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Mismatch of Supply and Demand of Agricultural Land-Based Ecosystem Services

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Abstract

Use and intensity has been the major factor that has influenced Ecosystem services. Spatial relationships have been the dependent factors that present the arising disparities between supply and demand. In this literary work we have catalogued these particular special relationships under six categories. This work also explores the relocation of resources to the affected groups.

This article goes further and identifies the human contributions to service supply and transfer. The importance of cataloguing helps to create a distinction between "local" (demand and supply with in the requisite local), "proximity"(natural close transfer), "process"(distinct transfer by natural processes), 'access' (users can get to the ecosystem), 'commodity' (supply contributed and transfer carried out by market players), and 'global'.

In regards to the various circumstances, precise scientific methods and different policy methodologies are appropriate. One major question is in what way to deal with the actors who empower, sustain, and contain ESs. With this being said, deliberations with regard to landscape preservation, conservation support, and private solutions are greatly necessary.

This literary work proposes an outline that analyzes and improves the associations concerned by revealing mismatches amongst supply and demand. An effort has been made to utilize and select indicators that will be used to compare supply and demand in these relations. Furthermore examples present the ability of the method to constrain the misuse of ecosystems and to conserve the agreeing ESs.

Keywords: Spatial Flow, Transfer Type, Ecosystem Services, Benefiting Area, Connection Area, Resources, Agro Ecosystem Services, Payment for Ecosystem Service

Introduction

Through a supply of natural goods control of material and energy flows towards a reduction in natural hazards, and the taking advantage of opportunities of cultural experiences in connection with nature and landscapes, ecosystems have been able to impact and are the greatest contribution to human welfare. In regards to ecosystems there are a variety of other (not directly used) natural functions, which support the preservation of essential resources. Thereby, contributions are made such as for safety, fulfillment of essential natural resources, maintenance of health, good social relationships, and the freedom of choice.

With a disparity existing amid economic growth that is socially driven on one hand and the availability of naturally limited resources on the other the unveiling of an emerging impediment has become visible; an example of this is the excessive use of vital reserves and the accompanying losses of natural processes providing the essentials of our life. The issue regarding the misuse is the fact that very few of these resources or usage limits are made public known and therefore are not used in a sustainable manner.

In order to overcome this problem, ecosystem services (ESs) are defined as the contributions of ecosystems to human well-being. These contributions are not limited to luxury goods but also consist of the most basic of requirements necessary for survival (air, water, food, heating). The perception of ES is a methodology that shall evaluate and designate not only the range and connections concerning roles and procedures in the natural environment but also their importance to society.

Additionally another reason to reflect on the ES framework is that the social viewpoint and economic instruments tolerate possible market disappointments to be overcome. With the navigation of challenges to administer ES across a fourfold disparity: Primarily, ecosystem commodities and services can be sectioned into excludable and non-excludable ones. Next, they can either be cataloged as 'rivalingor 'non-rivaling' being

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contingent on whether they are usable or not. Regardless of what they case may be they must be managed correspondingly.

A large range of environmental goods are non- excludable, such as climate regulation, air quality, safety against disasters, or (partly) scenic quality. But if it were impossible to exclude specific ecosystem users, then primarily profit-oriented players would be encouraged to use them without maintaining these assets in the same way as others.

Those who partake and are concerned are at risk of being knocked out of the completion due to elevated expenditures and low revenue. If only responsible market players are able to survive in the long run, it is much more difficult for society and policy to maintain the environment goods and to ensure the welfare of mankind.

If policy makers try to neutralize this outcome, they need support from general citizens as well as tools were for instance an updated agricultural policy that not only promotes ecological cultivation but also omits the funding for industrial cropping or an exhaustive consumer information policy that would not facilitate unethical practices by an oversize of privacy. Novel disagreements as well as regulatory tools for strategy, policy, and fiscal policymaking procedure can be provided. Being that ecosystem services and goods are also factored economically, prospect remains that adverse market mechanisms can be rectified.

