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Regional Disparities And Asymmetric Shocks: The Case Of The Spanish Regions

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Does land use under ecological constraints emerge a compensation between urban and rural areas? Some explorative considerations

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Abstract

Rural areas are characterised in terms of land use by spatially ecological potentials whereas urban areas concentrate the land use on economic activities with higher productivity neglecting the local spatially relevant ecological potentials. This common view seems to be deepened on the background of an increasing demand for restrictions in land use in order to maintain the ecological potentials under the sustainability postulate. This development can be seen in both, urbanised and rural areas but it also seems that an increasing division of labour takes place between different types of areas: Urban areas provide jobs and wealth in the narrow economic sense and rural areas provide the ecological potentials by waiving economic welfare. This kind of waiver is not necessarily a volunteer action by local authorities as it is frequently imposed by upper governmental levels via natural protection laws and restrictions for land use. The paper structures the main developments in the field, highlights the mutual interdependencies and entanglements between urban and rural areas and shows under which conditions which kind of compensation could emerge.

A closer look on the subject reveals that the land use restrictions by far are not as strict as it appears from outside, and as it would be necessary from the viewpoint of sustainability. The private and the public sector need to be distinguished. Compensation only emerges if the opportunity costs for land use in rural areas under a sustainable legislation are much higher than in urban areas and - from the view point of the local authority level - urban areas benefit much more from that restrictions than rural areas themselves. Also it needs to be taken into account that rural areas profit from urbanised areas by the provision of jobs and income to the commuting rural population which stresses the fact of mutual dependencies. Finally, two other aspects are important to consider in particular for the public sector: how are these types of areas delineated for administrative purposes i.e. do the functional dependencies compare with the administrative boundaries, and what are the determinants of the public revenue generated for the local authorities. A first tentative conclusion suggested that rural areas are less disadvantaged than it appears in the first place, but this result needs to be sustained by broader empirical research.

1. Introduction

The growth of occupied land is still positively related with the growth of GDP in modern societies although land is a scarce resource which cannot be enhanced in quantity but eventually in quality. However, the quality of land use and soil belong to the decisive factors for a sustainable development as any space represents the possible location for natural areas. Therefore the main objective of policy towards sustainability must be the decoupling of land use for economic purposes and economic development in order to provide the land for spatial and soil-bound eco-systems. One crucial point towards the sustainable land use represents the spatial incentive system inherent to the market economy in terms of the spatial distribution of economic activities and the spatial effects created by the fiscal system. It is easy to understand that in terms of land use the patterns in agglomerations and urbanised areas differs considerably from the rural areas, which has effects on the public and private income in that particular areas. It seems to also be obvious that the concentration of economic activities in agglomerations stems from the realisation of urbanisation and localisation economies (Isard 1956) and lead to an intensification of land use in that agglomerations.

Now the paper aims at the identification of the spatially discriminating factors responsible for unsustainable land use. Section two sets of by providing the frame for the paper in two directions, firstly showing the underlying understanding of the relation between land use land occupation and instruments and secondly providing some empirical results about the development in different contexts. There in section three the frame is set to identify the spatial structure (and spatial administration) in terms of kind of areas agglomeration, *metropolitan vs rural areas (sub-urbanisation)* ultra peripheral areas (no conflict in land use). These considerations are followed by an explanation of the division of labour and functions of different types of areas but the land use is also influenced by the Policies influencing the division of labour between areas (land use policies a.o.). as a preliminary result some conclusions are drawn as a starting point for the section four which is devoted to the relation between spatial patterns of land use and public and private finance. After elaborating the further steps on the base of an example a method is developed which allows to identify the opportunity costs of restricted land use. On the base of that concept the role of the delineation of and the division of labour between local authorities is highlighted and consequences of the features of public revenue systems are elaborated which finally allow to answer the question of the necessity of compensation of urban and rural areas.

2. LAND USE, LAND OCCUPATION AND INSTRUMENTS – SETTING THE FRAME

2.1. The frame

The paper builds upon the relation between land use and land occupation, which inter-relations are existent and which opportunities allow to influence the land occupation for unsustainable land use and to optimise the, in principle, undisputed land occupation for economic and social purposes. In order to structure the whole field three areas and there interrelations need to be distinguished:

- a) The understanding of an **sustainable land use**: That is indeed a question of definition and measurement. Some concepts are existing (sealed land, Öko-Wert (eco-value), Corine Data base,

