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Is a Sustainable Land-Use Policy in Germany Possible?

Beate Fischer, Frank Jöst, Bernd Klauer and Johannes Schiller

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Insights from an Analysis Applying the Concept of Stocks

Beate Fischer *[§], Frank Jöst*

University of Heidelberg

Bernd Klauer[+] and Johannes Schiller[+]

Helmholtz Centre for Environmental Research – UFZ

Abstract

Land is an essential but limited natural resource. We employ the concept of stocks to analyse driving forces for land-use conversion and to assess, whether the German political "30-hectares-goal" is feasible given the current institutional setting. In this paper major driving forces for land-use conversion are identified and underlying stocks and persistent institutional structures as well as their dynamics are investigated. It will be shown that meeting the 30-hectares-goal is unlikely. We further argue that due to persistent stocks and institutional structures land-use conversion from agricultural into urbanised land takes place on smaller time scales than its reconversion. We conclude that demographic change and regional migration processes may result in further land-use conversion even with declining population. Economic structural change as well as an increasing traffic volume will likewise contribute to further land-use conversion.

Keywords: Sustainability, Land use, Stocks, Institutional Reform

JEL-Classifcation: Q 24, Q 56, R 14, R 52

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* University of Heidelberg, Alfred-Weber-Institut, Bergheimer Str. 20, 69151 Heidelberg, Germany

[+] Helmholtz Centre for Environmental Research – UFZ, Permoserstr. 15, 04318 Leipzig, Germany

[§] Corresponding author: fischer@eco.uni-heidelberg.de

1. Introduction: Land-use conversion as sustainability issue

Land is an essential and multifunctional, albeit limited natural resource. Natural, open, and agricultural land is increasingly converted into urbanised areas. This transformation affects the quality of soils, but also entire ecosystems (Johnson 2001). Immediate environmental impacts range from local effects (e.g. soil degradation, alteration of hydrological characteristics) to regional effects (e.g. fragmentation of habitats). Land-use conversion may also bring about collateral effects, such as an increase in traffic volume or infrastructure requirements, which in turn induce further environmental effects. Beyond that, the quality and the availability of land affect the overall economic and social well-being of a society (MEA 2005). Converted land mostly serves as a site for developing road traffic infrastructure, private housing or commercial enterprises. However, the environmental and economic impacts as well as the underlying driving forces of land-use conversion are multifarious, complex, and largely contingent on the specific characteristics of the transformed piece of land and on the conditions at hand. This contingency makes it difficult to scientifically assess problems of land-use conversion in general terms. Correspondingly, there is no general agreement on how far and under which circumstances such land-use conversions are desirable or from which point on they should be considered unsustainable (Johnson 2001).

Despite the difficulties in revising the problem scientifically, growing awareness of the stated interdependencies and in particular of the possible adverse environmental effects has resulted in increasing political efforts towards developing sustainable land-use strategies. In this context, the German Federal Government has in 2002 proposed the so-called “30-hectares-goal”. As a part of the national “sustainability strategy” has the Federal Government stated the aim to reduce by 2020 the transformation rate of land into urbanised area from currently over 100 ha/d to 30 ha/d (Bundesregierung 2002, 2008). Though not legally binding, the 30-hectares-goal expresses the political intent of the German Government. Despite the government’s public dissemination efforts the goal remains controversial among the federal ministries as well as among various pressure groups. Whereas environmental groups demand a complete ban on the transformation of natural into urbanised land, pressure groups representing the construction industry, the housing sector, and landlords disapprove of any limit on transformation (Besecke et al 2005a: 84). In this paper, however, we will not engage in this discussion but will take the 30-hectares-goal as given and will focus on discussing the question, whether it could be achieved by 2020.

The idea of sustainability is basically concerned with the future development of nature and society (WCED 1987, Faber et al. 1995, Klauer 1999). Hence, sustainability policies have to be based on long time horizons. Often, political action has to proceed early and the responsible actors have to take advantage of windows of opportunities in order to realise their targets. That is, sustainability policies require a systematic assessment of the temporal structures underlying a problem. The concept of stocks is a theoretical concept that serves as a heuristic for such a systematic analysis of temporal structures.

The paper is divided into five sections. In section 2, we introduce the concept of stocks which in the subsequent sections is applied to the problem of land use. In section 3, we analyse the changes of land-use types in the past in order to identify different patterns of dynamics. We show that agricultural land is transformed into urbanised land on smaller time scales than vice versa. Additionally, we point out that the short time horizon of political decision making in contrast to the long time horizon of perceivable changes in land-use structures aggravate the challenge of governing land use. In section 4, we discuss the dynamics of the major driving forces of land-use conversion. We find that their dynamics through 2020 will antagonise the realisation of the 30-hectares-goal. In section 5, we investigate the relevant institutional structures regulating the current land-use pattern. We argue that the institutional structures themselves induce land-use conversion. At the same time, they are the main means for the realisation of the 30-hectares-goal. In section 6, we discuss the improbability for bringing about the necessary institutional changes, which would be required for achieving the goal by 2020. After 2020, however, the dynamics of some driving forces may become more favourable and a window of opportunity for sustainable land-use policy may open. Therefore, (slow) institutional reform should be pursued today in order to enable politics to take advantage of the expected window of opportunity.

2. Methodology: Stocks and Persistent Institutional Structures

In the following, we introduce the concept of stocks which is used as a methodological framework for the analysis in this paper. The concept of stocks as it is used here was developed by Schiller (2002) and Faber et al. (2005) and is rooted in the work of Georgescu-Roegen (1971).

The basic idea is to analyse a problem at hand from a specific perspective that focuses systematically on temporal structures. Therefore, the problem is reformulated and conceptualised as a set of stocks and persistent institutional structures, which are interacting. The notion of stocks, in general, may be applied to material entities that are durable on a given time scale. Stocks are not static. They interact, change and can be changed, but such changes take time. Hence, the notion of stocks emphasises the inertia of material entities against external influences (Faber et al. 2005: 158-160).[1] Material entities exhibiting such characteristics are e.g. underground deposits of ore and coal in a country, the machineries of a plant, the inhabitants of a region, the stock of unused buildings in a community, a population of cormorants in a habitat, the stock of CO_2 in the atmosphere. Persistent entities, however, also exist in the non-material world – examples are legal and informal institutions, habits, preferences, etc. They also show inertia against external forces. To distinguish these non-material durable entities from stocks we will refer to them as persistent institutional structures. If in the following we refer to the concept of stocks we address both, stocks as well as persistent institutional structures.

[1] Faber et al. (2005) use mathematical set theory to conceptualise quantifiable stocks.

