10	88
1137	Nebikon	LU	2,452	173,639	152,992	20,647	8	88
1064	Meierskappel	LU	1,301	61,222	54,014	7,208	6	88
1129	Fischbach	LU	731	24,329	21,664	2,665	4	89
4092	Birr	AG	4,197	284,554	253,503	31,051	7	89
1104	Triengen	LU	4,416	244,097	217,755	26,342	6	89
4095	Brugg	AG	10,611	780,713	703,024	77,689	7	90
4039	Remetschwil	AG	2,053	154,095	139,551	14,544	7	91
1030	Hitzkirch	LU	4,832	237,896	215,594	22,302	5	91
1130	Gettnau	LU	1,033	38,477	35,057	3,420	3	91
1083	Buttisholz	LU	3,257	138,607	126,630	11,977	4	91
1056	Greppen	LU	1,050	62,971	57,530	5,441	5	91
1085	Geuensee	LU	2,592	134,643	123,245	11,398	4	92
4224	Beinwil (Freiamt)	AG	1,047	24,822	22,875	1,947	2	92
1062	Malters	LU	6,861	325,529	301,530	23,999	3	93
4029	Gebenstorf	AG	4,801	276,441	256,727	19,714	4	93
1128	Ettiswil	LU	2,486	103,811	96,499	7,312	3	93
1131	Grossdietwil	LU	853	25,927	24,296	1,631	2	94
4027	Fislisbach	AG	5,441	340,055	318,696	21,359	4	94
4123	Windisch	AG	6,732	397,773	373,075	24,698	4	94

<i>BFS- No.</i>	<i>Name of community</i>	<i>Canton</i>	<i>Pop.</i>	<i>Permissible floor areas in residential zones [m²]</i>	<i>Built floor areas in residential zones [m²]</i>	<i>Floor area reserves in residential zones [m²]</i>	<i>Floor area reserves in residential zones per inhabitant [m²]</i>	<i>Degree of develop- ment of residential zones [%]</i>
4083	Zufikon	AG	4,250	262,598	247,729	14,869	3	94
1097	Rickenbach (LU)	LU	2,336	112,723	106,858	5,865	3	95
1081	Beromünster	LU	4,800	203,595	193,866	9,729	2	95
4044	Untersiggenthal	AG	6,876	496,398	472,812	23,586	3	95
4045	Wettingen	AG	20,135	899,541	856,827	42,714	2	95
4231	Dietwil	AG	1,214	50,092	48,575	1,517	1	97
4110	Remigen	AG	1,064	64,245	62,350	1,895	2	97
1089	Knutwil	LU	2,077	141,024	137,234	3,790	2	97
4066	Eggenwil	AG	904	59,866	58,564	1,302	1	98
4071	Jonen	AG	1,966	98,109	96,757	1,352	1	99
1094	Nottwil	LU	3,443	179,498	178,351	1,147	0	99
1088	Hildisrieden	LU	1,969	122,852	122,448	404	0	100
1055	Gisikon	LU	1,148	76,563	76,964	-401	0	101
1098	Ruswil	LU	6,636	289,425	291,526	-2,101	0	101
1037	Rain	LU	2,494	115,600	117,114	-1,514	-1	101
1031	Hochdorf	LU	8,877	452,101	459,342	-7,241	-1	102
1123	Altishofen	LU	1,531	69,765	71,124	-1,359	-1	102
1125	Dagmersellen	LU	5,103	198,220	202,976	-4,756	-1	102
4023	Bergdietikon	AG	2,404	202,876	207,963	-5,087	-2	103
4222	Aristau	AG	1,362	57,258	59,093	-1,835	-1	103
1001	Doppleschwand	LU	739	27,883	29,210	-1,327	-2	105
4062	Berikon	AG	4,519	255,355	267,694	-12,339	-3	105
1093	Neuenkirch	LU	6,185	253,584	266,132	-12,548	-2	105
4063	Bremgarten (AG)	AG	6,447	306,488	322,743	-16,255	-3	105
4034	Neuenhof	AG	8,360	346,598	367,608	-21,010	-3	106
1103	Sursee	LU	9,079	403,516	434,120	-30,604	-3	108
1065	Root	LU	4,633	206,845	222,534	-15,689	-3	108
1127	Egolzwil	LU	1,321	72,798	79,387	-6,589	-5	109
4061	Arni (AG)	AG	1,830	115,335	125,824	-10,489	-6	109
4024	Birmenstorf (AG)	AG	2,727	174,135	190,206	-16,071	-6	109
1701	Baar	ZG	22,355	1,036,937	1,135,589	-98,652	-4	110
4002	Biberstein	AG	1,481	152,096	169,640	-17,544	-12	112
4026	Ennetbaden	AG	3,167	222,361	249,359	-26,998	-9	112
1151	Willisau	LU	7,439	316,631	355,300	-38,669	-5	112
1023	Ballwil	LU	2,577	102,190	115,385	-13,195	-5	113
1107	Wolhusen	LU	4,143	207,442	234,839	-27,397	-7	113
1702	Cham	ZG	15,020	645,105	737,922	-92,817	-6	114
1067	Udligenswil	LU	2,196	114,968	132,535	-17,567	-8	115
1711	Zug	ZG	27,537	1,221,607	1,408,649	-187,042	-7	115