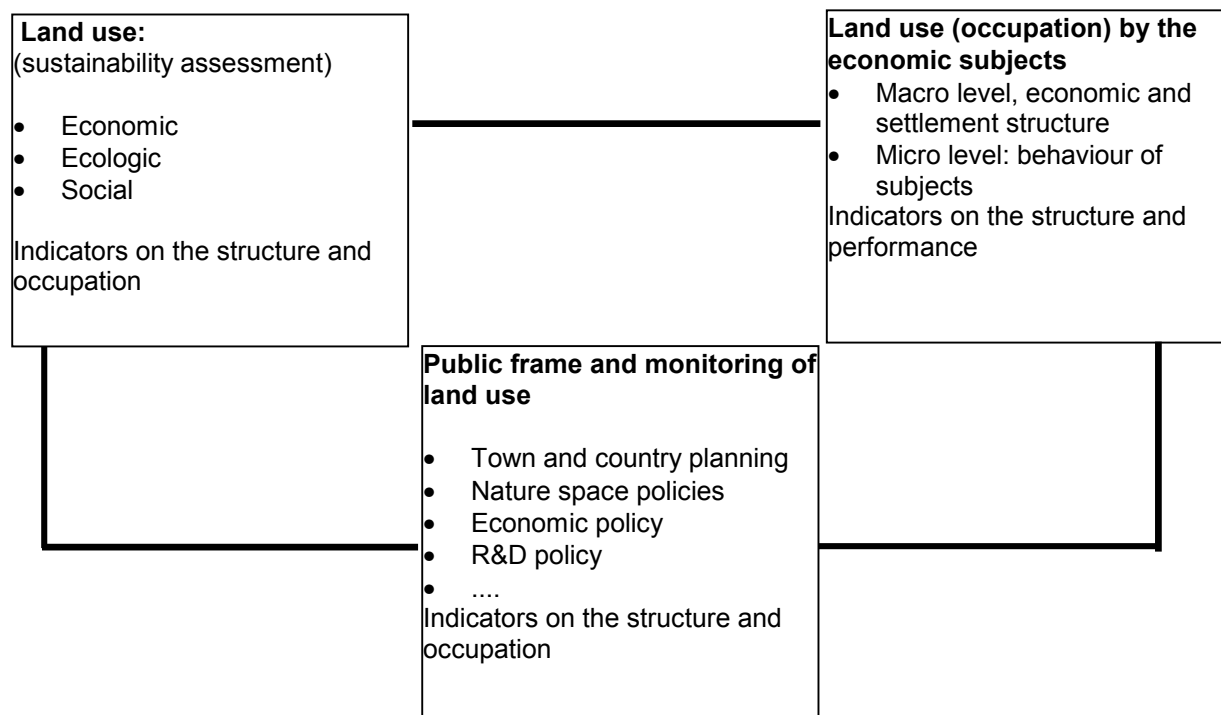
ATKIS etc. Krack-Roberg/Rademacher 1999) which are not available for the whole area of Germany yet.

- b) Which kinds of **land use in terms of occupation** exist? The area refers to the settlement structure and the economic structure also other occupational structures which need to be empirically compiled Krack-Roberg/Rademacher 1999 describe first approaches of the environmental account system) but there still remains the question how to measure the use of land in general terms. It is obvious that the GDP must be extended by other components in order to receive a rough estimate of the economic returns of specific land occupation structure.
- c) How to **monitor land use** ? Apart from the “hard” legal Instruments such as the regional and land use plans other policies influence land use such as regional economic policies, agricultural policies natural protection policies which built in most cases on the instruments of monetary incentives.

In terms of inter-relation the following points are most emerging:

- a) The **relation between occupation and land use** in terms of violating the postulate of sustainability why do specific occupations create a much better relation (higher efficiency) between the (ab-)use of land and the returns of that kind of use?
- b) The **relation between monitoring of land use and the land occupation** – how do specific instruments effect actors and which innovations towards a more efficient land use are provoked by certain instruments?
- c) And finally which **information about the actual land use** are needed for the policy making, and how can be secured that necessary information do reach the relevant actors.

Fig. 1: Basic structure for the investigation of the relationship between land cover, land use and the monitoring of land use



2.2. General Trends

The land used for settlement and transport in terms of m²/cap. in the Germany of the old Länder grew from 1950 to 1997 by 43,3 % and the space per capita for housing even by 153,3 % in the same time. (Enquete Kommission 1997). Table 1 gives a first impression on the land coverage in Germany in a detailed version. The intensive land use by urbanised areas becomes most obvious when the situation of city states is compared with the overall situation. Although the land used for transport system does not appear to big one has to bear in mind that the in particular transport cuts the landscape into piece and there lowers the ecological value of the remaining pieces considerably.

Table1: Coverage of Land in Germany 1990

classif.	Kind of coverage	Germany (old Länder)		Only city- states*	
		1000 ha	%	1000 ha	%
1	Built land	2 671,6	7,5	122,3	59,7
11	City like used land	2 103,2	5,9	87,9	42,9
12	Industrial, business and transport land	309,0	0,9	20,2	9,9
13	Mining, disposals and building sites	151,4	0,4	1,2	0,6
14	Artificial green fields but not used for agriculture	108,0	0,3	12,9	6,3
2	Agricultural land	21 661,0	60,7	46,3	22,6
21	Agriculture	14 270,3	40,0	17,0	8,3
22	Traditional permanent cultivation	258,0	0,7	2,6	1,3
23	Green land	4 326,9	12,1	19,0	9,3
24	Agricultural land with heterogeneous structures	2 805,8	7,9	7,7	3,8
3	Forest and close to nature land	10 821,0	30,3	24,5	12,0
31	Forests	10 424,1	29,2	22,2	10,8
32	Bushes and floor vegetation	331,2	0,9	2,1	1,0
33	Open land without or with insign. veg.	65,7	0,2	0,3	0,1
4	Wetlands	168,9	0,5	1,3	0,6
41	Wetlands inland	155,0	0,4	0,7	0,3
42	Wetlands along the coast	13,9	0,0	0,6	0,3
5	Water surfaces	379,8	1,1	10,6	5,2
51	Water surfaces inland	342,7	1,0	5,3	2,6
52	Sea	37,1	0,1	5,3	2,6
	Land in total	35 702,2	100,0	205,0	100,0

* Berlin, Bremen, Hamburg

Statistisches Bundesamt 2000

Table 1 just represents the cornerstones of the debate. The land consumption for settlement and transport is continuously connected with positive growth rates (see table 2) even taking into account different types of regions. Rural areas start from a lower level of land occupation but there growth of land use for settlement and transport takes place in higher rates. Agglomerations seem to have reached the limits in intensifying land use in the city centres but also in their rural parts. That observation points at the fact that the rural space in agglomerations is much more restricted that in the other parts.

