

Land Management and Cadastre – a Symbiotic Interaction?

Dr. Alexander KOHLI

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SUMMARY

Land management and urban planning nowadays often is blamed to fail – mainly in developed countries as well as in transition countries where the respective instruments are not ready. The last decade let us ask: Can the overwhelming appetite for trade and industry plots as well as for housing be steered? Can the public tasks for supply and care be planned to raise cost-efficient services or is there an obligation to provide services by inefficient, wide spread area and networks? Where do private investors or public utilities want to invest their funds? Reliability for investments is asked as well as well developed services to have an emerging community.

Taking into account the difficulties in developed countries and the huge efforts to be made to (re-)start the land management process in transition or post-conflict countries a choice between conflicting rights and needs has to be made. The reliability on property restrictions coming from planning periods has to be given. The cadastre is to provide actual, correct and precise data of property rights and restrictions. Not only – but also to give evidence of the changes coming from the implementation of a planning process and to serve as a basis for the next ‘dynamic planning cycle’.

The paper investigates experiences from Central European, Balkan and East-European countries, tries to figure out consequences for work flows and approaches and finally lights up the central role of a maintained digital cadastre as a pre-requisite for the practical implementation of planning results.

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1. INTRODUCTION

Taking into account the various experiences on land management in developing, transition or developed countries the results are sobering: the main goals often could not be reached and the respective laws fail under implementation. The relevant discussions for renewal or development of law bodies ask for

- more powerful implementing governmental institutions,
- more control and monitoring on all levels of implementation,
- more rigorous interpretations of the existing laws and a
- better quality of education for planners and architects.

Development Stage	Land Management Laws	Land Consumption / Sprawl	Services / Utilities
Switzerland – Industrialized Country	1969, Article on spatial planning incorporated in the Federal Constitution for Spatial Planning at three levels (state, regional and municipal)	Huge – only 75% filling grade of construction zones – periodical extension of construction zones	++
Azerbaijan – Transition Country	No clear legacy on Spatial Planning; Vertical integration of the planning process at different levels (state, regional and municipal) is missing; No proper horizontal coordination, and planning schemes are prepared by different bodies and institutions	Huge sprawl, illegal construction	+/-
Kosova – Post-Conflict and Transition Country	No clear legacy on Spatial Planning; 2006, UN-Habitat Urban Planning Initiative on Municipal Level; Weak Land Administration	Unregulated sprawl, illegal construction, illegal occupation run rampantly etc.	-

Tab. 1-1 Comparison of development stage, land management laws, sprawl and service quality.

Looking to Tab. 1-1 even with a land use planning and land management system that did not fulfill all of its tasks, at least coordination with services and care by utilities could be reached up to a very good extent. Service quality in developed countries as Switzerland is high and the investments by utilities are worthwhile. In countries with rank growth settlements supply by utilities as waste disposal, water, sewage and communication generally is weak.

The key question remains: How to achieve land management in a dynamic environment taking into account economic development, need for rising food and fiber production as well as preserving production capabilities and prevent land degradation? How to plan and manage all uses of land in an integrated manner that land management becomes sustainable and supports wellbeing and good governance? – A possible approach shows the following row of lemmas:

- Statement 1: Economic development consumes land.
- Statement 2: (Sub-)Urban development sprawls agricultural land.
- Statement 3: Land consumption and sprawl cannot be stopped but steered and controlled.
- Statement 4: Steering of land consumption and sustainable land management (SLM) create better conditions for development.
- Statement 5: Sustainable land management (SLM) needs cadastre as a pre-requisite.

2. ECONOMIC DEVELOPMENT CONSUMES LAND

As a base rule it must be accepted that the economic growth is asking for land. This happens in agriculture based as well as in industrial economies. Economic growth in Switzerland caused in 2009 that every second in Switzerland one square meter of land (agricultural ~) is consumed by streets and buildings. Taking into account a well defined and permanently monitored land use planning system was in place the land consumption could not be hampered. Several towns had to integrate formerly independent villages as suburbs. Equal results can be found in the megacity of Baku, Azerbaijan. There development combined with migration from the land produced phenomenal construction boom.



Fig. 2-1 Construction hype in Azerbaijan (2008, left) and Switzerland (2007, right).