BFS- No.	Name of community	Canton	Pop.	Permissible floor areas in residential zones [m ²]	Built floor areas in residential zones [m ²]	Floor area reserves in residential zones [m ²]	Floor area reserves in residential zones per inhabitant [m ²]	Degree of develop- ment of residential zones [%]
1033	Inwil	LU	2,306	86,899	100,299	-13,400	-6	115
1058	Horw	LU	13,618	757,420	878,330	-120,910	-9	116
1704	Menzingen	ZG	4,335	177,561	208,580	-31,019	-7	117
1707	Risch	ZG	9,779	336,534	396,718	-60,184	-6	118
1708	Steinhausen	ZG	9,213	459,002	541,683	-82,681	-9	118
1026	Eschenbach (LU)	LU	3,547	145,004	171,202	-26,198	-7	118
1102	Sempach	LU	4,105	185,554	221,210	-35,656	-9	119
1706	Oberägeri	ZG	5,653	330,185	393,838	-63,653	-11	119
1057	Honau	LU	366	18,772	22,409	-3,637	-10	119
1054	Ebikon	LU	12,571	527,423	632,302	-104,879	-8	120
1084	Eich	LU	1,690	91,920	113,584	-21,664	-13	124
1710	Walchwil	ZG	3,593	242,878	306,173	-63,295	-18	126
1709	Unterägeri	ZG	8,280	406,732	517,931	-111,199	-13	127
1705	Neuheim	ZG	2,006	98,677	126,209	-27,532	-14	128
1099	Schenkon	LU	2,678	120,205	154,221	-34,016	-13	128
4038	Obersiggenthal	AG	8,450	391,702	512,553	-120,851	-14	131
1053	Dierikon	LU	1,467	48,360	63,470	-15,110	-10	131
1059	Kriens	LU	26,751	993,633	1,326,674	-333,041	-12	134
1063	Meggen	LU	6,752	412,399	565,625	-153,226	-23	137
4040	Spreitenbach	AG	10,930	326,491	460,932	-134,441	-12	141
1703	Hünenberg	ZG	8,804	413,295	589,008	-175,713	-20	143
4252	Kaiseraugst	AG	5,481	295,609	428,379	-132,770	-24	145

Category of community	Number	Absolute FAR [m ²]	Median [m ² /inh.]	25 th percentile [m ² /inh.]	75 th percentile [m ² /inh.]	min. [m ² /inh.]	max. [m ² /inh.]
Small community	102 (53%)	2.5 Mio.	20	10	35	0	68
Medium-sized community	84 (44%)	5.8 Mio.	14	7	24	0	68
Large community	5 (3%)	0.8 Mio.	10	5	21	2	21

Table A2: Estimation of floor area reserves (only positive values) per inhabitant in residential zones of selected communes in the Cantons of LU, ZG, AG (2012) [source: author's representation, data: swisstopo 2013a, swisstopo 2013b, cantonal spatial planning departments, INFOPLAN-ARE 2012, BFS 2013d, AGIS Canton of Aargau 2013, Grundbuch- and Vermessungsamt [Land registry and surveyor's office] Canton of Zug 2013, rawi Canton of Lucerne 2013]