Table 2: Land used for settlement and transport in 1997 and development 1981-97 and 1993-97 in the German old and new Länder

Region type	1997 in % of the whole space			Growth old Länder in %	
	National	old Länder	New Länder	1981-1997	1993-1997
Agglom. areas	16,8	19,6	10,2	16,8	2,9
city centre	52,2	52,4	50,6	17,8	1,5
high density	19,9	20,0	15,1	23,1	2,7
Dense	12,3	13,2	9,4	16,1	4,2
Rural	9,0	10,3	8,2	11,4	4,9
Urbanised areas	11,3	12,0	9,2	19,7	4,2
city centre	34,0	36,3	28,9	19,8	3,0
Dense	12,1	12,5	9,8	20,8	4,1
Rural	9,3	10,0	7,7	13,7	4,5
Rural areas	8,0	8,9	6,5	23,4	5,4
Dense	9,1	9,3	8,3	22,0	5,5
Rural	7,1	8,5	6,0	24,4	5,2
Sum	11,8	13,3	8,4	19,7	3,9
growth 1993-97 in %	4,3	3,9	6,1		

Source: own compilation from Dosch/Beckmann 1999

This observation does not apply to the type of urbanised areas. The city centres are slowing down in recent years whereas the rural parts have the highest growth rate. In rural areas both types the “rural-rural” and the rural dense areas are growing with nearly no difference but highest rates of all areas, in particular, in the last years 1993-97. Taking into account the availability of land in relation to the land occupied to so far, it is obvious that the reserves in free land in urbanised areas and in particular in agglomeration areas are not high. The general trend shows that the growth of land use for settlements is slightly decreasing (Dosch/Beckmann 1999) but far from stagnation. Growth rates have been higher in the new Länder where an even stronger sub-urbanisation process took place after the iron curtain fell. Apart from the regions with very expensive settlement land in the South and West of Germany there are still considerable reserves for reuse of land in inner cities. In general the settlement growth is strongest around urbanised areas due to lower prices and higher availability of land for settlement (Dosch/Beckmann 1999).

Dosch/Beckmann 1999 compiled some general tendencies (table 3) highlighting the development of different land use in their relation with each other. Most apparent are the strongly increasing land use for housing and settlement and the decreasing agricultural land. The growing number of single households and second and third residencies leads to increasing need for land for housing. This tables in particular place in the suburban areas surrounding urbanised and agglomeration areas as identifies in table 2.

Table 3: General Trends in land use 1989-97 for the old German Länder

Building areas and for public use in relation to	
Land for transport	Increasing
Green areas/open spaces	Strongly decreasing
Housing areas in relation to	
Land for transports	Strongly increasing
Green spaces in settlement areas	Green areas increase as do housing areas
Land for work space (total of building areas without housing)	1993-97 again more housing areas in relation to business areas
Business land	Decreasing
Land for road transport in relation to rail	Five times as much road than rail
Agricultural land in relation to	
Forests	Decreasing
Building/municipalities	Strongly decreasing

Source: Dosch/Beckmann 1999, 505

3. UNEVEN DISTRIBUTION IN LAND USE?

Now the focus turns towards the uneven distribution of potentials and activities in spatial structures. That needs to further elaborate on the one hand the functions of areas in the division of labour and on the other hand to highlight the exchange processes and entanglements between that areas. Furthermore policies are described which take deviating effects on the specialisation of areas such as the provision of natural areas for the other areas with more intense use of the spatially bound natural potentials.

3.1. Structure of Land Use

Land use differs in areas considerably starting from differing natural equipment of areas and resulting from historic, political and social and economic factors. By the time spatial structures developed which can be described by concentration of population, economic activities, the use of natural resources, infrastructures etc.. Most emerging in the respect of land use and occupation is the settlement structure measured by the population density as one can assume that the population density is strongly connected with the intensity of land use and defines well the problem in practice the structural differences between urban and rural areas. Schmidt-Seiwert 1997 distinguished 6 structural types of settlement based on the population density in cities and the surrounding areas.

Possible delineation of types of areas on the base of settlement structures

Agglomerations		Urbanised areas		Rural areas	
Population density > 150 cap./km ²		Population density 150 <100 EW/km ²		Population density < 100 EW/km ²	
High density with big centre	High density with centre	mid density with bigger centre	mid density with mid centre	Low density with small centre	Low density without centre

Schmidt-Seiwert 1997

The question raised above on the distribution of land use in spatial respect is particularly important for the comparison of rural and urbanised areas because this relation most predominantly shows the differences in land use. Therefore we only distinguish between urbanised areas from rural areas keeping in mind that urbanised areas also include the agglomerations.

Rural areas:

Rural areas formerly were characterised by agricultural and forest use of land in order to receive income. Now rural areas experienced by the decreasing importance of agriculture as a source of income and increasing concentration on the development of other sources of income by zoning land for commercial and industrial use, recreation, leisure activities. Rural areas are characterised by low population density, low density of settlements, tendencies of emigration, rural or village life style and a high share of free space, i.e. without any buildings or other soil-sealing activities such as transport. The high share of free land allows the provision of ecological potentials such as adequate living conditions for high biodiversity, landscapes and other natural resources such as water and fresh air. But the increasing intensification of the remaining agriculture led to high emissions with the consequence of endangering the ecological of rural areas (SRU 1996, Bantle 1998).