3. (SUB-)URBAN DEVELOPMENT SPRAWLS AGRICULTURAL LAND

On all continents, a relative decline in average urban growth rates has been observed for the last 20 or 30 years, compared to those of the preceding decades. This declining trend in demographic growth becomes more obvious if fixed perimeters are used, as a general process of spatial expansion is being seen everywhere. The advancement of urban sprawl along communication routes often precedes the type of sprawl where the empty areas are filled.

Besides these general forms of urban sprawl, the patterns of peripheral expansion turn out to be very varied in terms of type of housing conditions, population pattern, means of protecting structures, construction type, social categories concerned. Despite geographical, socio-cultural and political situations differing greatly from one metropolitan area to another, the processes of urban expansion are similar.

In metropolitan areas in developing or post-conflict countries, the informal urbanization of the outskirts is a classic working-class practice. This happens in the form of clandestine housing developments that fail to comply with the planning regulations, or in the form of illegal occupation of sites without the owners' consent, with inhabitants constructing their own, often precarious, dwellings. If this illegal occupation (e.g. Kosovo (UNCESCR 2008), *invasiones* in Latin America, *squats* or *squatter settlements* in Asia, *campements* in Africa) develops preferentially on available sites on city outskirts, often not suitable for habitation, it may equally occur within the gaps in the urban area, including in central or peri-central zones.

According to Boret (2004) the centrifugal dynamics by no means affect only the poorer people and working classes, who are pushed towards increasingly off-centre locations. A dispersal of well-off households across the outer peripheral area is also in progress, facilitated, of course, through the rapid growth in car ownership. This oddity occurs as well in metropolitan areas in developing countries. Luxury apartments in Cairo, a long way from the centre, the construction of vast luxury residential blocks of very low density in Sao Paulo, luxury residential districts in Delhi's rural fringes are illustrations of this phenomenon.



Fig. 3-1 Sprawl as a planned development for IDP's Gardabani near Gori, Georgia.

The dispersal of city dwellers is, in some cases, driven by the search for a better living environment, which translates into a process of population of the rural areas around the city by urban people. This is illustrated by the proliferation of *datchas* in the countryside and forests around Moscow, the conversion of farmhouses in the south of Delhi, or the *conjuntos cerrados* (secure residential blocks, gated communities) that are multiplying around the village centers in the Sabana to the north of Bogota.

In large metropolitan areas in industrialized nations, the phenomena of remote and discontinuous urban extension linked to increased car use and home ownership, has also been commonly observed in France (Fig 3.2). The American metropolitan areas lead this phenomenon to its climax.

Urban development is related to the income situation of people. Prud'homme (2004) stipulates a direct link between size of a city and per capita income. As logical conclusion it can be stated that higher income people tend to realize the "desire for single family housing" (Boret, D. 2004). Households moving to the outskirts of cities can be explained initially by the available property found there. In effect, going with improvements in transport people are always looking further away for less expensive property. This factor, combined with a strong desire for property ownership and the role of accommodation as a social mirror and the favorable image of single-family houses within our societies, strongly influences households' "desires" as regards housing type. The housing in dense districts against all planning efforts is less attractive. In an analogous way all over the world the new form of housing in gated communities is asking for more land in the outskirts of cities. Due to these facts it can be concluded that there is a strong sociologically driven force which causes sprawl.

Sprawl may also result from planned development, as demonstrated by detached housing developments and other residential programs produced by the capital investment sector or controlled by the public sector. Some projects may be on a very large scale: new districts corresponding to satellite sub-cities in Delhi, huge metropolitan projects in Bangkok, edge cities in Cairo, re-settlements of IDP's in Ramana (Baku, Azerbaijan) or Gardabani (Gori, Georgia, Fig. 3-1) etc.

In industrial countries construction zones were extended on repeated occasions or periodically as a stimulant for development for municipalities. Land market dried out albeit the existing construction zones are filled up to an extent of 75% only. In Switzerland up to 25% of the areas still is not under construction due to land stockpiling or difficult ownership conditions. Therefore increasing density by realizing unused construction zones through legal force is under intensive discussion (Bertschi, M. 2002 and Eggenberger, M., Stettler D. 2008).