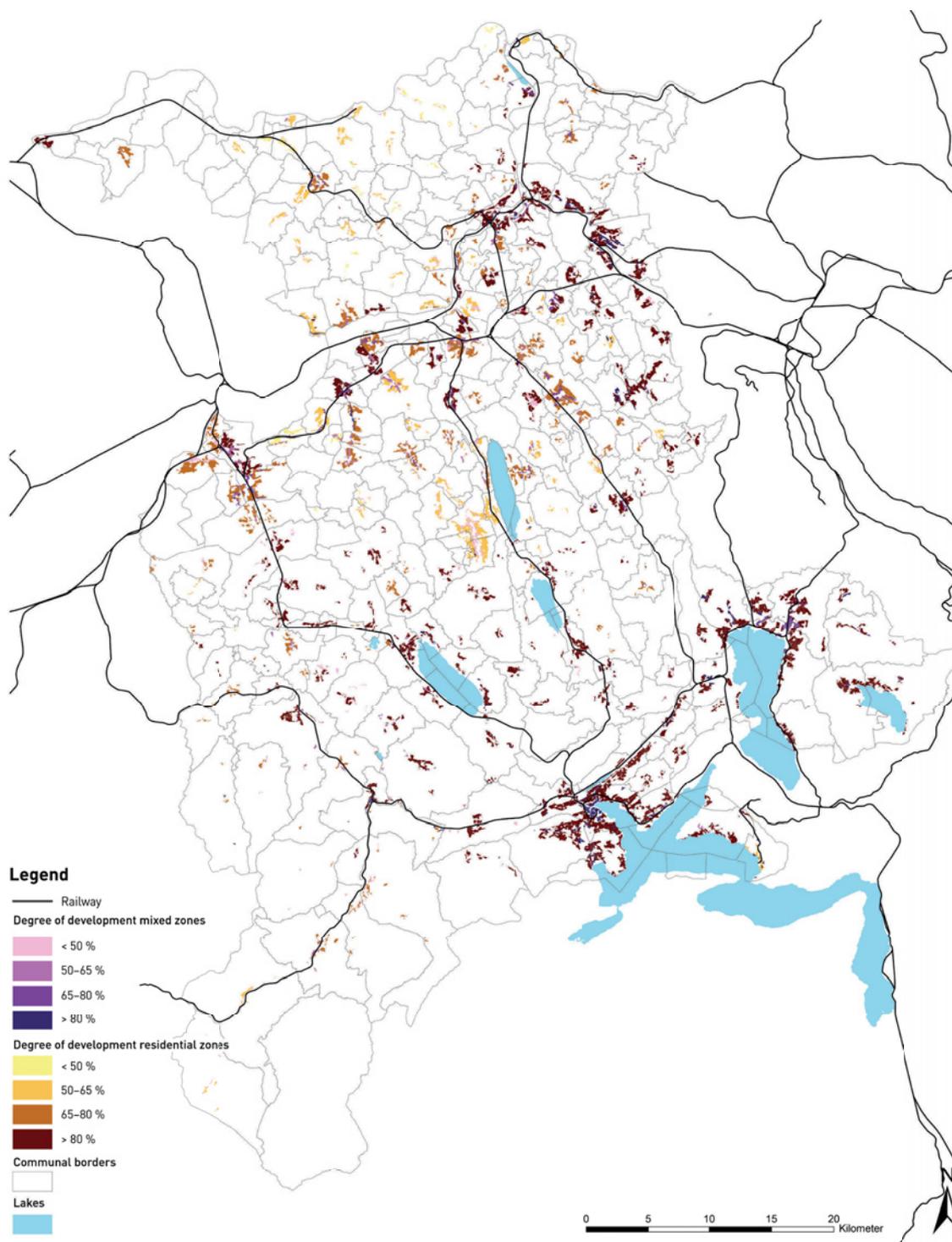


Figure A1: Degree of development of residential and mixed zones in selected communes in the Cantons of LU, ZG, AG [2012] (source: author's representation, data: swisstopo 2013a, swisstopo 2013b, cantonal spatial planning departments, INFOPLAN-ARE 2012, BFS 2013d, AGIS Canton of Aargau 2013, Grundbuch- and Vermessungsamt [Land registry and surveyor's office] Canton of Zug 2013, rawi Canton of Lucerne 2013)

II Method for plot-level estimation of floor-area reserves and degree of development in residential zones

II.I Objective

As a supplement to the method described in Chapter II, the degree of development is also estimated on a plot-level basis. The objective of the procedure is to quantitatively estimate the floor-area reserves and the degree of development of residential zones within existing land-use planning. To this end, 20 selected communes in the Canton of Solothurn may serve as examples⁹. The method should be comprehensible to municipal authorities and reproducible for a spatial planner. The results should permit presentation in categories of small-, medium-, and large-sized communes. The generated key figures should permit more detailed assessments on a plot-level basis.

II.II Definitions

The degree of development denotes the ratio of the actually implemented floor areas to the permissible floor areas as per building law:

$$\text{Degree of development } D [\%] = \frac{\text{FA}^{\text{built}}}{\text{GFA}^{\text{permissible}} * c} * 100$$

FA^{built} Actually realized floor area on the plot [m²]

$\text{GFA}^{\text{permissible}}$ Maximum gross floor area permissible by building law [m²]

c Correction factor 1.15

The floor areas implemented on the plots exclusively concern above-ground building parts, which is why this value cannot be used for conversion into the floor area indicator, as per the IVHB (IOHB:Appendix 2).

II.III Data sources and data processing

The data used should reflect the actual situation on the plots as accurately as possible. This achieves the most plausible possible representation of the degree of development, which can, moreover, be compared across municipal boundaries. For processing purposes, in particular the programs Excel, SPSS (Statistics program by IBM), and FME (Feature Manipulation Engine) were used¹⁰. The examination was carried out from January 2014 to April 2014.

a. Actually built floor areas

The actually built floor areas are computed using the official survey data of the canton and the RBD data of the BFS¹¹. A part of the building areas from the official survey data has an EGID value (Federal Identifier for Buildings). The RBD data are so-called point data, where the specification on the number of floors is of particular interest. All points contain an EGID value. Buildings in residential zones which are not considered in the degree of development (garages, railway stations) are filtered in the ArcGIS through an attribute in the RBD data.

To calculate the built floor areas, the building areas from the official survey data are combined with the RBD points. If the official survey data have an EGID value, the associated RBD points are added; if the official survey data have no EGID value, a spatial cut

⁹ See fig.32, p. 80.

¹⁰ FME is a GIS software of the company Safe Software. It functions like the model builder in ArcGIS, while the advantage lies particularly in the faster calculation necessary for the large datasets. The change from ArcGIS to FME therefore took place at an early timepoint, though ArcGIS continued to be used to examine and present the results.

¹¹ Polygons with an area of < 30 m² are removed, since there is a high probability that these are not residential buildings (auxiliary buildings, garages, garden sheds, etc.).

is carried out. Since not all RBD points lie within a building, those RBD points that lie outside buildings must be brought close to the next possible building (> 35 m²) beforehand using a neighbor search¹².

Finally, the number of floors is multiplied by the building areas¹³, resulting in the floor area per building. The data quality of the RBD data varies widely, depending on the commune, although it is the only homogeneous data source available for the purpose of ascertaining the number of floors, transcending municipal and cantonal boundaries.

b. Permissible floor area

Using the zonal plans of the communes from the cantonal GIS database (SOGIS)¹⁴ and the municipal identification numbers of Switzerland of the BFS, a cut is carried out first using ArcGIS so that each zone can clearly be assigned to a commune. Subsequently, the new attribute¹⁵ of usage indicators is manually recorded in the attribute table of the zonal plans, using the municipal zonal plans and building regulations¹⁶. Reserve zones are not considered to be building zones, since the cantonal building regulations stipulate that the assignment of a reserve zone to a building zone requires a proper land-use planning procedure¹⁷.