Likewise socio-economic matters (prices, maintenance, ownership), the spatial influences with an emphasis on access via people for the profits of ecosystems are vital for a reasonable use of ES as well as maintaining the defense of products of nature against misuse and damage. Lately, numerous promising approaches have been recognized to emphasize as well as examine spatial relationships between service-providing areas (SPA), service-benefiting areas (SBA) and the space in between. Repeating similarities that have been explained of service transmission, of which mainly four particular types have been recognized by Fisher et al. (2009). Syrbe and Walz (2012) gave an in depth explanation outlining the arrangement by tallying the service connecting area (SCA) between SPA and SBA. Predominantly, the spatial flows of ES are exhibited by [1] utilizing a multi-agent simulation system (SPANS) founded on the ARIES modeling platform (Villa et al. 2011).

The SPANS algorithm was created in an attempt to explain the routing of a particular ES afforded in one location and utilized in another. [1] Has established a standard structure describing likely depletions, sinks and other kinds of impediments affecting the spatial flow between the locations of provision and use that are thus specific characteristics of the previously mentioned SCA. Due to the fact that various individual flows must be taken in to account, such a model is data intensive and requires in-depth familiarity and may not be appropriate for mapping and or even observing a whole region or country.

A benefit flow is defined as an indicator measuring the spatial flow area in relation to the whole SBA and the establishing of possible configurations for different services. Regrettably, the usage of the term ‘ecosystem services flow has been unclear, indicating as well to spatial transfer being the actual use of afforded facilities minus concern to spatial routing such as in the Mapping and Assessment of Ecosystems and their Services (MAES) documents [1] (Burkhard et al. 2014).

Literature Review

In order to meet the goal of achieving sustainable development of ecosystems, the supply of as well as the demand for ES must be accounted for. This is a primary note developing from current up to the minute research in relation to the management of natural and managed ecosystems (e.g. Castro et al., 2014, Nieto-Romero et al., 2014; Zasada, 2011), and which is also in line with the ES framework (Huang et al., 2015). The demand can be addressed by using nonmonetary indicators (e.g. people’s perceptions of the value/importance of ES) and/or by using economic indicators derived from real or hypothetical markets (Martín-López et al., 2012; Turner et al., 2010). The supply is related to farmers’ willingness to adopt landscape management practices and farming procedures (e.g. organic farming or extensive Management) that would promote ES such as amenities, as well as soil and water protection (Zasada, 2011). The outline of demand and supply will entail the identification (profile, preferences and valuation of ES) of beneficiaries, as well as of providers, to ensure socially efficient management of ES, solving the problems of under provision or mismatching of ES (Pagiola et al., 2005).

The Governing Forces of Supply & Demand of Agricultural Land Based ES

As authors we were faced with the task of quantifying ESs regionally in the framework of the EU biodiversity strategy, as it has to be done in nearly all-European countries. Indicators have been established that describe the most relevant services or even particular characteristics of such services [2]. It can be beneficial to illustrate and map ES by indicators that definitely define potential, supply, flow, demand, and human impression as well as the conditions of ecosystems. Of course, it is possible to work through the list of ESs very analytically.

Subsequently the underlying processes and relationships are quite different, some of these aspects can be more or less useful to quantify. A very numerous number of indicators may make it difficult to proficiently utilize this data in planning and policy. Therefore, the decision for many nations especially those that exist in the first world are made by carefully selecting only a subset from all possible cases and most of all with the intention to confront supply and demand indicators as far as their meaningful.