The description of a problem in terms of stocks is, in the first place, descriptive and thus by and large free of a valuation. However, the definition and classification of stocks which are relevant for a specific problem always contain a subjective evaluative moment (Faber et al. 2005: 156) because they are based on the perspective of a specific decision maker or political actor. In Germany, for example, the relevant stocks for a sustainable land-use policy are quite different from the perspective of a particular community compared to those relevant from the government's perspective. To assess the relevance of stocks a complementary system's perspective that reflects the causal relations between the elements of the system is necessary (Faber et al. 2005: 157) in order to, e.g., identify opportunities for political influence. Complementary to the ascertainment of a stock or persistent institutional structure as relevant or irrelevant, these entities may also be valued as desirable or undesirable. The basis of such an evaluation might be individual preferences but also societal norms such as sustainability.

In order to evaluate stock dynamics and persistency, three notions of time are important and are intimately linked to the concept of stocks. We can distinguish between an *absolute notion of time*, the *notion of an inherent time of things* and the *notion of the right moment to act*.

- The *notion of absolute time* denominates the time that can be objectively measured and visualised as a time bar. The absolute time is insensible to the changes in the world.
- The *notion of the inherent time of things* denotes typical time horizons for things. In many cases, it cannot be assessed precisely but in an approximation such as the life time of human beings, the regeneration time of a forest or the decay of radioactive material. The inherent time of stocks is what we call stock dynamics. The inherent time of things is normally also the measurement to evaluate whether something is going on slowly or quickly, something is early or late.
- The *right moment to act* indicates the necessary starting point for political action for given political targets. Necessarily, the right moment to act needs to be based on stock dynamics. The right moment is usually dubbed as neither too early nor too late.

To summarize, we evaluate stock dynamics by describing changes of stocks and persistent institutional structures over time. In order to do that, we analyse information about stock dynamics in the past and use scientific theory, which enable us to formulate hypotheses about the dynamics in the future.[2] Eventually, the comparison of the dynamics of relevant stocks shall enable us to decide about favourable moments for political action.

The concept of stocks is not a super-dynamic theory that replaces other scientific theories on system dynamics. It is rather a simplifying perspective focussing systematically on the temporal dimension of phenomena. This is of high relevance for sustainability policy, because it aims at the achievement of certain states of nature and society in the future that allow 'future generations to meet their own needs' (WCED 1987). In order to summarise and

[2] However, we want to mention that there is another way to describe the persistency of stocks, which is more common in political analysis. Persistency can also be described in terms of the necessary efforts to overcome a given stock dynamic. However, the disadvantage of this approach to evaluate persistency is that it does not say much about temporal structures. Therefore, we use this approach only in addition.

simplify the dynamic features of a problem at hand, information from science (any kind of dynamic theory), from expert knowledge and from experience can be used to estimate stock dynamics. Thus, the concept of stocks facilitates the integration of knowledge about the dynamics of the relevant entities from different scientific and non-scientific sources and allows for a holistic view. As a consequence, however, statements that are gained by using the concept of stocks cannot claim the same rigour as a narrow, mathematically based dynamic theory. Nevertheless, the statements claim intersubjective plausibility because they are comprehensible for a wide range of agents such as policy makers and concerned citizens.

In this paper, we reformulate the problem of unsustainable land-use conversion applying the concept of stocks. As stated above, stocks can be valued as desirable or undesirable. For the problem of this paper, an underlying valuation is that urbanised land, as it is statistically defined in Germany, is ecologically of less value than agricultural land.[3] Thus, the continuous growth of urbanised land leads to the further loss of ecologic qualities, which is considered as being unsustainable. From a descriptive point of view, we ask which stocks and institutional structures cause or influence the observed growth of the undesired stock “urbanised land” respective the decline of “agricultural land”. The relevant stocks and institutional structures are derived by an evaluation of available literature (e.g., Enquete-Kommission 1998, Besecke et al. 2005, Goetz et al. 2005, Jörissen / Coenen 2006, Dosch 2008, Köck 2008). In addition, our evaluation is consolidated by insights gained from discussions with practitioners.

3. Dynamic features of land-use conversion

The total land within given boundaries (in our case: within Germany) can be regarded as a stock with infinite durability. For conceptualising the problem at hand, this stock is divided into sub-stocks of different land-use types. We use the categories of the German land-use survey, which is based on the land registries kept by the sixteen German states. In 2004, 53 % of the German land was used for agriculture, roughly 30 % were covered by woodland, and urban land accounted for almost 13 % (StaBA 2006a: 213). Figure 1 shows the dynamics of the share of the three sub-stocks (urban, agricultural, forestry) within the years 1950–2000 for the old West German states and 1992–2000 for the new East German states.

[3] Of course, in some cases urbanised land may be ecologically more valuable than agricultural land. However, the stated general evaluation reflects the valuation underlying the 30-hectares-goal.

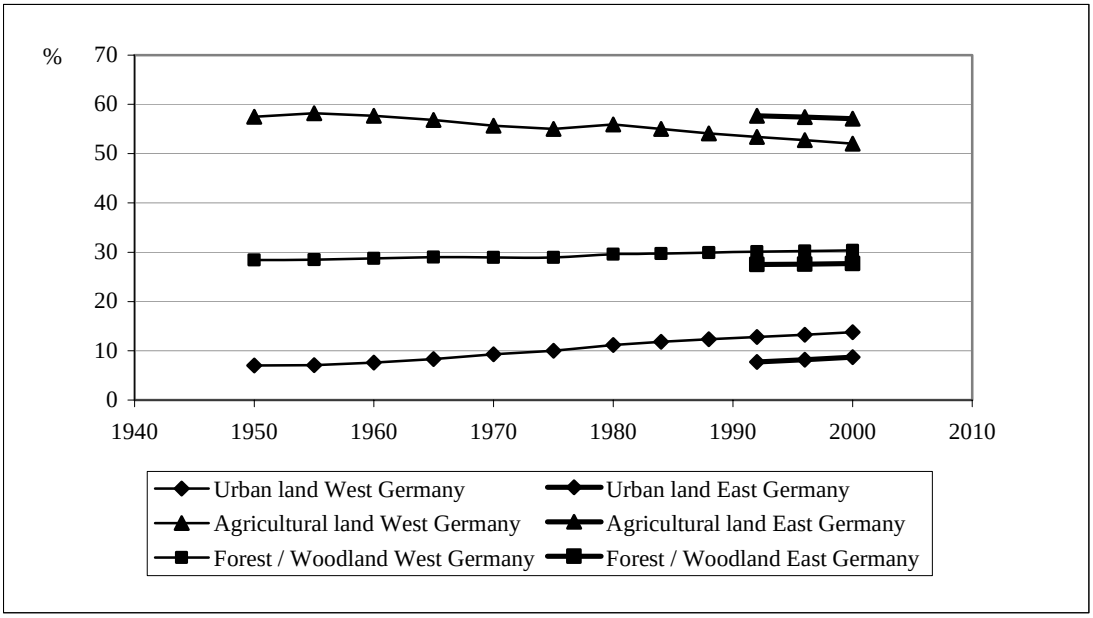

Figure 1: Shares of land-use types of total surface (source: StaBA 2008a, b)

The figure suggests two key dynamic features of the problem:

1. The on-going processes of land-use conversion are relatively slow, in particular when compared to typical time horizons of policy makers. Legislation periods in Germany range between four to eight years. Over such a time period, the relative size of the sub-stocks (urban, agricultural, forestry) has changed only slightly. Substantial changes can be perceived on longer time spans such as 20 or 50 years. Apparently, the problem of land-use conversion is of a long-term nature.
2. The driving forces of land-use conversion are very persistent themselves – they have continuously been effective over five decades. Therefore, we suppose that these drivers are themselves stocks or persistent institutional structures or have such behind them. And although the steady conversion process may be slow relatively the stock size, over the five-decade time span significant changes have been taking place: In West Germany, for example, the urban land has nearly doubled within 50 years. Its share of the total surface increased from 7 % in 1950 to 13.8 % in 2000. Simultaneously, the agricultural land decreased from 57.7 % to 52 %. After the reunification a similar development seems to have taken place in East Germany.