Urbanised areas

Urbanised areas are characterised by the density of economic activities and population on a local and a regional scale. Furthermore these areas show dense settlement patterns and low share of free space which can not adequately fulfil the ecological balance function. Urbanised areas are, in comparison to rural areas, better equipped with social infrastructure such as health services education and training facilities and cultural life. The ecological potentials are usually used (or over-used) without or with low restrictions by emissions of industries and transport, noise, soil-sealing combined with the loss soil functions and free space as environment for the life of many species. These too high burdens leads to worsening quality of live in the rural neighbourhoods (Handwörterbuch der Raumordnung 1995; Adam, Blach 1996; Hilligart 1998; Aring 1996).

3.2. Division of functions of different types of areas

The spatial structures show in a simplified view a division of labour concerning different functions which build on a wide variety of entanglements of and exchange relations between urbanised and rural areas.

Production of goods and services

Urbanised areas provide income for the working population, enterprises and the public households by the production of goods and services. Both, goods and services are also provided for the population of rural areas. Against it the function of rural areas stands for provision of agricultural products. Because of the decreasing agriculture (with high productivity) decreases the income from that sector. That results in the search for alternative sources of income in rural areas such as the settlement of enterprises and industries, land intensive recreation and leisure facilities. In addition, an increasing share of the rural population gains the income in urbanised areas which is supported by the demand for workforce in cities. Cities also attract workforce for a higher income level which may lead to relatively high unemployment rates. Consequently private and public income flow in rural areas. Daily commuting leads to increasing transport activities (SRU 1996).

Use of ecological potentials

Urbanised areas consume more natural resources than provided on the land of their territory – apart from raw materials, food, environmental goods such as clean air, drinking water, life space for biotopes

and species, free spaces for recreation and leisure activities and also waste and other disposable toxins. In fact this land needs to be “imported” from rural areas.

Thus, ecological potentials of rural areas, mainly provided through a free space are used across their boundaries. That division of labour is often supported by planning instruments by the allocation of ecological functions to specific areas such as water protection areas. Planning is aim here to the provision of ecological potentials for urbanised areas for the supply and disposal and the use as a space for balancing the ecological burden in urban areas.¹ These allocations of functions restrict rural areas in many ways in terms of their options and abilities to attract income. Restrictions occur in particular for the dedication of commercial and industrial sites and infrastructures i.e. rural areas suffer from opportunity cost by that restrictions as long as that restriction do not lead to compensations concerning the exported part of the service to urbanised areas.

Use of infrastructure

Urbanised areas, in comparison to rural areas, dispose of a high density infrastructure such as cultural amenities, health services, education and training. By, sometimes well developed, transport infrastructures these services are also used by the inhabitants of rural areas. The grant system foresees financial contributions for these services by higher grants for urbanised areas which provide urban functions to the surrounding area. The transport infrastructure also allows people, in particular with higher income, to move out of the urban centres in order to benefit from the higher quality of life. Consequently urbanised areas lose from by drainage of tax payers from the city whereas rural areas are benefiting.

Figure 2: entanglements and exchange processes between rural areas and agglomerations

Rural areas	Direction	Agglomerations
agricultural products and other raw material		Goods and services
emigration from rural areas		Emigration, suburbanisation
Emissions by agriculture, transfer transportation	→	Emissions by production, transport, waste etc.
commuters (job, training, ammenities)	←	Commuters (recreation)
Natural potentials		Labour/income
drinking water		
fresh air, Meso climate		
landscapes, biotopes, variety of flora and fauna		

3.3. Policies influencing the division of functions between areas

The distribution of land use and urban functions between rural and urban areas is not exclusively naturally grown. It also results from directly and indirectly spatially relevant politics. Firstly, politics monitor the spatial distribution of spatial functions by (passively) allowing certain land use but also

(actively) and directly support and build up specific land uses. The aim is to distribute the scarce resource “land” to concurring uses, in fact to shape the spatial pattern of land use. This includes on the one hand to avoid spatial disparities in the social and economic development (which only works to limited extend) on the other hand to protect the ecological potentials from over-use. The co-ordination of the spatial effects of sector policies play a major role on the regional level.

Restricting policies are most apparent for the protection of ecological resources and potential. The aim is here to define protection areas on the back ground of an increasing demand and intensity of land use. These areas ought to prevent conflicts with other affecting uses and to secure a controlled demand of that resources. The allocation of these kind of areas takes place by nature protection policies, water protection areas, forest protection etc.. That kind of protection areas are in most cases related to rural areas and represent restrictions for the private and public yield in that areas except the protection leads to direct income such as tourism.

Wide ranging planning instruments are used for the assignment of priority use for selected areas in order to achieve the co-ordination task which avoid the conflicts in land use such as for securing non built up areas (such as biotope and landscape protection, recreation, water protection). The assignment of such areas with priority uses, as a rule, do not lead to balancing payments which compensate for the lost use. These instruments, in general support the functional division of labour between spatial entities.