The premise is that this confrontation of supply and demand can uncover imbalances and thus unsustainable use of natural resources. But one can expect that only a plain confrontation of supply and demand will not totally solve the problem. Besides the above-mentioned spatial relations, also the various access alternatives to the ecosystems and the transfer of goods and benefits should be included in the consideration. The latter depends on natural processes or on human activities and is strongly scale dependent. Therefore, it must be assumed that political measures and socio-economic approaches to govern ES in a sustainable way can be derived more specifically if these relationships are considered. Therefore, the authors took up the approaches from Ruhl et al. (2007), Fisheret al. (2009), Syrbe and Walz (2012), and Bagstad et al. pursued the question if a clear distinction of the arising cases can improve the possible conclusions for fruitful governance of natural resources and a fair ESs use. Led by a correspondingly prolonged arrangement, recently calculated markers should be challenged and scrutinized if the differentiated view can offer helpful insights.

This literary work displays indicators of ESs from several data sources, which have been calculated and mapped in various regions and can be included in the national reporting for various nations and can assist in categorizing various biodiversity strategy as a selection of the entire indicator set. The purpose of this paper is to check the new scheme as well as to show the deficiency in pre-existing schemes using specific examples and to highlight the specific supply-demand connections. Therefore, it shall propose indicators and ideas that are useful for analyzing, in particular, the spatial link between supply and demand sides of ESs and for overcoming the respective challenges. A nationwide and spatially precise monitoring of different environmental aspects highlights emerging problems and provides starting points for possible planning and political corrections.

Utilizing resources of appropriate analyzing and charting pointers on behalf of supply and demand, decision makers, planners and private activists may be permitted to guard capital and synchronize the ES consumption. The ES notion has been primarily a creation mirroring the worth of nature as well as motives in regards to utilizing it carefully. Subsequently a large amount of the ecosystems have been utilized, most services contain human influence as well as ecosystem/ environmental impact. Therefore, the assessment and mapping must contemplate such influence/ impact or the consequences of conservation. While an essential incentive of the ES notion is to defend biodiversity, each indicator must be verified. Concerning what it means for cautious use and maintenance of biodiversity (EU 2011; [2]).

Communities are rarely aware of their dependency on natural goods, processes and potential that guarantees their well-being today or in the future. In juxtaposition, from a socioeconomic point of view, services have existed solely with respect to a request of a recipient. Therefore a distinction in regards to the supply and demand side of service provision, and even regarding all the above-mentioned considerations, "we may have to add the aspects of ecosystem conditions potential, impact and flows" (Villamagna et al. 2013; Burkhard et al. 2014; [3]; Jones et al. 2016).

Demand cannot be captured merely by the willingness to pay for ES, since people with low financial power even depend on ES more than the rich [4]. A major issue had come to the limelight and that is the issue of environmental justice. This issue is to ensure that ES will remain available for all people in need for the foreseeable future. It can never be overemphasized on how the various ecosystems must be protected from mistreatment and exploitation by predominantly capital seeking participants. Hence, a comprehensive examination of demand and possibly jeopardized supply of ES-jointly with the demand for conservation or defense of ecosystems will be essential for our global future. ES framework bridges the variously interconnected ecosystem and socio-economic system, considers the mutual impact and intrinsic subsystems [5].

It considers the stock of natural assets as a starting point for the flow of material, energy, information, and organisms as a result of both ecosystem potential and human co-production in terms of land use. Additionally a key feature in regards to ecosystems and its potential is often regarded to as 'capacity', which is important and looked at as an assurance to regenerate goods and guarantee service industries in the long run. In a case in which usage surpasses naturally limited potential, a potential exists were the ecosystem can be damaged, resulting in low ES supply or quality of life resulting from environmental damage. Demand from social society encompasses the purchasing power to acquire desired profits as well as the fundamental needs of all citizens, that have proven challenging to monetize.

Delving further into the research one may utilize matching maps of the region in question that can assist to expose hazards aimed at the health of the ecosystem, as well as unsustainable use and the potential of harmful ramifications to the landscape, vulnerable assets, impaired flow as well as mismatches between supply and demand in order to provide indications for improving the environmental situation and maintaining biodiversity.