We will see in the following that the differing time scales are a tremendous challenge for a sustainable land-use policy.

Furthermore, figure 1 indicates that the land-use conversion problem manifests itself chiefly by a continuous conversion from agricultural land to urbanised land. Looking into the dynamics of these two sub-stocks, we can see that urban land is much more persistent against conversion than agricultural land. Supposing the conversion of agricultural to urbanised land

is in line with the applicable land-use planning at the community level[4], the conversion typically takes one to four years. The time horizon is determined mainly by the duration of political and administrational decision procedures as they are officially required by the Federal Building Code and the construction time of buildings.

The reverse conversion of land from the stock of urbanised land towards the stock of agricultural land, however, is effectively much more time consuming. This is not only due to the physical characteristics but also to institutional structures. In the case of brownfields and vacancies, the demolition of unused buildings is costly and there is no legal obligation for (former) owners to undertake theses actions and to cover their costs. Therefore, it can easily take 10 or more years to reconvert urbanised land.[5] When urbanised land is still in use, it is even more difficult to reconvert the land, because specific and per se persistent property rights with resulting monetary value are protected by law. It has to be presumed that a realistic time horizon is 50 years and more.

Effectively, the stock "urbanised land" is much more persistent against conversion to other land-use types than those other types. A sustainable land-use policy has to take this into account. In the following, we will see that this has interesting consequences.

4. Driving forces of land-use conversion

Understanding the reasons and driving forces for land use and its changes is a complex topic (Seidl 2005: 63). The multiplicity of types of land-use transformations is mirrored in a multiplicity of involved actors (e.g., land and facility owners, communities, tenants, regional planning associations, authorities, investors), of economic and social structures (e.g., production and communication technologies, sectoral split of the economy, urbanisation, mobility), and of legal institutions (e.g., federalism, building law, taxation, subsidies). By employing the concept of stocks we will try to identify main drivers of land-use conversion. With this, we attempt at reducing the issue's complexity by focussing on the relevant aspects and their temporal dynamics.

For Germany there is no exact data available to assess the relative weight of the sub-categories (i.e., sub-stocks) of the urbanised land, which would inform us about its predominant uses. But an estimation based on partial data of the land-use statistics (StaBA 2008a) suggest that we concentrate our analysis on three main land-use types: in 2004 road traffic infrastructure accounted for approximately 34 %, private housing for about 25 %, economic use for approximately 15 % of the urbanised land (own calculation, see also Dosch 2008: 42). These three urban land-use types have grown substantially in the past. However, private housing and commercial use expanded much faster than road traffic infrastructure

[4] This may be a limitation for any individual piece of land. On an aggregate level it is, however, no effective limitation to land-use conversion. This is discussed in section 5 of the paper.

[5] Here, we suppose that it is possible to reconvert urbanised land to more natural states. This is, of course, not always the case, in particular, when the soil is degenerated or contaminated.

(Fischer et al. 2009, see also EEA 2006: 37). In the following sections we discuss the main driving forces behind these developments: population, economy and road traffic.[6]

4.1 Population

Demand for housing land directly depends on population size and the housing consumption patterns. In the following, we argue that a decreasing population will be favourable for the 30-hectares-goal, especially after 2020. But at the same time the per capita increase in living space is likely to over-compensate this positive effect.

The German population reached its peak with 82.5 million people in 2002 (StaBa 2008). Official estimations expect a slight decrease by -1.5 % until 2020 and a larger decrease by -10.4 % until 2050.[7] Decisive for a thorough analysis of demography as a driving force for land-use change is its regional heterogeneity. Regional migration will accelerate population decline in some regions, whereas other 'boom regions' experience further population increase. Therefore, we also need to evaluate regional population forecasts, which exist for 97 regions in Germany (see BBR 2006). Figure 2 illustrates the predicted development of growing, stable and declining regions.[8]

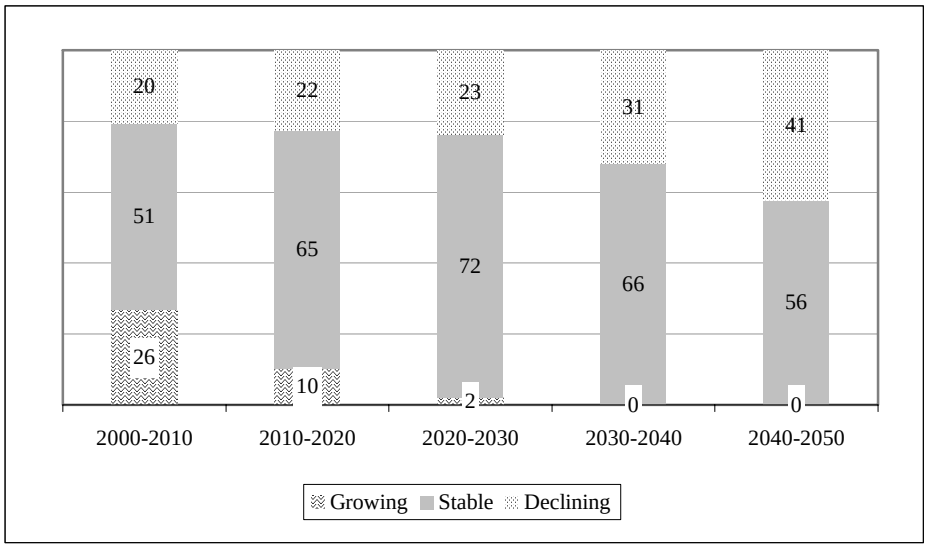

Figure 2: Number of regions with different population dynamics (own calculation, source: BBR 2006)

Due to the disparate inertia to convert agricultural land in urbanised land and the other way round described in section 3, we expect no substantial cutback of urbanised land in declining regions. What we foresee instead is that land conversion takes place to a very limited extent

[6] Because this paper focuses on the temporal structures of current land use in Germany, we do not discuss in depth the question which driving forces are relevant. A more detailed discussion of the relevance of driving forces can be found in Goetz et al. 2005, EEA 2006, Jörissen and Coenen 2006 and is summarised in Fischer et al. 2009.