There are also many policies which directly and indirectly influence land use in favour of private and public income. These politics follow the aim of monitoring a balanced economic development and social welfare. Most prominent is the regional policy which influences the regional development by tax relief, reduction of interests, and public loans. More indirect but in many cases much stronger influence is exercised by investments in infrastructure which strongly affect the entrepreneurial decisions. But infrastructure investments follow more the demands of the market economy which do not necessarily coincide with spatial and distributional considerations. In fact, infrastructure takes two effects by lowering the transaction costs for the exchange of goods and factors between different areas (Hallet 1997, 11) and therefore may lead to specialisation (Krugman/Obstfeld 1994) which can have advantages for rural areas but in many cases lead to further and concentrations what usually goes against the economic potentials of rural regions.

3.4. Relation between economic activities and land use

Urbanised areas and rural areas developed functional division of labour with specialisations in particular what concerns the provision of ecological valuable space. Many spatially relevant policies and increasing commuting of employees support that division of labour. A range of questions are emerging:

- Does a direct link exist between the consumption of nature and income opportunities? The extreme case of a nature park may be obvious in that respect but how to assess that question when only particular restrictions occur such as in a ground water protection area?
- It needs to be approved that certain land uses are excluded with in protection areas. In fact, many use are possible in protected areas and vice versa there are problems to attract investments in areas without restrictions as well. In that case is a delineation of allocation and distributional objectives necessary.
- Rural areas can only act as a balance for urbanised areas in ecological respects if there the demands for quality are considered e.g. that the agriculture also considers the ecological limitations of sustainability. In fact, many uses of agricultural land do not compare with the

¹ The damaged ecological potentials of urbanised areas are not considered in that concept so the abuse of that potentials in total is even supported.

demands of an ecological balance space (Alvensleben 1998). Consequently it needs to be investigated how far the agricultural sector undertakes real ecological services in the maintenance of landscapes which consider the demands of sustainability (Bauer 1997).

- After the clarification of these question one may think about the necessity of the integration of these findings into the financial balance system between local authorities. The financial system already considers the distribution of functions between rural and urban areas e.g. the additional investments necessary for the central or bigger cities due to the necessity of the provision of higher level services. These have to consider the kind of revenue deriving from the variety of functions of land use in the different types of areas. Does the internalisation need to fix the purpose for spending the grants? The unclear delineation of public and private service for the sustainability of land use is not clear so far.
- The concept of the sustainable land use undoubtedly takes position in favour of the functional division of labour between areas. There is a need to investigate how this position compares with the vision of a sustainable settlement and which changes are to be expected with consequent implementation. It is also not clear which consequences are to expect for the other spatially relevant sector policies.

In order to answer these question a first investigation was carried out for the German Raumordnungsregionen. These regions have been delineated for the investigation of spatial questions and were compiled on the base of functional complementarity i.e. cities and counties which are strongly entangled and interrelated were put together in one analytical region. In Germany 97 regions exist of which 74 belong to the old German Länder. Some data are only available for the old Länder which, in that cases, leads to restricted results.

The first appropriation was also restricted by the availability of data which is envisaged to be extended in a second stage of the analysis. The indicators used in table 4 cover several dimensions of the whole approach (the computing was made on the base of the standardised data with reference to the German averaged):

- the economic activities (GNP) itself the as the resulting tax base the tax revenue by capita;
- the intensity of land use by the settlement density (measured by the population density on the settlement and transport land) and the population density for the whole area;
- the land close to nature quality represents and indicator for the land most sustainably used,
- intervening variable between the population density and the economic activities represent the density of employees
- the balance of commuters represent a variable which gives an indication on the exchange process between different areas.

First results can be described as follows (see table 4): Not surprisingly there is a strong relationship between population density, settlement density and share of land for settlement and transports. A more surprising result represents the relatively weak relation of population density with employment density in particular bearing in mind that the analysis is based on the level of the Raumordnungsregionen which are on a higher level than NUTS 3 but still below NUTS 2. Higher levels of employment density are connected with a positive commuting balance but which is not too strongly connected with the population density. Also considering the production and tax base per capita, which are strongly interrelated with each other, we can see a higher correlation with the population density but lower with the employment density. Putting these results together we can say that production and tax base are more related with population density and the settlement patterns than with the employment. When also including the question of nature quality we can see higher negative correlations with the employment

density than with the production or the other way around we can see a stronger connection between low environmental quality and employment and commuting on the one hand whereas the GNP is not as much connected with bad quality of the environment but more with higher population densities. In fact this means that these region are not necessarily worse in terms of their land use.

Table 4: Correlation matrix² of basic indicators for the comparison of land use and economic activities

		Settlement density	Share land f. settlement/transport	Close to nature land /cap.	Tax revenue/cap.	Gross production / cap.	Density of employees	Balance of commuters	Population density
Settlement density	R ² Pears. Sig 2 side N		,774** ,000 97	388** ,000 74	,475** ,000 97	,433** ,000 97	,482** ,000 97	,519** ,000 97	,822** ,000 97
Share land f. settlement/transport	R ² Pears. Sig 2 side N	,774** ,000 97		-,225 ,054 74	,544** ,000 97	,481** ,000 97	,279** ,006 97	,464** ,000 97	,957** ,000 97
Close to nature land /cap.	R ² Pears. Sig 2 side N	-,388** ,000 74	-,225 ,054 74		-,265* ,023 74	-,251* ,031 74	-,434** ,000 74	-,455** ,000 74	-,253* ,000 74
Tax revenue/cap.	R ² Pears. Sig 2 side N	,475** ,000 97	,544** ,000 97	-,265* ,023 74		,915** ,000 97	,215* ,034 97	,438** ,000 97	,439** ,000 97
Gross production / cap.	R ² Pears. Sig 2 side N	,433** ,000 97	,481** ,000 97	-,251* ,031 74	,915** ,000 97		,349** ,000 97	,565** ,000 97	,397** ,000 97
Density of employees	R ² Pears. Sig 2 side N	,482** ,000 97	,279** ,006 97	-,434** ,000 74	,215* ,034 97	,349** ,000 97		,785** ,000 97	,306** ,002 97
Balance of commuters	R ² Pears. Sig 2 side N	,519** ,000 97	,464** ,000 97	-,455** ,000 74	,438** ,000 97	,565** ,000 97	,785** ,000 97		,422** ,000 97
Population density	R ² Pears. Sig 2 side N	,822** ,000 97	,957** ,000 97	-,253* ,000 74	,439** ,000 97	,397** ,000 97	,306** ,002 97	,422** ,000 97	