Now the residential zones marked with an 'AZ' can be employed. The plots (properties) can likewise be ascertained on the cantonal GIS platform SOGIS. With the aid of a cut¹⁸, the two datasets (plots and zonal

plans) are merged, which allows each plot to receive its own distinct usage indicator¹⁹. Subsequently, the theoretically possible gross floor area is ascertained by multiplying the area of the plot by the usage indicator. Here, the plot area is considered to be identical with the applicable property area. In a final step, all plots are removed whose permissible gross floor area is less than 1 m² ²⁰.

c. Correction factor

In order to compare the permissible gross floor areas with the actually realized net floor areas, these must first be converted into floor areas using a correction factor. In most cantonal planning and building laws, ancillary and functional areas (stairwells, winter gardens, or laundries, for example) are not added to the expressed use and hence also not to the gross floor area, though they are represented in building areas from the data of the official survey. The net floor areas from the official survey data are, therefore, larger than the gross floor areas from the land-use plans. Accordingly, the gross floor areas are multiplied by a factor of 1.15. This +15% factor is a rather generous value, but since the building areas from the official survey data tend to be too large (projecting building parts and balconies, for example, are also depicted as part of the floor area), this value does seem justified.

12 In officially surveyed buildings without RBD data (or vice versa), the procedure is as follows: If the RBD points are more up-to-date than the officially surveyed buildings (no officially surveyed buildings yet), and if the RBD points have a ground-plan area (attribute value), they are used for the subsequent calculation. Officially surveyed buildings that are larger than 50 m² but have no RBD point are assigned a floor number of '1.'

13 Or with the area attribute of the RBD data.

14 Categorized according to W1, W2, W3, etc., without usage indicators. The zonal plans of the communes of Langendorf and Oberdorf were missing in the platform and were directly gathered from the communes.

15 The attribute 'krit' is created to mark zones with specific uncertainties (1 if 'critical', otherwise 0). In case of doubt, the zonal plans of the canton are relied on, since they have the highest up-to-dateness. With the aid of aerial photos and Google Maps (search for change of land use/new zoning), in the case of discrepancies between the sources, the attempt is made to select what is more probable.

16 In Feldbrunnen-St.Niklaus, the design plans are contained in the zonal plan. Generally, however, the specification of a usage indicator is missing, so that the zone is adopted as in the zonal plan and assigned the attribute krit = 1. In Riedholz, a change of land use to the zone W4 was carried out in 2013, which does not yet exist in this form in the building regulations. A usage indicator of 0.8 was assigned as density indicator. According to the canton authorities, Biberist has residential zones > 4 floors. A usage indicator of 0.7 was defined.

17 In principle, it would be interesting to also be able to include the mixed zones in the analysis. However, unlike other cantons the Canton of Solothurn does not have mixed zones. Rather, the mixed zones are called 'commercial zones with residential use.' Frequently, a maximum usage indicator for residential usage is prescribed, and it is recorded that the share of work usage should be larger. A useful estimation is, therefore, impossible using the present method – or too many assumptions would have to be made.

18 Or AreaOnArea-Overlay in FME.

19 Plots that were divided because of the AreaOnArea Overlay (for example, being located on two different sides of a street) are joined again (only inasmuch as they have the same usage indicator). In this case, multipart polygons are created. The area of the plots is once again calculated anew (Parz_AREA).

20 This removes sliver polygons created by cutting.

II.IV Final arithmetic operation for the degree of development

The buildings must once again be blended with the plots, since sometimes a building lies on two plots. The base area of the buildings is calculated once again and is subsequently multiplied by the number of floors to ensure that the correct number of floor areas and building base areas is assigned to the right plot. For final estimation of the degree of development, the floor areas are now multiplied by the corrected permissible floor areas ascertained above. Multiplying the result by 100 displays the result as a percentage value.

II.V Discussing the methodology

In contrast to the method on a municipal level (see Appendix I), the above-mentioned method for estimating the degree of development on the level of the plot is significantly more reliable. Nevertheless, the results represent an estimation. Because of further influences (unfavorable geometry, boundary margins, building lines, forest margins, other construction bans or private-law stipulations, etc.), however, the actual development potential is reduced. On the other hand, usage transfers onto directly neighboring plots would still allow the constructional densities to be realized. For these reasons, the value estimated using the present method remains plausible.