[7] Moderate scenario (Model 1-W 2) of the official population forecast (StaBA 2006b).

[8] We use the following classification: growing = over +3 % within 10 years, stable = between +3 % and -3 % within 10 years, declining = under -3 % within 10 years. This categorisation is, of course, somewhat arbitrary, but for the sake of illustration we consider it as useful.

in order to satisfy changing consumption patterns and to attract new inhabitants in declining regions (see section 5). In stable regions, we anticipate land conversion to some extent and further large-scale land conversion in growing regions. Despite the declining total population, there will be ten regions with growing local populations between 2010 and 2020 according to BBR 2006. Only after 2030 there won't be any growing regions any more. Between 2040 and 2050, 41 declining regions and 56 stable regions are to be expected.

In the past, the housing consumption patterns contributed to land-use conversion to a large extent. Changes in household formation, location choice, and consumer housing preferences contributed in turn to the changing housing consumption patterns (Barnard 2005: 36, Keilman 2003: 490). The result of these developments can be described with the average per capita living space, which is indicated in figure 3 for the period from 1965 to 2002. In 1965, the average living space in West Germany amounted to 22.3 m² and has been rising steadily to 42.8 m² in 2002. In East Germany, a catch-up process took place after the reunification.

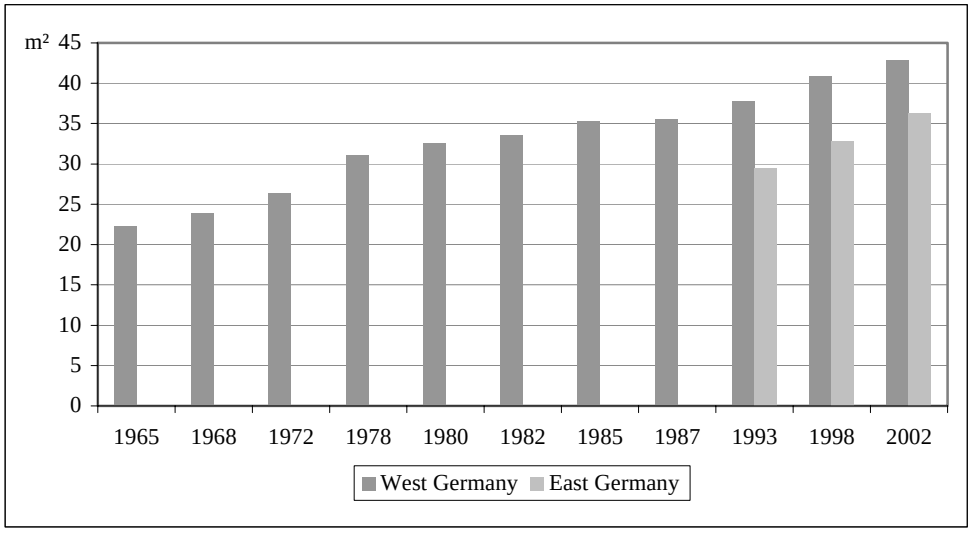

Figure 3: Average Living Space per head in Germany 1965 to 2002 (source: StaBA 2008c)

The increase of per capita living space of about 0.5 m² per year on average is an aggregate measure. We interpret the underlying preference structure as persistent. There are several reasons why we should expect that this development will continue in the future. With the aging population we await more people living on their own and consuming more living space. With rising vacancies in declining regions we expect a fall in rents and housing prices, which is a further incentive to increase the living space. On the other hand, there are also reasons supporting the expectation that the growth dynamics of the living space per capita will slow down such as increasing rents in booming regions and energy costs.

Finally, we want to come to a rough estimate on how the combined effects of population decline and persistent consumption patterns affect land-use conversion in the future. For this, we differentiate between scenario *A* where the living space per capita will be rising only by 0.25 m² per year (see also BBR 2006: 79), and scenario *B*, which extrapolates the

development of the past.[9] As can be seen from figure 4, in both scenarios does the increasing living space *per capita* over-compensate the population decline. Hence, ongoing pressure on housing demand is to be expected.[10]

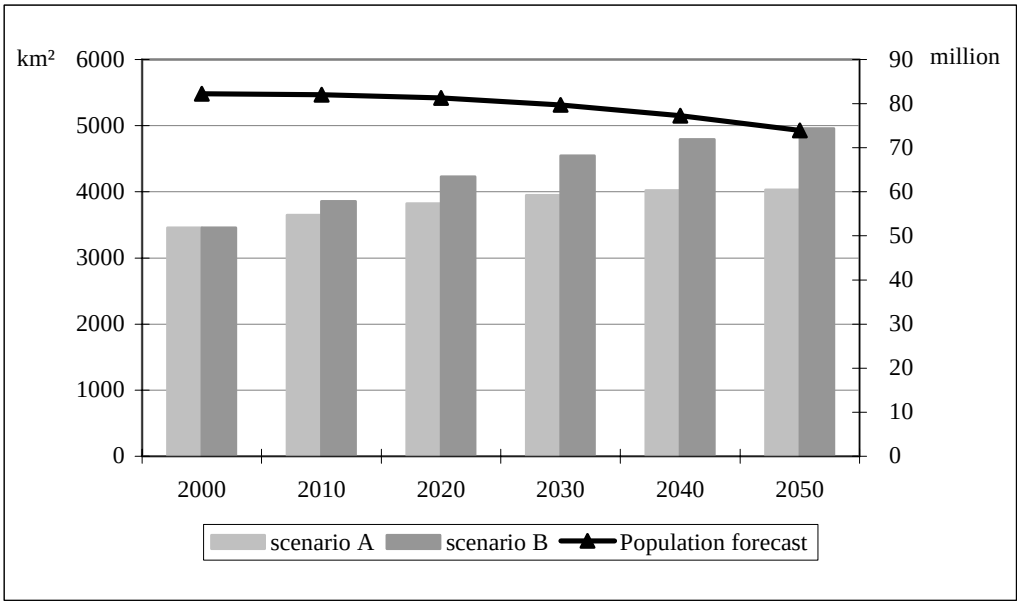

Figure 4: Forecasts for total living space and population decline until 2050
(source: own calculation, StaBA 2006b)

We have seen that the demand for housing will not automatically decrease with a declining population. The population changes until 2020 need to be considered as insufficient as to allow a sustainable land-use policy. Under these circumstances any policy aiming at the reduction of land-use conversion will increase land prices, which will in turn make further public support for the 30-hectares-goal unlikely. On the other hand, the population dynamics after 2020 will open a window of opportunity for a more sustainable land-use policy. The overall decreasing population after 2020 as well as the absence of growing regions will allow a more restrictive land-use policy. However, there is uncertainty about the future development of the living space per capita, which is crucial for the final housing demand.