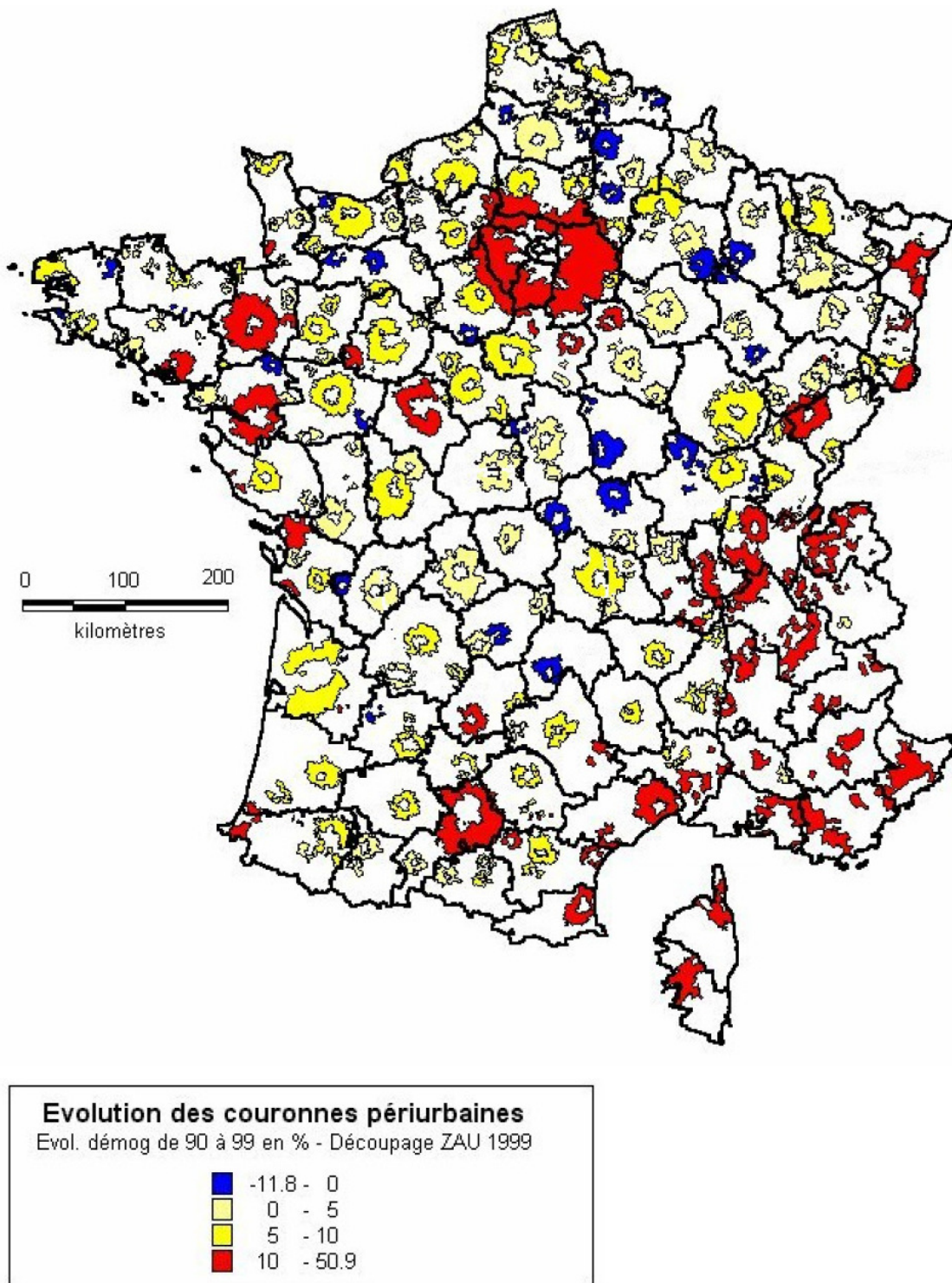


Fig. 3-2 Evolution of sprawl in French urbanized areas from 1990 to 1999 (Guet, Y. 2004).

4. LAND CONSUMPTION AND SPRAWL CANNOT BE STOPPED BUT STEERED AND CONTROLLED

The sustainable treatment of land as an ending resource nowadays is a mayor goal of space-oriented activities. Against the background and the requirements of a growing population the World Bank defined its sustainable land management (SLM) in 2006 as a knowledge-based procedure that helps integrate land, water, biodiversity, and environmental management to meet rising food and fiber demands. This should be achieved by sustaining ecosystem services¹ and livelihoods. This definition mainly is focused to agriculture and rural development. When it comes to urbanized areas the water, environmental, and biodiversity aspects may have priority.