Additionally, there are interdependencies amongst amenities called trade-offs (affecting each other) and synergies (facilitating), which can be acknowledged using charts/ maps and pointers. Dependencies amongst customers are caused by rivalries and through conservation of the affected ecosystems. Demand and supply are rarely understood at the identical point. The ecosystems that produce services are looted in the SPA. By divergence, the need comes from citizens who desire to benefit from service. If it is possible to designate particular areas for the service use, we call them SBA. However in some cases, the beneficiaries are the service use, we call them SBA. However in some cases. The beneficiaries are dispersed very widely or even worldwide.

It can be difficult to clearly decide where the SBA actually is is (Fisher et al. 2009; Syrbe and Walz 2012). The possible supply and demand indicators in the following examples underline that there is rarely a clear spatial point-to-point relation between supply and demand. ESs exists only if there is any kind of transfer of goods and services to a beneficiary. Several possibilities exist, methodically represented in each instance of transmission and for each scale level, an individual assortment of supply, demand, and perhaps flow indicators are necessary; likewise, the mapping and monitoring approach has to be adapted. But the question is, are there suitable factors dependent on the types of transfer? Depending on the associations of service allocation amongst benefit and provision, there are exact methods to arrange pointers of demand and supply and to outline possible methods to govern ES.

1. The first case, 'ES local', concerns services that provide benefits mainly at the area where they are generated. One can assume that governance must deal mainly with the real plots where supply and demand arise, but our first example suggests that this case is hardly that simple.
2. For the second case, 'ES proximity', benefit is not derived at the same point as its origin; therefore, the distance is crucial. ES generation and transfer depend on proximity between SPA and SBA and trends towards zero for long distances. The distances are fixed by ecological laws and can hardly be levered out by management measures.
3. The third case, 'ES process' arises where movements reach the beneficiary (or potential victims) by natural processes even at a greater distance. Here, a spatial analysis can give insights into the interspace, the so-called SCA (Syrbe and Walz 2012), whose characteristics control the effects as it can be analyzed, e.g. using the model of Villa et al. (2011). Since this SCA has different owners as well, corresponding management must govern and negotiate the interests and behavior of several, sometimes distant, stakeholders. Artificial processes have been separated from this case (to case 5) because they often lack physical landscape structures and are more dependent on market mechanisms.
4. The fourth case 'ES access means that a user can get to an ecosystem and enjoy the ES there if he or she can reach it. Therefore, the user needs a way to get there and must be allowed to accessit. This applies to most cultural ES and is exemplified by urban recreation below. The respective governance approach deals mainly with the access possibilities or restrictions, but must also include a balance of interests between users who seek access and residents who should maintain the ES without economic drawback.
5. The fifth case, 'ES commodity', is much more complex because the goods of an ecosystem can only render benefits if an actor carries goods (timber, meat, fruit, etc.) to the final consumer. The benefit has to be shared (income for the actor and final use by consumers). Since the actors not only organize the transport but also shape and maintain (or damage) the ecosystem, it is worth focusing the ES analysis on the first steps of valorization. Since transport and sale depend rarely on landscape structures (SCA), this case is separate from case 3.
6. The sixth case, 'ES global', is relevant when the benefit of a service is global and cannot be restricted spatially. For planning and political issues, it is interesting how a global ES can be safeguarded even without direct SPA-SBA connections. The clause 'thinks globally, act locally 'is not randomly connected with the selected example.

Naturally, carbon appropriation can be debated here, just as all other greenhouse gas emissions regarding climate change effects. Even though there is essentially a universal request area, nevertheless it can be important to analyze spatial transfer effects here. More than anything else it is a case of mutual commitment that each one contributes to a common goal as much as possible and shares the expense. Maps and indicators can offer answers in regards to how much can possibly be completed and presented (regarding ecosystem potential) in relation to how much possible rewards exist that may potentially be utilized.