Values 1,000 < ,600 are printed bold and boxed in; values ,600 < ,400 are printed bold. Negative correlations are printed in italic. Data bases: BBR 1998, own computations

This first analysis should not be used for the formulation of conclusions at that stage. It should better be used to deduce necessary refinements which we see in two ways. The first way is to split the analysis for different types of regions in a more rough way (agglomerations, urbanised areas and rural areas) or a refined analysis (agglomerations with high density, agglomerations with outstanding centre, urbanised regions with higher density, with mid density and centre, with mid density and with centre, rural areas with higher density and lower density). I will be also worth testing to produce a classification of regions on the base of a cluster analysis instead of the introducing it as an independent variable. A possible shift of the analysis on the county level of NUTS 3 seemed not to be recommended as the Raumordnungsregionen are much more consistent than the administrative NUTS 3 level. More over a refinement of the included indicators is necessary The following list of indicators would be useful:

- the relation between the built area and open space in order to better specify land use in relation to the production;
- the open space per capita for a better identification of areas with higher share of land with higher ecological value;

² I like to thank Lisa Benz for the technical support.

- employment in the second and the third sector for the better identification of the relation between a particular land use/coverage and the production taking place there;
- the share of employees between 30 and 55 and the qualification of the employees which allows to better quality the occupation of employees referring to the exchange between different types of regions.

The previous section tried to follow an approach which allows to describe the empirical relations between the patterns of land use and coverage whereas the following section concentrates on a better understanding of the logics of land use which lay behind that pattern.

4. SPATIAL PATTERNS OF LAND USE AND PUBLIC FINANCE

Following the outlined debate it becomes clear that the a division of labour (in terms of a specialisation between areas) leads to deviating opportunities for revenues for both, individuals by their wages and local authorities by their revenues due to tax income. The questions arises how both are affected, and whether a need for compensation emerges.

4.1. Relation between public finance and land use: a rough example

This subject will be address by a simple example for the clarification of the involved questions. Assume stronger restrictions for the use of land due to water protection. If the land is owned by a private in many countries a compensation would be offered in order to balances the opportunity costs of the private owner. In the ideal case of a market economy these opportunity costs need to be added to the water price in order to internalise the costs of a water protection area, and, which prohibits other uses. Furthermore, assume that the local authority gains its revenue by taxing the particular private owners within its boundaries who benefit from the water protection. Not any distortion of prices and taxes would take place.

- Now assume that a compensation of the opportunity costs of the private owner of the land would not take place, but the protection needs to be secured by law; in this case possible earnings of the owner would be lesser than without any restriction and also public revenue would decrease.
- Assume that the water protection area belongs to the premises of the local authority; then a compensation usually would not be considered to be justified as a public body is not conceived as a private economic actor. Public authorities should only receive money for the execution of public tasks – in that term they are dealt with in a different way from other economic subjects. Therefore, the balance of opportunity costs which result from public purpose (protection of water) must not be achieved for a public body.³
- Assume the protected area belongs to the local authority and the water generated from that area is only used within the limits of this particular area. Then, one could conclude that at least the population of that local authority profits in total from the restrictions to that area, although that solution does not compare with a market solution. Therefore the distortion of the result is obvious but may be tolerated.

³ Public bodies receive their revenue on the base of needs and opportunity costs are not a source of need. See for that discussion also session 3.4.

- Assume the water is delivered to other areas outside the limits of the involved local authority. In that case a clear disadvantage occurs in terms of the distortion of price but also in terms of the distortion of the inter-regional balance of income and revenue opportunities. In that case the regional export of environmental quality would clearly take place without any compensation of the profits apart from higher profits of the company performing in the water protection area.

The last conclusion is not as clear if we take into account that other not-priced services are provided in the way that commuters come for work to local authorities which overuse their natural resources (such as an industrial city) but live in an other local authority in the clean and cosy countryside environment. Much depends on the base on which the revenue of a local authority is built on: If the revenue derives from the income of the people living in a particular local authority, the use of natural sources is exported to that areas where people live in the outlined case. In that cases, some compensation for bigger cities already takes place in many countries: Bigger cities receive higher grants per person due to higher expenditure for public transport and the provision of centralised public services. The higher grants are meant as a compensation for the local authority's extra expenses for the commuters. Otherwise, the grant system should be connected with the amount of jobs rather than the inhabitants in terms of a compensation for efforts made in order to create jobs in a particular local authority.

This very brief description of the problem reveals the key elements which may make it necessary to think about compensation systems due to restrictions for land use in different areas which will be further discussed below: Are, in fact, opportunity costs of restricted land use occurring (also considering problems over time)? Is a division of labour between areas of local authorities foreseen? How are the public revenue systems for local authorities organised, do the systems consider the outlined dependencies? All these questions are closely related to the problem who benefits of and who pays for the restrictions in planning and therefore for a sustainable land use.