Bearing in mind Prud'homme (2004) the city itself based on its economic role as a flywheel is the moving force for sprawl. In cases land use planning is in place sprawl happens in a periodical flow after extensions of construction zones (e.g. planning cycles of 10-15 years in Switzerland). The pressure for repopulation of the outskirts by legally approved zoning is mainly dependant on economic reasons as mentioned above. These processes allow steering by risk based land use planning or prioritized public interest. Overall total stop seldom happened because economic pressure was big enough. In non industrial countries economic pressure often is overwhelming and dynamic so even steering and controlling do not happen if the relevant instruments are not in place (see Tab. 1-1). Whereas land consumption declines right away if economy is showing signs of weakness.

Steering is successful especially if there is danger to be avoided by risk based land use planning measures. Hazardous areas as floodplains, mud and snow slide areas etc. are not feasible conditions for housing (Kohli, A. 1999). Even belated identification can be the reason



Fig. 4-1 Debris flow in the Bernese Alps, municipality of Brienz (2005, left), Switzerland and landslide in the eastern Jura Mountains, municipality of Wintersingen near Basel, Switzerland (1999, right).

¹Ecosystem services are the benefits people obtain from ecosystems. These include: - Provisioning services that provide necessities such as food, water, timber, and fiber; - Regulating services that affect climate, floods, disease, wastes, and water quality; - Cultural services that provide recreational, aesthetic, and spiritual benefits; - Supporting services such as soil formation, photosynthesis, and nutrient cycling. Source: Millennium Ecosystem Assessment 2005.

for resettlement² or restricted areas. In such cases active land use planning becomes SLM and is an asset for the community by increasing security of life and of investments as well.

5. STEERING OF LAND CONSUMPTION AND SUSTAINABLE LAND MANAGEMENT (SLM) CREATE BETTER CONDITIONS FOR DEVELOPMENT

By applying strong SLM procedures including transparent land consolidation procedures to rural and urbanized areas amongst other things investments in utilities become highly worthwhile and create higher effects than in sprawled areas. Efficiency rates increase and network planning for water or sewing make sense. Site developments as well may take profit from available and easy to connect utilities, as these effects can be realized by first agglomeration of construction in abandoned areas, industrial wasteland, or gaps of settlements. The higher density of users creates better conditions as overall costs for citizens and capital investors decrease and service quality may be raised.

In Azerbaijan, especially in Baku continuing degradation of the urban environment is going on due to a missing modern spatial planning system, missing new master plans or detailed plans for urban areas. Consequently, new construction is carried out under the pressure of market forces, basically without proper planning regulations. As well it is not quite clear who is responsible for the preparation of plans and issuing of permission for changes in land-use and building permits. State planning authorities still try to oversee planning issues that might be handled at the regional or local (municipal) level (UNECE, Committee on Housing and Land Management 2007). Easily to apply building permits would help to increase security of



property. Stable and transparent procedures with defined planning horizons create security amongst owners and readiness for dynamic developments – altogether factors for well-being of a developing and an industrial community.

Fig. 5-1 Photo composition of an urban investment project in Baku, Azerbaijan – Flame Towers, under construction since 2008 - 2011.

² In the Swiss Canton of Nidwalden, Municipality of Oberdorf the destruction of a training center Hostetten-Wil was ordered due to the danger of flooding. Measures for damage prevention would have been disproportional. In future this area is restricted area for construction.

6. SUSTAINABLE LAND MANAGEMENT (SLM) NEEDS CADASTRE AS A PRE-REQUISITE

6.1. The Cadastre as the Central Instrument of Land Management

As a pre-condition land management in each form as land reforms, land consolidation, land use planning etc needs a sustainable base documentation of topology, topography, and property. In cases where a reliable cadastre is missing property remains unclear and SLM hampered. So in the immediate aftermath of a conflict the securing, restoration or setup of land records as the cadastre follows as a consequence in post-conflict countries where land records were available (Augustinus, C., Lewis, D., Leckie, S. 2007). Unlucky examples are easy to find such as Kosovo or other Balkan countries. Even if kind of a cadastre system is in place but reliability and maintenance do not properly work a somehow unclear property situation makes SLM nearly impossible as show above in Azerbaijan.

Loss of property and investments by lacking transparency of public planning and unreliable cadastre will produce very low trust in cadastral documentation. Furthermore problems will be created by illegal development and construction in restricted or endangered areas. Nowadays in Kosovo municipal authorities try to regularize and legalize illegal constructions as a first step back to reliable land management systems as the cadastre (UNCESCR 2008).