The majority of European countries is consistent with sustaining the same practices and will evaluate and chart ES upon their territory and incorporate the outcomes in a nationalized as well as a region wide report to the European Commission [6]. Consequently, a mandate of individual states as well as the politically most relevant ES have been designated and analyzed as a group of (quantitative) indicators, that ought to fit into a EU-wide indicator scheme (Maes et al. 2013,2014).

In the larger scheme of things there are main indicators that seize the crucial provisions of a certain class, supplemented by several auxiliary indicators that show special aspects or the relation between supply and demand. Event though not all indicators have been in conjunction with the state governments yet, we exhibit utilizing four main informative illustrations of the group, regulating, providing and cultural ES; In what way demand and supply can be measured and equated as a contribution to viable management of limited environmental resources.

The effects of retarding run-off, loose soil as well as unevenness and obstacles reduced by humans through various mining, agricultural practices, building and construction eventually lead to damage and erosion. There is a lasting need for prevention of eroding surfaces in regards to arable fields, in which high precipitation, extreme slope degrees and scarcity of vegetation growth possess a risk of elevated soil loss in the case a thunderstorm were to arise. Syrbe et al. (2016)

When one takes a closer look erosion rates have the potential of representing unmet demand. From this perspective, full demand represents the conjectural aggregate of soil that would vanish if the entire state or region were not blanketed by vegetation. The conjectural sum has additionally been measured in the model, however merely as an secondary variable to estimate the avoided soil dissipation as a disparity of both.

For this reason, the associated maps and indicators share of actual versus avoided erosion. Furthermore they allow a fathoming of the consequences of expended ecosystems. Indicators, graphs and maps shall present to us an appeal to combat any negative implications in accordance with data. Furthermore the successes we encountered (or overlooked) regarding the protection of soils shall be further exploited. In various locations according to the results recovered the avoided erosion in various terrains is ten times more than the residual actual erosion.

Within the above-mentioned model there are certain factors that are included and considered in the model such as organic farming, crop rotation as well as soil tilling, frequency of certain crops/ permanent crops and landscape structures. These factors allow for some progress to be proven. Nonetheless there appears to be a negative trend (rising erosion rates and shrinking avoidance) arising due to the escalation of energy crop cultivation in the region mainly amid 2009 and 2012. The example of soil erosion seems to amalgamate relationships of the two cases, case 1 (‘ES local’) and the case concerning the split-off effect of precipitation and run-off formation takes place locally, just where the protective effect of vegetation is required. With the accumulation of runoff above a slope, the closeness of shielding landscape elements can thwart excess elimination. Soil loss can be averted locally by basic natural land cover.

When analyzing arable fields, the cultivators are capable of and accountable for contemplating the erosion problem and shaping of basic conditions. Erosion-preventing landscape elements can decelerate run-off and have the most positive impact if they are situated at the best possible places regarding the underlying physical process (e.g. in depth lines or crossing steep slopes).

Also, off-site effects of slurry seal coating (on streets and railways) or nutrient entries into valuable habitats depend on proximity to the erosion area due to the declining transport capability of run-off at the slope toe. Planning solutions and governance should, therefore, concentrate on the field in question and regard the flow connections and landscape elements within a catchment. We all benefit from food safety due to fertile soils, clean water bodies, and clean streets, but the first benefit arises locally in the fields that are threatened by erosion and must be protected by an adapted agricultural advice and policy.

The case ‘ES proximity means that the spatial relations do not reach very far. Therefore, the supply and demand areas must be close together to govern the service, also barriers shaping the connections have to be considered. This is a strong argument for highly structural diversity. The denser near-natural elements exist in intensively used landscapes the closer such SPA elements are situated to acre fields consisting the SBA here. As a consequence, the ecosystem monitoring will take up also the landscape element density as a future proxy indicator for more than one ES to encourage farmers, planners, and politicians to act accordingly.

Many tend to omit a very vital sector with regard to ES and that is the number of livestock, where the farmer can be regarded not only as a supply of feed but also as a supply of waste and is responsible for disposal and the area for ruminant animal production. There is a demand indicated by farmers and vice versa. This can be expressed by through the farmer’s decisions about their size of their livestock.