II.VI Results

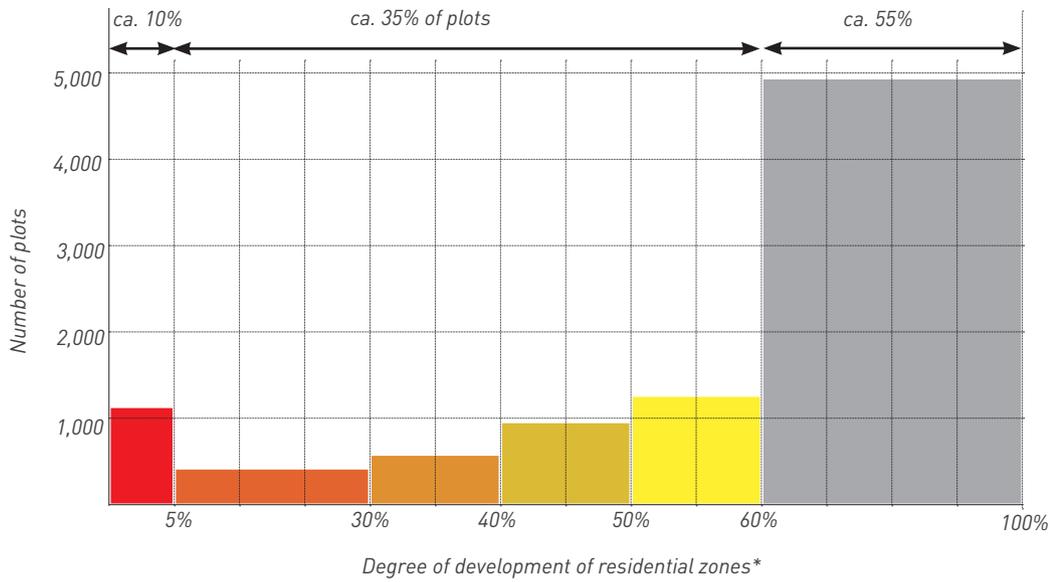
Name of community	Inh.	Categories of degree of development	FAR per category [m ²]	Number of plots	Total FAR with degree of development 0–60% [m ²] rounded	Population capacity (40–50 m ² floor area per inhabitant) rounded
Lüsslingen	520	< 5%	13,623	29	25,000	500–620
		5–30%	2,651	6		
		30–40%	2,535	8		
		40–50%	2,701	12		
		50–60%	3,466	19		
		60–100%	4,726	62		
Nennigkofen	488	< 5%	6,321	13	23,000	450–570
		5–30%	7,923	16		
		30–40%	2,129	5		
		40–50%	3,021	11		
		50–60%	3,296	10		
		60–100%	2,945	34		
Horriwil	839	< 5%	11,070	28	24,000	470–590
		5–30%	1,867	5		
		30–40%	2,729	11		
		40–50%	4,226	22		
		50–60%	3,802	23		
		60–100%	5,796	82		
Kriegstetten	1,259	< 5%	15,067	38	42,000	850–1060
		5–30%	3,889	10		
		30–40%	10,155	36		
		40–50%	7,075	34		
		50–60%	6,150	32		
		60–100%	18,818	308		
Oekinggen	771	< 5%	10,879	23	22,000	450–560
		5–30%	1,977	7		
		30–40%	3,083	9		
		40–50%	2,163	10		
		50–60%	4,146	24		
		60–100%	6,803	95		

Table A3: Floor area reserves (FAR) in the residential zones per commune and according to different degrees of development in 20 communes in the Canton of Solothurn (2013) [source: author's representation, data: swisstopo 2012, swisstopo 2013, BFS 2013d, Canton of Solothurn SO!GIS 2013, current zonal plans and regulations of the surveyed communes]

Name of community	Inh.	Categories of degree of development	FAR per category [m ²]	Number of plots	Total FAR with degree of development 0-60% [m ²] rounded	Population capacity (40-50 m ² floor area per inhabitant) rounded
Feldbrunn-St.Niklaus	919	< 5%	5,482	8	24,000	490-610
		5-30%	5,930	6		
		30-40%	3,948	12		
		40-50%	4,200	12		
		50-60%	4,791	21		
		60-100%	6,921	73		
Oberdorf (SO)	1651	< 5%	21,978	60	50,000	1,000-1,260
		5-30%	7,594	11		
		30-40%	7,379	22		
		40-50%	6,896	28		
		50-60%	6,517	32		
		60-100%	14,469	217		
Rüttenen	1443	< 5%	23,366	51	70,000	1,410-1,760
		5-30%	12,406	23		
		30-40%	11,198	36		
		40-50%	12,036	46		
		50-60%	11,345	54		
		60-100%	11,933	134		
Biberist	8125	< 5%	47,154	122	168,000	3,360-4,200
		5-30%	26,626	50		
		30-40%	23,988	82		
		40-50%	35,400	155		
		50-60%	34,783	183		
		60-100%	60,181	817		
Dettingen	2233	< 5%	34,285	86	74,000	1,480-1,840
		5-30%	8,348	20		
		30-40%	7,475	25		
		40-50%	12,764	61		
		50-60%	10,901	65		
		60-100%	37,723	273		
Derendingen	6058	< 5%	40,642	87	158,000	3,160-3,950
		5-30%	32,087	41		
		30-40%	32,324	115		
		40-50%	29,522	133		
		50-60%	23,519	146		
		60-100%	37,723	471		

Name of community	Inh.	Categories of degree of development	FAR per category [m ²]	Number of plots	Total FAR with degree of development 0–60% [m ²] rounded	Population capacity (40–50 m ² floor area per inhabitant) rounded
Gerlafingen	4,888	< 5%	41,670	85	96,000	1,910–2,390
		5–30%	13,507	27		
		30–40%	13,008	47		
		40–50%	13,445	62		
		50–60%	13,971	85		
		60–100%	26,607	310		
Lohn-Ammansegg	2,634	< 5%	28,530	76	66,000	1,330–1,660
		5–30%	9,589	14		
		30–40%	9,713	41		
		40–50%	9,882	47		
		50–60%	8,766	56		
		60–100%	18,818	308		
Luterbach	3,374	< 5%	31,163	62	65,000	1,300–1,630
		5–30%	4,905	12		
		30–40%	10,859	31		
		40–50%	9,736	57		
		50–60%	8,527	66		
		60–100%	18,704	299		
Subingen	2,995	< 5%	29,578	85	52,000	1,040–1,300
		5–30%	1,635	6		
		30–40%	4,992	20		
		40–50%	8,002	33		
		50–60%	7,788	59		
		60–100%	16,148	282		
Zuchwil	8,715	< 5%	39,990	52	102,000	2,040–2,550
		5–30%	13,057	27		
		30–40%	12,277	42		
		40–50%	14,569	67		
		50–60%	21,924	128		
		60–100%	33,104	402		
Bellach	5,151	< 5%	40,626	61	82,000	1,630–2,400
		5–30%	5,147	13		
		30–40%	9,576	36		
		40–50%	13,072	65		
		50–60%	13,148	83		
		60–100%	29,432	379		