The maintained digital cadastre following the boundary concept is the central instrument of a coordinated land management – with its maps and registry land use planning and land consolidation as well as the management of public-right restrictions are sustainably to handle. Wrong placed settlements in endangered or hazardous areas, value loss through decreased life quality near traffic or airfields etc. can be avoided. In addition it is a fact that most planning processes are very time-consuming and consist of up to 75% of data acquisition and preparation. Only 25% are left for the effective planning work. With the new cadastre this ratio can be reversed to 25%:75% (Kaufmann, J. 2008).

6.2. The Cadastre of Public-Right Restrictions (PRLR Cadastre)

No one who owns land in most dwelled areas of the world can simply use it as they wish. Owners have to comply with conditions laid down by Governments and by the authorities. And this means complying with a multitude of acts, ordinances and official restrictions – so-called public law restrictions on landownership rights (PRLRs). These restrictions may be: Comprehensive development plans, zoning laws, building codes, impact fees and ordinances, lines of construction, lines defining the minimal distance to forests, cadastre of refuse dump locations, water protection zones, maps of hazard zones etc.

Until now, it has not been particularly easy to obtain all the information relevant to a specific parcel of land. Because a variety of authorities may be involved in the restrictions, a time-consuming trek from office to office is often needed. For this trouble the PRLR Cadastre offers a solution by displaying authoritatively summarized the most important restrictions that apply to each land parcel (Dütschler, P., Bigler, M. 2006).

The PRLR Cadastre as an add-on extends the positive effects of the cadastre and improves the efficiency of SLM by reliable information. The building of the PRLR Cadastre appears as a

more demanding task for the surveyor what let him create the comprehensive instrument for sustainable land management (Tab. 6-1).

Fields of business activities	Tasks	Spatially related activities	Tools/Methods
strategy	visions and goals	land policy	political activities
management	measures and projects for the implementation of the policy	(spatial) land management	LAND MANAGEMENT land-use planning land consolidation land reallocation landscape development land recycling monitoring navigation geoinformation land registration cartography surveying geodesy GEOMATICS
administration	active handling of spatial information, data exploitation, visualization, creation of reports	(spatial) land administration	
documentation	cadastral operations, data modelling, data acquisition, data maintenance	(spatial) land documentation	

Tab. 6-1 Field of tasks of surveyors in Switzerland (Kaufmann, J. 2008).

7. CONCLUSIONS

Comprehensive documentations in maintained digital cadastres following the boundary concept of the really existing legal situation of land will form a mighty basis for sustainable land management (SLM):

- SLM based on cadastre allows to react with quick procedures on dynamic developments and improves security of property;
- SLM based on cadastre allows transparent workflows in sense of good governance;
- SLM and cadastre as well as PRLR Cadastre should run in a symbiotic relationship for maximum effect.

It will be a more demanding task of the surveyors organized in FIG to develop and implement sustainable land management activities to help to resolve the social and environmental problems of the human community.

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BIOGRAPHICAL NOTES

Dr. Alexander Kohli, born in 1967, graduated at the Department for Rural Engineering and Surveying in 1995 from the Swiss Federal Institute of Technology (ETH Zurich). From 1995 until 1998 he was doing his PhD studies at the Versuchsanstalt für Wasserbau (VAW), Swiss Federal Institute of Technology (ETH Zurich) on BUILDING SCOUR IN FLOOD PLAINS under the supervision of Prof. Daniel Vischer.

After the PhD in 1998 he started as surveying engineer and geomatics expert in the Swiss engineering company BSB + Partner, Consulting Engineers and earned in 1999 the Swiss license for licensed land surveyors. Since he became partner with BSB + Partner he runs a special department for Cadastral Surveying and Consulting working for public and private organizations in the fields of Project Development, Land Management, Administration and Cadastre in Switzerland, the CIS, and in the Balkan States.

Since 2001 he acts as head of the public-law planning association (regional planning association) Repla Grenchen-Büren within the Swiss plateau. In 2009 Dr. Alexander Kohli was dispatched as delegate of the Swiss professional organization of surveyors in FIG, Commission 8, Spatial Planning and Development.

CONTACTS

Dr. Alexander Kohli
BSB + Partner, Ingenieure und Planer
Dammstrasse 14
CH-2540 Grenchen
SWITZERLAND
Tel. +41 76 393 01 21
Fax + 41 32 654 59 31
Email: alexander.kohli@bsb-partner.ch
Web site: www.bsb-partner.ch