4.2. Sustainable land use and opportunity costs

The concept of opportunity costs builds upon the idea to compensate for the not realised alternative use of a particular resource. Looking back some centuries land was not the scarcest resource or input for production one can think of. Even until the fifties and sixties conflicts of land use was perceived as a local problem which occurred in well defined areas but was rather no problem on the background of the whole land available in all counties. In terms of opportunity costs there was only compensation necessary in that areas where the conflicts occurred. The more intensive use of the land in this century converted into a land scarce resource which has been best assessed in spatial terms by the computation of the ecological footprint for certain areas (Rees/Wackernagel 1999). The ecological footprint revealed that there is, indeed, an overuse of natural resources which can be made visible by the size of the geographical area need to overall nurture an area.

Spatial areas are defined for certain purposes in order to restrict the land use as described above. Apart from the, indeed, very interesting question of the in total tolerable land use under sustainability restrictions, which addresses the core of the scale problem (Costanza et al. 1997) we would like to concentrate on the allocation question. The key questions is how far, in fact, other uses are prohibited by the already existing particular restrictions and, thus, which opportunity costs and distributive effects are resulting for that kind of sustainable land use.

Looking at particular areas it becomes obvious that opportunity cost differ considerably between areas which is best expressed by land prices, in the following case we distinguish an urban and an rural area. Land prices for land without any planning restrictions depend on a range of determinants:

$$L_{U,R}^{npr} = f(AC^{npr}, IS^{npr}, PR^{pr}) \quad (1)$$

$$L_{U,R}^{pr} = f(AC^{pr}, IS^{pr}, PR^{pr}) \quad (2)$$

L: Land price;

U: Urban areas;

R: Rural areas;

AC: Location and accessibility (positive dependency);

IS: Endowment with infrastructure, highly correlated with agglomeration (positive dependency);

PR: Planning restrictions for land use on other land (positive dependency);

npr: Land without planning restrictions;

pr: Land with planning restrictions.

Planning restrictions lead on the base of the outlined assumptions to decreasing land prices for land whereas the not restricted land will become more expensive given the available land. So in fact planning restrictions lead to increasing land price for land without any obligations.

Of special interest are for environmental reasons mainly the restrictions for land use and closely related the endowment with infrastructure. In principle, in some remote areas restrictions for the land use may be introduced without any effects to the land prices because of a - in terms of land pricing - dominating peripheral location and bad accessibility. In that case the opportunity costs for restrictions of land use are neglectable. This situation was true for many countries in Europe until about the turn of the century.

The policies described under 3.3. towards a more restrictive land use just indicate the demands for a more sustainable land use which became necessary because of both the increasing demand for land and the increasing awareness of the negative effects of land use on e.g. the bio-diversity demands for natural parks and extensive agriculture; quality of water demands for flood prevention natural reserves, quality of soil demands for waste reduction, clean technologies and extensive agriculture, quality of air demands for less acid rain in order to protect soil and forests.

If the calculations of Rees and Wackernagel are right, and many comments support their findings, we are still far away from a sustainable land use and the total use of land must be reduced - down to one tenth of the current use in particular in the industrialised countries. But the questions is where this reduction will predominantly take place, in agglomerations or in rural areas or both of these. In principle one can think of three possibilities (see table 5) out of a matrix which also allows an intensification of land use in one type of areas in order to achieve a reduction of the environmental impact in total by specialisation.

Table 5: Possible combinations of land use in urban and rural areas

Changes in land use	In urban areas	In rural areas
Intensification	1	2
Extensification	4	3

Valid combinations for an in total reduction would be of course 4-3; The combinations 4-2 and 1-3 are only tolerable if the intensification of land use is smaller than the extensification; the possible combination of 1-2 is exclude as this cannot not lead to a reduction in total in any case. But, the interesting question remains how the land prices are affected by planning restricts and which kind of specialisation would result. On the base of equitation (1) increasing restriction for land use would c.p. lead to increasing land prices for land without planning restrictions. The quotient k of land prices L in rural R and urban U areas for unrestricted land npr before and after a move towards a more sustainable land use regulations for land with planning restrictions pr at the time t_0 and t_1 would indicate a shift of economic activities:

$$k^{npr} = \frac{u^{npr} \left({}^{t_1}L_U^{npr} - {}^{t_0}L_U^{npr} \right)}{r^{npr} \left({}^{t_1}L_R^{npr} - {}^{t_0}L_R^{npr} \right)} \quad (3)$$

The difference between t_0 and t_1 is also moderated by the coefficient u for urban and for r rural areas which mainly indicates that the reaction of economic activities could be deviating in urban from rural areas. This approach takes into account that the reaction differs in these types of areas due to a different endowment with infrastructure IS and different accessibility AC . The land prices should c.p. depend on different degree of regulation for land use at the time t_0 and t_1 . Now, possible results are

$$k = \begin{cases} > 0 \\ = 0 \\ < 0 \end{cases} \text{ which would mean in the first case a shift towards more economic activities in rural areas, the}$$

second case no alteration of economic activities in the division of labour between urban and rural areas and the third case increasing activities in urban areas. A first conclusion could be that planning restrictions lead to new relations between land prices. Shifts of economic activities due to these price differences are plausible and expected.