Name of community	Inh.	Categories of degree of development	FAR per category [m ²]	Number of plots	Total FAR with degree of development 0-60% [m ²] rounded	Population capacity (40-50 m ² floor area per inhabitant) rounded
Langendorf	3,756	< 5%	22,151	54	55,000	1,090-1,370
		5-30%	5,840	14		
		30-40%	4,657	17		
		40-50%	8,862	39		
		50-60%	13,166	68		
		60-100%	27,098	340		
Riedholz	2,193	< 5%	30,098	70	101,000	2,030-2,540
		5-30%	28,755	28		
		30-40%	13,915	47		
		40-50%	16,909	64		
		50-60%	11,722	68		
		60-100%	15,239	214		
<i>TOTAL small and medium-sized communes</i>					1,300,000	26,000-32,000
Solothurn	16,465	< 5%	95,865	110	173,000	3,460-4,330
		5-30%	12,337	18		
		30-40%	22,751	45		
		40-50%	17,797	66		
		50-60%	24,351	108		
		60-100%	46,273	648		



*Plots with a degree of development of over 100% and/or smaller than 200m² area are not depicted.

Figure A2: The number of plots with reference to the category of degree of development in 20 communes in the Canton of Solothurn (2013) (source: author's representation, data: swisstopo 2012, swisstopo 2013, BFS 2013d, Canton of Solothurn SO!GIS 2013, current zonal plans and regulations of the surveyed communes)

III Degree of development and typologies

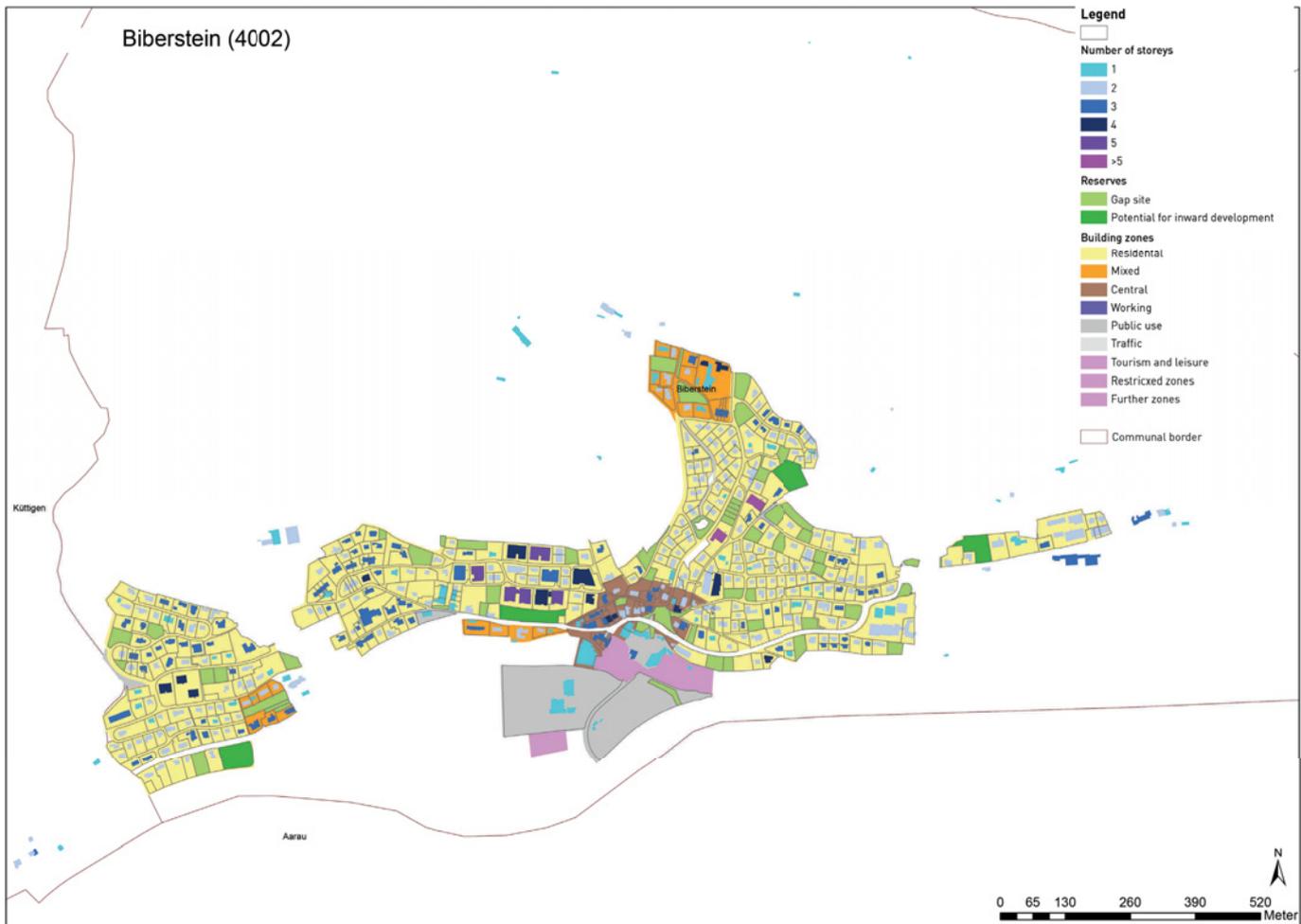


Figure A3: A small commune with high degree of development of residential zones (112%)