Livestock numbers can be obtained from statistical data from local and national statistical offices. Furthermore these precise data may be accessed online through relevant databases. Only the cattle livestock data structured at the municipal or district level are regularly available, while the other livestock species are only available in this resolution every couple of years. It is not very meaningful to compare supply and demand numerically because animals can also be fed with field products, even from imports, and other animals can graze on grassland as well. But the juxtaposition of grassland share and livestock numbers yields insights into critical accumulations and potential overuse of the environmental goods. Strictly speaking, it is not the critical supply of feed for the livestock but the impact of nitrogen loaded slurry to the meadows and water bodies, which are described here.

Potential enhancement of indicators would try to include more animal species beyond cattle, which are the only one used here, but this is unfortunately constrained due to limited available statistical data. Reared animals are used to provide meat, milk, eggs and some other materials for a worldwide market. But the first benefits arise locally for the livestock owners who have to earn their livelihood thereby. Only these farmers are capable of and responsible for preserving the fertility of grasslands, the quality of soils and even environmental goods such as groundwater quality in rural landscapes, whereas the final consumers cannot control this directly. We compared the grassland area with the livestock number because overstocking will damage pasture and groundwater due to a possible overload of slurry output. However, the slurry cannot be transported worldwide; actually it makes only good economic sense if they stay within a certain distance. On the other hand, slurry transports even cross regional and national borders and are conducted by commercial enterprises as well as the decision to rear more or less cattle so that each approach to govern these relation-ships must start with common agricultural policy.

Miss-Match of Supply and Demand of Agricultural Land-Based ES

The examples show some key challenges to balancing spatial mismatches of ES supply and demand. The first challenge is that the supply-demand relation seldom explains the pluralism of ES using an overlay of two maps as it is done for instance by Burkhard et al. (2014) for a multitude of ES and by Nedkov and Burkhard (2012), in particular, for flood regulation (see below) using a 5-tier classification, which can be qualitatively compared but not subtracted.

Case 1, ‘ES local’, does not require any kind of transfer function exceeding the site of generation. If an ES was provided in the same area as used (SPA and SBA are identical), transfers would mainly remain local even though not negligible in each case. However, a management staff must concentrate on fair access to the service and on the prevention of on-site overuse. In this case, supply and demand studies can provide arguments for maintenance of resources in land use [7]. By a monetary calculation of erosion based on the valuation system by Pimentel et al. (1995) and using the same model as in Example 1, [8] were able to show that the service of erosion is higher than the potential yield on the 5% most vulnerable arable areas in certain regions, so that a land freeze would be recommendable there for farmers-even from an economic perspective. Though the national study does not include monetary calculations, this could be a future path for development based on the presented physical indicators.

National data are useful for general political decisions; therefore, vital data (2014) offers for instance similar erosion data and the basic soil map [9] used for this study. Case 2, 'ES proximity', requires an analysis not only of ES potential but also of demand in close vicinity. Besides the habitat characteristics, buffering tools and structure metrics can be the most suitable instruments for assessment. Partly, one may consider density indicators as a proxy for the entire ES assessment. Since the BGR erosion data are only valid for arable fields and do not consider small landscape elements, the model applied here is a further step for policy recom- mendations. Now there is more specific information available for soil erosion [10].