4.2 Economy

The German economy has been subject to continuous structural change over the past 50 years. The agricultural as well as the industrial sector have lost some importance to the benefit of the service sector (StaBA 2009). One could think that the agricultural and the industrial sector would need more land for buildings than the service sector, so that the relative growth of the service sector would diminish the pressure on land-use conversion. This

[9] We expect that the factual development will be most likely in the corridor of the two scenarios *A* and *B*.

[10] However, it should be noted, that the indicator of average living space per capita is not equal to average urbanised land per capita. As an aggregate measure, it contains some important consumption patterns as argued above, but not all. For example, it does not contain preferences concerning the size of the buildings, the location of a building and the size of adjacent gardens.

is, however, not the case empirically. On the one hand, the build-up land for agricultural use (e.g., stables, farmsteads) has decreased only slightly and the land for industrial use has been quite constant (see figure 5).[11] On the other hand, the build-up land for the service sector has been on the rise.

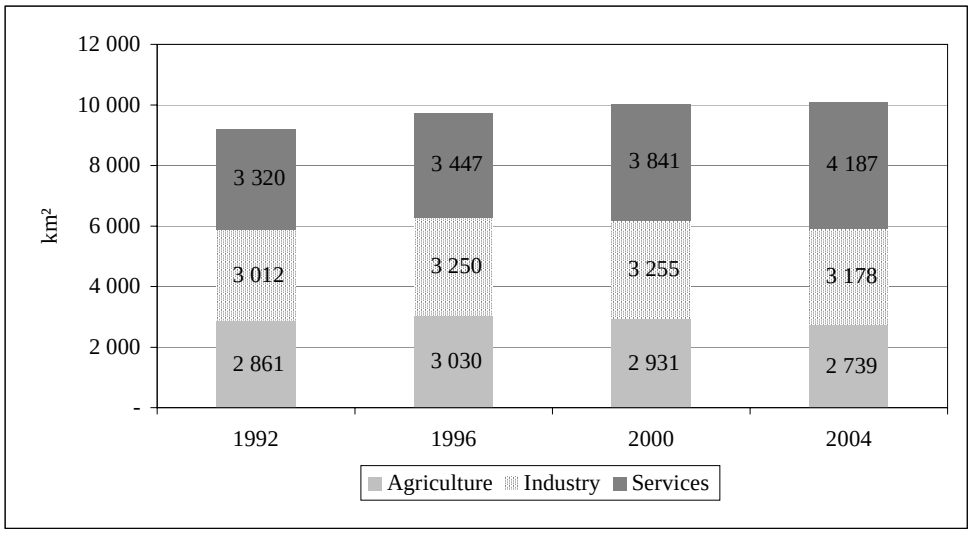

Figure 5: Development of the total commercial built-up land (source: StaBA 2008d)

As we have already argued in section 3, unutilised buildings will normally not be demolished or reused for something else in the short or medium term. The sub-stocks of urbanised land for agricultural and industrial uses are very persistent and therewith, the decline in one sector does not compensate the growth in another.

The empirical finding can be explained from a political point of view: For decision makers, it is virtually impossible to impose a policy that makes it more difficult and costly for firms to find production sites. Indeed, the opposite takes place. Communities store and subsidise developed building sites in order to attract companies and therewith jobs and tax revenues (see also Besecke et al. 2005a: 83), as we point out in more detail in section 5. It will become transparent that due to the persistence of the underlying incentives, the trend of converting agricultural land into urbanised land for commercial use will continue.

4.3 Road Traffic

The extension of roads has two main causes. The first one is closely connected with the extension of residential areas and commercial sites. Every building site needs transport connections. The growth of roads is therefore partly related to site development of residential areas and commercial sites. It is estimated that access roads account for about 45 % and highways for 21 % of the growth of road traffic infrastructure (Penn-Bressel 2005: 130).[12]

[11] The data include only the years 1992 to 2004 because, unfortunately, there is no longer time series available for Germany or West Germany with data beyond that period.

[12] Roads to access agricultural fields and forests make up 31 % of the growth of road traffic infrastructure.

The second reason is increasing road traffic itself. Current road traffic estimations predict advancing traffic in every respect: more humans and more commodities will be transported covering increasing distances (Prognos 2001, Intraplan Consult 2007). Traffic is not a stock itself, but it is a very persistent phenomenon due to persistent spatial structures of physical entities (e.g., buildings, road network) and persistent institutional structures (e.g. mobility habits, business relations) lying behind it. In order to get an impression of the dynamics figure 6 shows exemplarily the impressive development of the number of motorcars over a period of 50 years. We argue that the continuous growing stock of motorcars will lead to more traffic and will make more roads and parking facilities necessary.

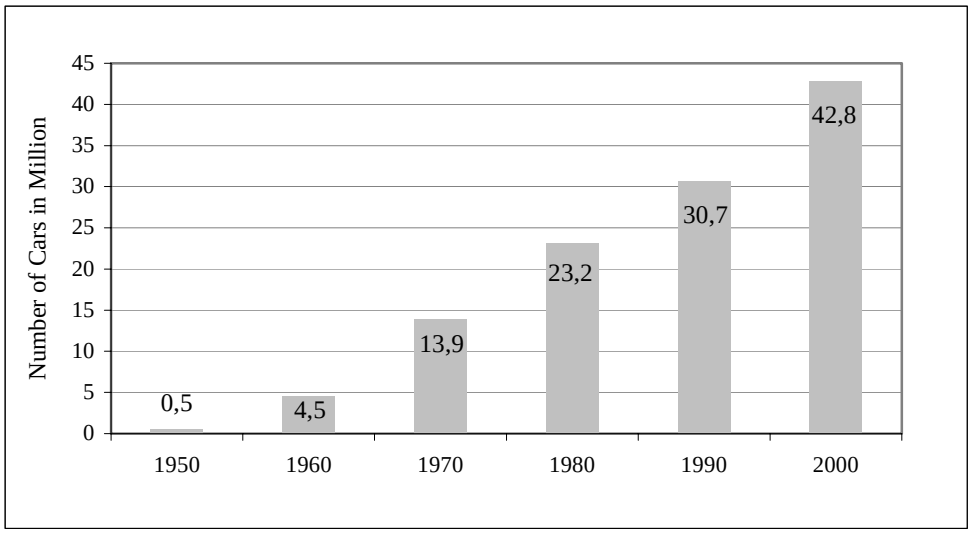

Figure 6: Development of motorcars in Germany 1950 to 2000 (source: KBA 2007)

Although one might expect satiation at some point in the future, it is not likely that this will be until 2020 or shortly after. This is in line with the estimation that is used by the German Government in order to decide about the expansion of the road network in the context of the German Federal Transportation Network Plan ("Bundesverkehrswegeplan"). A further increase of cars up to 51.1 Million by 2025 is expected, which translates into 1,000 people at the age of over 18 years who on average would possess 737 passenger cars (Intraplan Consult 2007: 3).