[source: author's representation, data: swisstopo 2012, swisstopo 2013, cantonal spatial planning departments, INFOPLAN-ARE 2012, AGIS Canton of Aargau 2013]

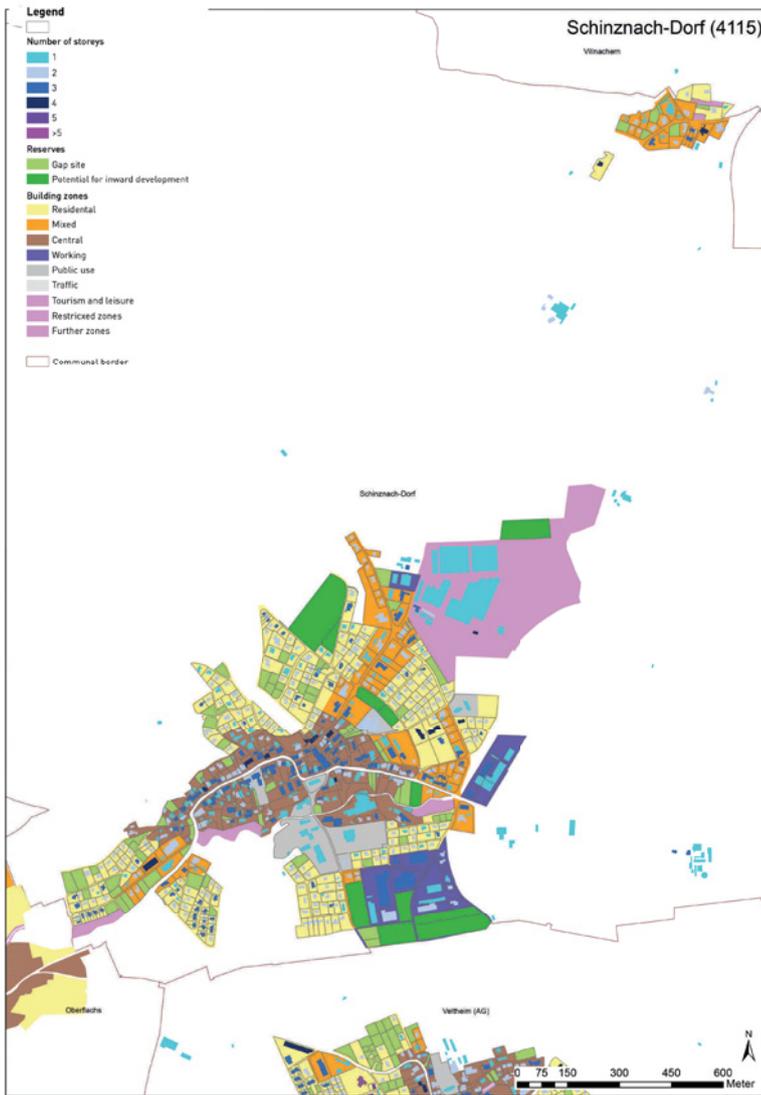


Figure A4: A small commune with a low degree of development of residential zones (50%)

[source: author's representation, data: swisstopo 2012, swisstopo 2013, cantonal spatial planning departments, INFOPLAN-ARE 2012, AGIS Canton of Aargau 2013]

IV Estimation of procedural costs for the Swiss Plateau

	Canton of Genf	Canton of Waadt	Canton of Neuenburg	Canton of Fribourg	Canton of Bern
Number of small communes in the Swiss Plateau (GRAMS 2015: 205 f.)	17	190	7	106	165
Population in small communes in the Swiss Plateau (GRAMS 2015: 205 f.)	18,579	111,104	5,464	86,916	124,700
Number of medium-sized communes in the Swiss Plateau (GRAMS 2015: 205 f.)	16	53	12	30	71
Population in medium-sized communes in the Swiss Plateau (GRAMS 2015: 205 f.)	64,880	217,851	52,900	110,839	270,526
Annual procedural costs for the informal pre schedule for the local planning revision ('inward development guide') for cantons* [kCHF]	81–109	554–760	41–62	311–419	527–729
Annual procedural costs for the informal pre schedule for the local planning revision ('inward development guide') for cantons as well as small- and medium-sized communes* [kCHF]	240–336	1,640–2,352	120–288	920–1,296	1,560–2,256
Annual procedural costs for the common local planning revision for small- and medium-sized communes* [kCHF]	492–640	3,234–4,259	300–388	1,812–2,386	3,258–4,273
Annual procedural costs** for the 'local planning revision of the third generation' for small- and medium-sized communes* [kCHF]	565–721	3,541–4,661	352–443	1,985–2,612	3,625–4,722
Difference in procedural costs between the common local planning revision and the 'local planning revision of the third generation'**	+ 13–15%	+ 9%	+ 14–17%	+ 9–10%	+ 11%
Annual building investments*** in the cantons 2013 (BFS 2014d) [kCHF]	3,604,732	5,157,175	722,377	2,081,988	6,591,935
Annual procedural costs for the 'inward development guide' as percentage of the building investments 2013 (costs for cantons as well as small- and medium-sized communes)	< 0.01%	0.03–0.05%	0.02–0.04%	0.04–0.06%	0.02–0.03%