Case 3, 'ES process', requires some kind of process-based analysis, which can be done using models or indicators measuring process variables such as a flood retention area in our example. This case seems to be explainable regarding the SCA. But this is only one aspect of a variety of factors shaping the ecosystem-society interaction. Regulating services can be understood through the aid of risk theory and experience with disaster precaution, which would extend beyond the scope of this paper. These services are often side effects of the primary economic use. Their actors and the users of the SCA are similarly responsible for caring for the ES, but must be informed or get clear rules and sometimes be compensated for this. [11] Overlaid demand and supply estimations using 5-tier the semi admittedly, mountain areas with high precipitation artists who make the cinema films paintings, literature, etc. are quasi-mental actors, even if the products are not always commodities in the narrow sense. This case should concentrate analysis on the actors, and it is the most interesting case regarding the question of sustainable resources use. The actors must be regarded as firstly responsible for sustainable use of their entrusted ecosystems, which have values for mankind beyond the pure ownership of single persons. Final users can only decide through the aid of knowledge which the actors are willing to hand over. Many actors accept this responsibility, but society (mostly government) has to guarantee that, effectively, all actors act transparently and sustainably in order to avoid the preference for primarily profit-oriented and even irresponsible players.

The last case 6, 'ES global', provided no example because we cannot limit particular areas of beneficiary groups. However, the case shows characteristically that every limitation of a certain group or area of benefit must not keep sight of trade-offs, which can occur very far away. Our economy is intertwined to such an extent worldwide that each decision about resource use in Europe also has to be double-checked for its long-distance effects. Just like the concept of virtual water that is carried in products using it for production abroad (Hoekstra and Chapagain 2007), concepts for virtual land imports are necessary in order to balance the effects on land use in foreign countries (Meier et al. 2014). The second challenge is to find indicators that are not only (quantitatively) comparable but also provide meaningful insights into the charged relationship between limited resources and inevitable needs of people. Kroll et al. (2012) found that not only land use changes but also higher land use intensity had.

The most outstanding influence on ESs supply yield indicators must also entail intensity issues. A major question that may result is, why do land users need a service, and what aspect of this service is crucial? An example of this is the, availability of fodder that has been found to not be the limiting factor for animal husbandry with in the model; reasonably, it is the area for slurry application concerning the compromised water quality as well as the other roles that grasslands serve moreover (cf. Sala and Paruelo 1992). In regard to erosion, what is demand? It proves useless to deliberate on the levels now, none the less land and policy users must designate the most susceptible zones and modify their corresponding norm there, or at the least rearrange the terrains through novel protective actions and/or heavier crop rotation.

Thirdly, with a quantitative assessment as a prerequisite on behalf of each balance a lot is dependent on very critical data value whereas an individual may then be incapable of differentiating analytical products from valid disparities. Only data that covers an entire planning or politically relevant area can be used here; ideally, data would be publicly available also in other European countries to ensure EU-wide comparability (Kroll et al. 2012). We see the blank spots in the cities on many maps, which are only just tolerable. Nowadays, frequently incomplete data trigger bitter compromises and may even raise the issue of potential monitoring. Recent statistical data lack specific crucial years (Example 3: the population data used are only occasionally available after a census), livestock species (Example 4: other animals, such as sheep, are only available every 10 years), several municipalities.

Information about supply-demand ratios can help decision makers to alter the landscape in order to achieve a sustainable use of resources [12] Therefore, decision makers need to be informed and encouraged to know about the potential mismatches and spatial problems. This can be done with catchy Information using many pictures and clearly understandable language that deals with locally relevant data. But in the end, precise measures must be suggested such as by Brandhuber (2012), LfULG (2013), or Hiller (2007) regarding erosion prevention, and the costs should be calculated for entire administrative units (Grunewald and Syrbe 2014). We stated the question of whether a clear distinction between the arising cases can improve the possible conclusions (and not only enhance the workload and complexity of analysis). Based on the presented scheme, recently calculated indicators can offer partly interesting insights although not all comparisons are instructive (such as the erosion map on the national level). In some cases, the view should be focused on a finer scale or on local quantitative relations between supply and demand. But in order to zoom in, the scope must be known. Therefore, the coarse maps can help as well. The differentiation of six cases proved to be useful for a selection of fitting scale. As the examples suggest, possible planning and governance solutions depend on the agents and distances of benefit transfer and, thus, on the differentiated cases [13].