3.3. The role of the delineation, division of labour between local authorities and compensation

The consideration so far only addressed the problem of what kind of opportunity cost occur but did not go deeper into the analysis who actually is gaining profit or is paying the bill for these shifts of prices due to planning restrictions. This analysis will be deepened by looking at different combinations of profiting and paying actors also considering a distinction of private and public actors. The analysis will also reveal the inherent difficulties with this type planning restrictions.

Table 6a if restrictions and profits are with the same private body then an internalisation automatically takes place: an example: the owner of a site gains water from this site. Stronger sewage regulation which makes necessary to improve the owners sewage system lead to higher quality of water which

can be sold for a higher price. That is not the case when the profiting and paying body deviate from each other. Then, the planning restricting authority should provide a compensation paid by the gaining to the restricted private in order to maintain the polluter pays principle. This would be the case of a water company only benefits from the higher water quality but effort to achieve this water quality was made by e.g. house owners who were obliged to improve their sewage system on their premises.

Table 6: Possible combinations of profiting and paying actors under planning restrictions

a) only private actors in one local authority: compensation possible and required

Profit \ Restriction	Private 1	Private 2
Private 1	Internalisation given	Negative external effect for 2 Positive external effect for 1 Compensation possible!
Private 2	Negative external effect for 1, positive external effect for 2. Compensation possible!	Internalisation given

b) only public actors of two local authorities : compensation not possible in every case

Profit \ Restriction	Public A	Public B
Public A	Internalisation given	Negative external effect for B Positive external effect for A
Public B	Negative external effect for A positive external effect for B Compensation possible ?	Internalisation given

c) mixture of public and private actors without identity of payer and beneficiarii

Profit \ Restriction	Private 1 in A	Public A
Private 2 in B	Negative for 1 and positive for 2 external effect in the private sector	Compensation by a tax on the private benefit?
Public B	Compensation by a public subsidy to the private?	Negative for A and positive for B external effect in the public sector

The same apply for public bodies acting like private bodies but the constellation inheres a conflict between the principle of adjusting the allocation and the actual need financial means of local authorities to fulfil their task as a public body. In the case of public land owner a compensation is hard to justify. Public authorities are not supposed to be profit maximising entities and should only take action in the case market failure. Public revenue should only be determined by the need of the local authority to fulfil its public tasks so in that case a compensation for the reason of adjusting the income would not be justified. In fact, the allocation of public funds demand the internalisation is not a reason for revenue when that revenue is not needed for a specific purpose. (table 6b).

It is getting even more difficult if cross connections occur between public and private sector in two different local authorities (table 6c). The difference would occur in the event that the public body and private body deviate in terms of restrictions and benefits. That can be clarified by the following example: The rural local authority A introduces a restriction for land use on their territory for companies in that case private 1 in order to provide ecological potentials for local authority B where in particular private 2 benefits. How is it possible to compensate for the restrictions of private 1. In fact one can hardly imagine that local authority B pays directly to private 1. The most apparent chain would be an agreement between local authority A and B on planning restrictions together with compensation payments which are lead to the private 1 and taken from the private 2. That case does not consider yet the missing tax revenues of local authority A be reducing the economic activity of private 1.

Further on, those cases do not consider possible regional multiplier effects and the question what happens in case of missing opportunity cost. The latter means for example, there exists a rural area which is not able to attract economic activities. That makes it easy to convert the land into protection area because opportunity cost do not occur. That kind of planning and development restrictions may not take strong effect at present but might be a burden for the future development of the region.

The solution to this problem could be a public decision of the spatial distribution of economic activities on the territory a spatial unit with the consequence that the population and companies in restricted areas are compensated or other source of income would be provided. Of course there is always the (non-) solution of all people leaving protection areas in order to obtain biological retreats, but experience teach the lesson that nowadays a minimum of services and people need to be held in all areas in order to keep control. It is interesting to note that than the whole problem turns from a problem of the allocation into a problem of distribution. But it is also not finally concluded whether an in total sustainable land use is only achievable by an increasing regional division of labour or whether the extensification of land use has to be achieved on both urbanised and rural regions. As long as agglomeration effects lead to advantages in the production of goods and services and as long as economies of scale and scope lead to the concentration of economic activities there will be also a spatial division of labour. The fundamental question of whether the spatial distribution of economic activities is a consequence or a precondition of/for wealth/revenue does not matter, but there is a strong suspicion that it always is both of it.

4. CONCLUSION

The paper aimed not at providing answers but structure the discussion on the question: Does land use under ecological constraints emerge a compensation between urban and rural areas? A first empirical assessment which obviously still lacks considerable refinement suggests that there is a division of labour between areas in terms of the provision of employment, natural space and settlement and tax revenue but that division of labour seems not unequivocally compares with the urban and rural pattern which is usually assumed. Proposals have been made for a further refinement of the analysis which may allow to better understand the pattern of distribution of labour. The most interesting result is expected if the urban-rural pattern is not an independent variable. It would be interesting to cluster the regions according the division of labour and than to compare with the common understanding of urban-rural patterns.

The second dimension investigated was the question on what needed to be considered if one concludes a compensation between areas (independently of the pattern which results in the division of labour). The compensation must be connected with the opportunity cost for that regions which cover the disadvantages in division of labour. The compensation has to be seen on the background of public policy field which strongly affects private actors. Because public actors, in allocation terms, have to be seen in a different light than private actors it is not too easy to argue only on the basis of an efficient allocation – a strong distributional element needs to be considered. That insight refers to the finding in ecological economics that the question of sustainability always includes the question of distribution of wealth which is a matter of common decision making.

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