* Rhythm of local planning revisions 10–15 years

** Without use of contributions from the surplus value levy due to rezoning to higher density

*** Investments in the entire cantonal area in buildings for supply, disposal, traffic, and communication, education and research, health, culture and recreation, agriculture and forestry, industry, business, services, housing

Table A4: Estimation of procedural costs for the 'local planning revision of the third generation' for cantons as well as for small- and medium-sized communes in the Swiss Plateau (source: author's representation)

<i>Canton of Zug</i>	<i>Canton of Schwyz</i>	<i>Canton of Luzern</i>	<i>Canton of Solothurn</i>	<i>Canton of Aargau</i>	<i>Canton of Zurich</i>	<i>Canton of Schaffhausen</i>	<i>Canton of St. Gallen</i>	<i>Canton of Thurgau</i>
0	0	29	52	91	55	19	8	39
0	0	32,333	41,665	93,905	57,936	16,111	7,406	46,253
5	9	42	30	76	87	5	22	35
40,025	51,714	178,508	120,709	333,723	422,305	16,697	120,552	120,451
14–16	27–31	162–217	189–248	378–512	324–434	54–78	68–93	162–233
40–48	80–96	480–672	560–768	1,120–1,584	960–1,344	160–240	200–288	480–720
90–115	162–207	1,104–1,430	1,164–1,522	2,460–3,204	2,226–2,881	318–419	492–634	1,098–1,429
110–135	198–234	1,287–1,627	1,310–1,694	2,810–3,599	2,602–3,284	348–458	584–730	1,258–1,608
+ 17–22%	+ 17–22%	+ 14–17%	+ 11–13%	+ 12–14%	+ 14–17%	+ 9%	+ 15–19%	+ 13–15%
851,825	1,031,285	2,402,323	1,639,666	3,835,786	10,247,464	419,126	2,650,175	1,791,720
< 0.01%	< 0.01%	0.02–0.03%	0.03–0.05%	0.03–0.04%	< 0.01%	0.04–0.06%	< 0.01%	0.03–0.04%

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About the author



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After graduated as architect in 1996 at ETH Zurich, Anita Grams was project leader in several architectural companies and private planning offices in Switzerland. 2009 she completed post-graduate studies in Spatial Planning at the ETH Zurich and was appointed as professor for architecture and spatial planning at Bern University of Applied Sciences. Since 2012 she is a lecturer at the Institute for Spatial and Landscape Planning at ETH Zurich. Her teaching activities reach from planning methods and instruments, scientific working in spatial planning to coaching of project teams. Since 2015 she is the study programme coordinator of the MAS programme in Spatial Planning at ETH Zurich. This programme of further education was established in 1965 and addresses to professionals with leadership responsibility in complex spatial tasks.

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Her research focus is on development of innovative planning processes and methods for inward development in small and medium sized municipalities to which she completed her doctoral thesis in 2015 at ETH Zurich. This publication under the title *Playing with Density* was awarded 2017 by the International Society of City and Regional Planners ISOCARP with the Gerd Albers Award. Her latest research interest lies on experimental teaching methods in spatial planning and process-orientated learning as key skill in handling uncertainty.

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The revised Swiss Spatial Planning Law, which came into effect in 2014, and the minimum strategy of 'inward development before outward development' obligate municipalities to direct their spatial development to ward existing, largely built-up spaces, and to coordinate building zone dimensioning across municipal boundaries. For many small- and medium-sized municipalities in Switzerland, this means changing thought patterns with regard to spatial planning practice.

A major element of inward development is the constructional densification of existing settlement areas. However, especially in small- and medium-sized municipalities, densification is confronted with numerous problems, such as insufficient acceptance of dense building typologies, mobilisation obstacles for reserves secured under building law, and the lack of thought patterns concerning inward development. This is where the research in this volume sets in, leading to the hypothesis that inward development in the main settlement areas of Switzerland is possible, but that the existing formal instruments of spatial planning themselves are insufficient for this purpose.

An estimation of the reserves in the Swiss Plateau shows that there is a theoretical capacity for accommodating around 0.5–1 million additional inhabitants there is without having to adjust the formal instruments. Around two-thirds of all reserves are located in small- and medium-sized municipalities with fewer than 10,000 inhabitants, which, moreover, make up 93% of all administrative units of the Swiss Plateau. In addition, it is estimated that half of the floor area reserves lie on already built-up, though underused, plots. In the main settlement area of Switzerland, a systematic 'density eschewal' is taking place in small- and medium-sized municipalities.

In order to help inward development achieve a breakthrough in the main settlement area in Switzerland, informal procedures are needed in these municipal categories that result in a revision of local planning. In doing so, informal procedures should not negate the specific organisational form of small- and medium-sized municipalities, namely, the militia system of governance, but should rather adapt to this principle. An 'inward development compass' brings together the knowledge existing in the militia system of governance, forming the informal prelude to the 'local planning revision of the third generation' in small- and medium-sized municipalities.

The inception of the revised spatial planning law and its stipulations on inward development and densification confronts the three large-scale areas of Switzerland with different challenges. Yet driven by changes in the fields of demographics, energy, and finances, the initial problems will manifest themselves most clearly in the Swiss Plateau. If the required transformation process is to succeed, a more pronounced orientation of policy and spatial planning towards the initial problems in small- and medium-sized municipalities is necessary.