We have seen that there is an interdependency between the land for private housing and commercial enterprises on the one hand and the traffic infrastructure on the other hand. If the increase of the former two could be successfully slowed down, the transport infrastructure would not expand as fast as in the past. However, with regard to traffic infrastructure, we expect further pressure on the expansion of the road network as it is already planned in public spending programmes such as the German Federal Transportation Network Plan, which includes measures until 2015 (BMVBW 2003).

5. Institutional structures of land-use and their dynamics

The expansion of the urbanised land can only take place with the official approval by communal and state authorities. Hence, we have to analyse the rationale of these authorities. The following analysis shows that ample designation and development of land for private housing and commercial enterprises is a very constant behaviour of the communities. We argue that the rationale of communal actors depends strongly on the institutions in which their actions are embedded. This is important as it is considered to be another driving force of the land-use conversion problem (Van Haaren / Nadin 2003: 352, SRU 2004: 165). In addition, these institutional structures are the main means for governing land use and therefore it is necessary to evaluate the persistency of them in order to identify the political scope of action for future reform.

5.1 The current practice of land-use designation and the institutions behind

The chief players of land-use designation are the 12,141 German communities.[13] The local land-use planning and the approval of building licences are part of their local self-administration, which is guaranteed by the Federal Constitution (Köck / Bovet 2008: 27, Bizer et al. 2006: 24). In the following, we firstly give three examples of preparatory land-use plans to illustrate the communities' land-use designation practice. Secondly, we elaborate in more detail the rationale in the background of their practice. Thirdly, we discuss the institutions, which in our view are responsible for the current land-use conversion. And finally, we roughly depict the institutions that are supposed to govern communal land-use designation and assess their effectiveness in limiting land-use conversion.[14]

5.1.1 The actual land-use designation practice at community level

The fact that communities continuously designate more agricultural land for building purposes can be acknowledged on the basis of their so-called preparatory land-use plans, which usually forego legally binding land-use plans. The communities' general aim at the stage of the preparatory planning is to avoid limitations to their future scope of action as effectively as possible. Therefore, communities tend to maximise the designation of building land in their preparatory land-use plans (Bizer et al. 2006: 42). These plans are (only) legally binding for the communities. At the moment, they cover planning horizons up to 2015 or 2020. As these plans are very heterogeneous among communities with regard to spatial and temporal coverage, we can only demonstrate the practice of ample land designation by giving three examples: two communities, Friedrichshafen and Flöha, and one neighbouring-community-network of the cities Mannheim and Heidelberg ("Nachbarschaftsverband"). For Mannheim-Heidelberg as well as Friedrichshafen a further growth of population is expected,

[13] Of course, the available building land depends not only on the communities but on the supply by land owners. Land owners are more often than not interested in converting their agricultural land into building land because of the high profits that can be realised. However, it is unclear to what extent land owners may influence the land-use designation of the communities in favour of their own interest.

[14] For a more detailed overview see Köck et al. 2007.

whereas a massive decline of population is predicted for Flöha.[15] In figure 7, we contrast the actual planning state with the required limitation of new building land if the 30-hectares-goal were actually to be achieved through a linear adjustment path.

The light grey pillars represent the area of land which is already designated for urbanisation according to existent communal preparatory plans. The dark grey pillars represent the area, which the communities could convert until 2015 respectively 2020 if they did contribute to meeting the 30-hectares-goal. In order to break the national goal down to community level, we assume

1. a linear adjustment path: the land-use conversion will not drop abruptly from the current rate of more than 100 ha/d to 30 ha/d but will approach the 30-hectares-goal linearly; and
2. a proportionate burden sharing among the communities: all communities lower their conversion rate commensurate to their total area.[16]

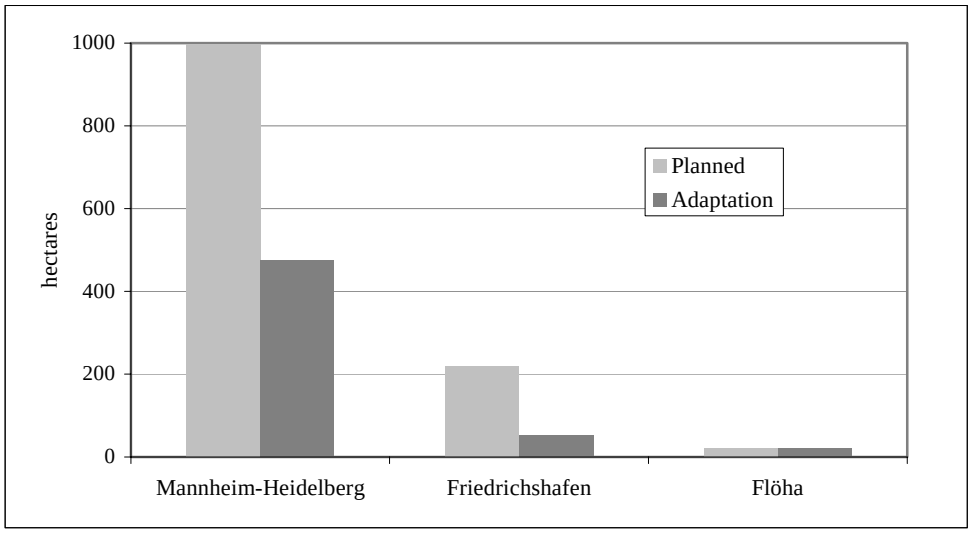

Figure 7: Planned designation of building land in preparatory land-use plans and required building land assuming a linear adjustment path towards the 30-hectares-goal until 2020 (own calculation, source: Nachbarschaftsverband Mannheim-Heidelberg 2006, Verwaltungsgemeinschaft Friedrichshafen-Immenstaad 2006, Verwaltungsgemeinschaft Flöha 2006)

Figure 7 yields the following two insights:

1. A tremendous level of amendment is required in order to meet the 30-hectares-goal. Mannheim-Heidelberg and Friedrichshafen have by now already planned much more building land than they would be allowed to have in the case of a linear adjustment path.

[15] Friedrichshafen is located in the south of Germany and has 57.193 inhabitants. A growth of population up to 58.000 is expected until 2015. Flöha and its adjacent communities are located in East Germany and have 13.180 inhabitants. A rapid decline of population until 2015 of up to 12.250 is forecasted. The neighbouring-community-network Mannheim-Heidelberg in West Germany covers 664.655 inhabitants and a population growth up to 689.046 inhabitants is estimated for 2020.

[16] So far, the German government has not decided how to break down the national 30-hectares-goal to the community level.

The planning of Flöha is just below the required amount for the 30-hectares-goal, i.e., it almost exhausts its "share". It illustrates that we can not expect shrinking communities such as Flöha to compensate the over-proportionate growth of growing communities and booming regions.[17]

2. The preparatory plans are already legally binding and recognized by the state and the regional planning authorities. Therefore, it is unlikely that they could be substantially altered in the course of implementing the 30-hectares-goal.