Discussion & Conclusion

The resulting hypothesis is that a clash of demand and supply indicators may disclose disproportions yielding unmanageable usage of ES. A primary example of soil loss did not present an added worth. It is evident, nevertheless, that more dire zones of recent erosion and those of averted soil loss. Nonetheless to conduct actions, the perspective needs to be much enhanced in the vicinity of jeopardized fields and the relevant agricultural exercises concerning soil preservation. From the national level, quantitative comparisons possibly might be additionally significant to observe balances of averted soil losses in order to evaluate the success of policy. The subsequent occurrences will be more revealing and its selected areas that would be denoted on a map in red are comparable to real flood damage. The 'ES process' case seems to be relevant for comparisons also on the coarse (regional/national) scale due to distant geo-ecological effects. The recreation example is presented, with reason, as a previously balanced supply-demand comparison.

Using the completed balance, one can find cities with more or less need, but if city planners and politicians want to improve the situation in their city, they need to look deeper into the respectively existing interim results. The last example, reared animals, shows quite clear indications for regional problems and possible solutions.

The set of examples offered different answers to the hypothesis depending on the distance and kind of benefit transfer. But what are the results for crafting the decision on land usage actionable in the physical realm in order to answer to landscape projection requests?

The actual benefits of ES are generated by natural processes. But the prerequisite is a suitable use of land considering the target function and the non-target ES, which are connected with each individual land plot in the sense of multi-functionality. The users or managers of the land are not the actual service providers (e.g. in flood control and aesthetics), but are required in the sense of social obligation of property and even more so as the recipients of subsidies to allow these services on their land and-if possible to increase them well-selected indicators of supply and demand and their comparable mapping can uncover mismatches between the potential of ecosystems if the distances and processes, i.e. agents of transfer, are considered. A differentiation of natural processes versus economic activities for the transfer of benefit helps to make comparisons between supply and demand more appropriate. Long distances between service supply and demand make it meaningful to compare maps of both also at a national level. If only short distances between supply and demand arise, quantitative balances can be more useful to map. In particular, maps of density seem to be more instructive than individual measurements if short distances or small elements are essential for ES supply-demand connections.

The presented scheme differentiating six cases of ES transfer from provider to beneficiary proved to be meaningful in the four examples under study. Further research should try to employ the scheme and perhaps to enhance this small sample. The results showed starting points to sustainably supply goods and services (Wu, J. and W. G 400-413). With the highly focused view of individual cases, areas can be identified where the socially triggered demand exceeds supply and thus the suspicion of irresponsible use should be pursued. This is an essential step towards governing land use processes in order to ensure environmental justice in regard to a fair sharing of ES and preventing an increase in irresponsible players. Particularly, political decision makers, entrepreneurs, and land owners should be enabled to consider environmental issues in their daily work by making use of subsidies and programmes of nature protection, but also by informing them of success and failure. The examples show that some ESs can be well differentiated between supply and demand sides, which allow recognition of whether or not the potential of nature is used sustainably-the latter would cause an exploitation of natural goods, of vulnerable areas or weaker groups of society. Sometimes, rather special aspects (such as the question of small landscape elements against soil erosion) are relevant to indicate since possible erosion-avoiding management can begin at this point. But it is not meaningful to stubbornly work out all mentioned topics for each service [14].

Instead of a calculation of supply and demand indicators, it can even make sense to incorporate the manner or Access between the ecosystem (process) and the beneficiary, depending on the type of relation. In our recreation example, the calculation of an access indicator between dwelling area and green space may easier guide urban planning decisions. Most ESs has supply and demand aspects that can be calculated and mapped by indicators [15]. These indicators allow the development of land use to be monitored at least in regard to target values and direction of development. Additionally, there are other relevant topics such as ecosystem structure, potential, human inputs and the flow between supply and demand. The elaborated scheme promises to put a step forward to more precise monitoring and assessment of ESs. This shall enable science, policy, and planning to apply the upcoming huge environmental database for better conservation of ecosystems and, in particular, their services.

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