5.1.2 The rationale behind the actual practice

What is the rationale motivating this ample designation of building land? One of the main interests of political actors at the community level is the establishment of new companies and inhabitants within their districts in order to increase the prosperity of the community. One of the most common ways to attract companies and inhabitants is offering building land. One outstanding reason is the importance of companies for preserving employment and wealth in a region or community (Bizer et al. 2006: 25). Besides, companies are subject to the business tax ("Gewerbesteuer"), which to some extent is directly accrued to the communal budget. Hence, it is argued that new businesses increase the communities' tax revenues. The same holds for new inhabitants. Often, communities apply thumb rules about the additional annual revenues realised by each new inhabitant. The amount depends on the specific situation of the community (e.g., size, income of inhabitants). For example, a community with about 100,000 inhabitants may expect about 1,000 Euro with each new citizen. In booming regions, it is also argued that land-use conversion is necessary in order to keep housing prices on a socially acceptable level. In declining regions ample building land designation is justified by the need to attract new inhabitants in order to keep up the number of inhabitants and therewith to be able to maintain and finance the existing infrastructure (Bizer et al. 2006: 25). These arguments demonstrate the importance of incentives induced by the financial system.

5.1.3 The communal financial system

The communal financial system defines three main sources of revenue for communities: business tax, income tax, and the allocation of funds by the (state specific) communal tax-redistribution system. Although the income structure varies widely between communities, we illustrate the weight of these income sources concerning the communal budgets by specifying some average values for West and East German communities: In 2007 in West Germany, the business tax accounted for 21 %, the income tax for 16.5 %, and the state redistribution for 30 % of the communal revenue (BMF 2008: 1). In East Germany, the most important source of funding was the state redistribution with 53 %, whereas the business tax accounted for 12 % and the income tax for only 7 % of the total revenue (BMF 2008: 1). The business tax is charged mainly on the profits of residential companies and therefore rather unstable as well as dependent on the economy. The income tax roughly complies with the inhabitants' income. The state transfer to the communities is granted according to a complex calculation procedure

[17] The preparatory land-use planning is only a supply-side planning and is not necessarily realised.

for which the number of inhabitants in a community plays an important role. Hence, the institutional structure provides strong incentives for maximising both, the number of companies as well as of inhabitants.

In addition, there is a lack of alternatives to the building land designation strategy. Although the Federal Constitution prescribes some financial autonomy for the communities, the scope of action is very limited and consists mainly of setting a rate of assessment ("Hebesatz") on the business tax and of defining charges for communal services. Thus, the limited possibilities of communities to improve their financial situation raise the importance of designating building land as a means of generating revenues.

5.1.4 The communal self-administration and the land-use planning system

There is a sophisticated system of spatial-planning and environmental legislation in Germany which is supposed to limit ecologically harmful and non-sustainable land use. For the problem at hand, however, the environmental legislation may be neglected, because it is usually not applicable to agricultural land (Köck et al. 2007: 5). Thus, we focus on the regulations of the Federal Building Code and the spatial-planning laws, in particular on the Regional Planning Act ("Raumordnungsgesetz"). Obviously, these institutions are currently not effective enough in order to guarantee a sustainable land use, because otherwise there would be no sense in the 30-hectares-goal. However, in order to assess the feasibility of the goal it is necessary to understand, why these institutions are not effective and how persistent they are.

The constitutional right of local self-administration in connection with the procedures of the Federal Building Code enable the communities to pursue their economic interests in land-use planning. At the same time this, when designating land, allows them to neglect interests beyond the local level. Such interests could be the interests of a neighbouring community, of the region, of the state or the country. The following example shall illustrate the problem: Community *A* decides not to allow the building of a new supermarket on its outskirts, because it wants to support the existing shopping facilities in its city-centre, avoid land conversion and shopping traffic. When the adjacent community *B* decides to allow the new shopping facilities on its grounds directly at the border of community *A* the latter has practically no or only little legal means to prevent this. In the worst case, community *A* will loose purchasing power in its city-centre and the associated jobs, it will likely have an increase in shopping traffic and land conversion will take place. Although the communities are legally obliged to take into account the interests of neighbouring communities, in practice this is rather a formal requirement and in most cases not effective.

Apart from that, the Federal Building Code prescribes that the communities act within the limits set by the applicable regional land-use plan. This planning is based on the Regional Planning Act and the various state specific planning laws. The idea of regional planning is to coordinate the various local spatial plans with each other as well as with public investments for infrastructure such as schools, hospitals, theatres, roads, and public transport. The process of regional planning is slightly heterogeneously managed among the 16 German states. Predominantly, however, it is a negotiation process between state authorities and the

communities (Köck 2008: 1311). The result of the planning process is a regional plan that serves as a guide for future communal planning. The plans are legally effective until new ones are approved of, which usually is the case every 10 to 20 years depending on the specific circumstances. In general, the plan is legally binding for the communities and the state authorities. For our problem at hand the following two planning concepts are of particular interest: the system of central communities ("Zentrale-Orte-System") and the differentiation between goals and principles.

The system of "Central Communities"

The regional plan assigns a status with respect to each community's centrality. This status is important for the state-financed capital endowment with public infrastructure and for the right to convert land. Small communities with no central status are only allowed to designate building land for their own residents ("Eigenbedarfsregelung"). In contrast to that, bigger communities with some centrality status are allowed to designate building land for new inhabitants. There are several criteria to assess the centrality of a community, of which two are of particular interest here: the size and the number of inhabitants of a community in relation to other communities. In borderline cases, the system of central communities constitutes an incentive to attract new inhabitants in order to receive more subsidies for public infrastructure. Beyond that, in densely populated regions it is nearly impossible to distinguish between central and peripheral communities. In this case, the system of central communities proves no longer appropriate for limiting land-use conversion because every community argues successfully that it has to dedicate more land for building activities in order to satisfy the overall demand (SRU 2004: 165).

Goals and principles in the planning process

The differentiation between "goals" and "principles" in the regional plan is also important in order to understand, why the regional planning has not been able to limit the communities' expansionary tendencies. Every planning statement is qualified either as a "goal" or a "principle". Whereas the goals are legally binding for communities, the principles are not (Köck 2008: 1312). This distinction reduces enormously the scope of regional plans. This is aggravated by the fact that even the legally binding goals very often leave room for interpretation. In the past, communities have used this room mainly in favour of an expansionary land conversion. As already mentioned, in many cases are the communities integrated in the planning procedures at the regional level in order to include their interests and to minimise opposition. The results, however, are spatial plans with an extremely narrow scope, which so far have not limited land-use conversion (Köck 2008: 1314, Bizer et al. 2006: 23).

In summary, the communal practice of ample and expansionary land conversion is determined by institutional structures, in particular by the German communal financial system in connection with the specific set of institutional competences assigned to communities by the Federal Constitution, the Federal Building Code, and the Regional Planning Act. In the present institutional setting, the most important possibility for a community to increase its income and wealth is to designate building land in order to attract new inhabitants and firms.

Therewith, competition for inhabitants and firms among the communities contributes to an inefficiently high rate of land-use conversion which is reflected in the many unutilised building sites all over Germany.

5.2 Dynamic features of the institutional structures

It is evident that institutional structures are persistent to some extent because it is one of their main objectives to set a reliable framework for action. However, it is difficult to qualify (or even quantify) their persistency and therewith evaluating how persistent they are. That being said, there are still some dynamic features that are worth being investigated.[18]

The 30-hectares-goal has been advocated by the German Government. However, as we have already outlined, the responsibility for land-use decisions lies not with the Federal Government but with the communities. Whether the goal can be achieved or not, therefore depends on the ability to overcome the persistence of the outlined institutional structures and to modify them in a revision. That would be a revision of the constitutional right of local self-administration, the Federal Building Code, the laws for spatial planning, and the communal financial system.

It is common sense that the implementation of the 30-hectares-goal would involve a severe limitation of the local self-administration of communities. As the latter is guaranteed by the Federal Constitution, the institutional requirements for changes are extremely strict and demand a two-thirds majority in both legislative bodies, the Federal Parliament (Bundestag) and the Chamber of the Federal States (Bundesrat). Even if such a limitation is pursued in a more indirect way by modifications of the Regional Planning Act and the Federal Building Code, communities have always the possibility to bring the case before the Federal Constitutional Court in order to clarify whether the limitations are in accordance with the Federal Constitution. Such a procedure is extremely time-consuming.

Although it is difficult to quantitatively evaluate the dynamics of institutional structures (in particular, without a detailed analysis of the content of judicial reforms) we want to give some rough estimation about the involved time horizons. The Federal Building Code was established in 1960 and has since then been reformed a couple of times (Söfker 2007: XI).[19] The typical time horizon for legislative changes of the Building Code has been about 10 years. The reforms were characterised by two tendencies: On the one hand, the reforms restored the competencies of the communities and alleviated land-use conversion. This tendency obviously contradicts the 30-hectares-goal. On the other hand, duties to document the environmental situation and to justify building activity were increased, which could be in favour of the goal. Obviously, it is not possible to assess, which one of the two tendencies will be in the lead in the long run; however it is clear, that it is by no means easy or quickly achieved to reform this law significantly into the desired direction.

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[18] Correspondingly, the following paragraphs are not meant as a juridical assessment.

[19] A detailed overview can be found in Söfker 2007: IX-XL.

Even more enlightening are the past changes – or rather the "non-changes" of the laws for spatial planning.[20] After 1945, we have seen a number of political attempts to adopt guidelines on the federal level that are legally binding for the states and the communities. However, in the end, they were not successful. The most ambitious attempt took place in the 1970s, when there some kind of planning euphoria in German politics occurred. Even then, it was impossible to generate approval of a nation-wide plan for land use ("Bundesraum-ordnungsprogramm") (Hübler 1991). Only broad guidelines were established by the Regional Planning Act, which was introduced in 1965 and substantially reformed in 1989 and 1998 (Gnest 2008). The state specific planning laws came into being at the end of the 1950s and during the first half of the 1960s (ARL 1991). The biggest change in the laws for spatial planning was the strengthening of ecological aspects in the planning process during the 1980s, which was also reflected in the increasing number of environmental ministries on state level obtaining the competencies for spatial planning. However, this process discontinued in the 1990s and the competencies were now assigned more often to the ministries of economy (Gnest 2008: 28, 31). So the past development of the spatial planning therefore does not indicate that it will be easily possible to overcome the persistency of the given institutional structures.

Finally, we look into the dynamics of the communal financial system. Regarding the 30-hectares-goal, it would be necessary to weaken the competitive incentives for attracting new companies and inhabitants. Consequently, cooperation and mutual arrangements between communities have to be alleviated. An economical use of land should no longer contradict the economic rationale of communal activities. Although it has been very difficult to reform the communal financial system in the past (Junkernheinrich 2003), the expected worsening of the financial situation of communities due to demographic changes will make a fundamental reform of the communal financial system very likely (Thies 2006). It is, however, unlikely that the competitive incentives will be suppressed completely (Schratzenzeller 2006: 63).

6. Conclusions

With some irony we can say that the political discussion about the lack of sustainability of land-use in Germany can be considered as turning into a persistent institution. As long ago as 1998, the final report of a parliamentary commission of the German Federal Parliament (Enquete-Kommission 1998) stated a very similar problem description as recent reports and analyses do. Furthermore, there are plenty of suggestions of how and by means of which instruments land use could become more sustainable in Germany (e.g. Krumm 2003, SRU 2004, Jörissen / Coenen 2006, Preuß / Floeting 2009). However, our analysis suggests that one reason for the failure to introduce these instruments lies in the persistency of relevant stocks and persistent institutional structures. The goal of this paper has been twofold: (i) to qualify this persistency by investigating the problem of unsustainable land-use conversion

[20] Detailed overviews can be found in ARL 1991 and Gnest 2008.

with the concept of stocks and (ii) to assess whether the German Government is able to reach its 30-hectares-goal by 2020 and (iii) whether one can expect more favourable conditions for the realisation of such a goal after 2020.

Our analysis shows that despite the actual and forecasted population decline a further growth of residential areas will most likely occur due to regional migration, the persistency of urbanised land in declining regions as well as due to the expected dynamics of housing consumption patterns (section 4.1). Likewise, despite the structural change in the economy towards the less land-intense service sector we expect further land-use conversion due to the persistency of unutilised buildings and brownfields (section 4.2). As the traffic infrastructure is related to the future growth of residential and commercial areas as well as to the volume of traffic, a further increase of the road network is also likely (section 4.3). After investigating the relevant institutional structures we find that these developments are anticipated in legally binding spatial development plans such as the preparatory land-use plans and the Federal Transportation Network Plan (section 5.1). In most cases, these existing plans severely fail to limit land-use conversion towards meeting the targeted 30 ha/d on national level, but are based at the same time on planning horizons until 2015 or longer. Our analysis of the institutional structures also shows that there exist very persistent institutions such as the communal self-administration and the communal financial system. These structures further the circumstance that any real or just perceived demand for urbanised land is met by a corresponding supply. Thus, it is not surprising that in the past all national and regional political attempts to introduce quantitative goals on reducing land-use conversion rates have failed. Growing demand has effectively controlled land-use conversion. Therewith, our analysis concerning the dynamics of relevant stocks and institutions indicates that it is by now already too late for realising the 30-hectares-goal by 2020.

After 2020, stock dynamics indicate more favourable conditions for the realisation of the 30-hectares-goal. Population decline will intensify and according to the pertinent scenarios there will not be any growing sub-national regions in Germany anymore: Hence, the demand for building land is expected to mitigate. This will allow for a more restrictive land-use designation policy, especially with regard to private housing. However, we also know from the assessment of the inherent time of the relevant institutions that their reform is extremely slow and time-consuming (Section 5.2). Taking this into account, the analysis suggests that the process of institutional reform should begin now in order to meet the upcoming window of opportunity past 2020.

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