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The ecosystem services concept – a new Esperanto to facilitate participatory planning processes?

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Abstract

Context

Several case studies investigated the role of ecosystem services in participatory planning processes. However, no systematic study exists that cuts across a large number of empirical cases to identify the implications of using ecosystem services in participatory planning.

Objectives

This study explores the potential of the ecosystem services concept to act as a boundary concept ("new Esperanto") to facilitate the integration of actors' perceptions and objectives into planning goals.

Methods

We analyzed eleven case studies to explore how the ecosystem services concept has been operationalized to support participatory planning processes, and to identify lessons from successful applications. We characterized the case studies according to contextual and methodological criteria. Each case study was assessed through a codified score card method in order to detect success or failure criteria in using the ecosystem services concept in participatory planning. We compared the case study criteria with the results of the balanced score card method.

Results

We identified several positive effects of applying the ecosystem services concept in participatory planning, including the facilitation of knowledge sharing and consideration of local experiences, the support towards a shared vision, and the increased awareness among local actors concerning their role as ecosystem services suppliers or beneficiaries. Among the drawbacks, we identified the risk of overemphasizing specific ecosystem goods or services during the process.

Conclusions

We conclude by providing some recommendations to enhance future practice related to issues such as communication, use of local knowledge and integration of ecosystem services in existing legal instruments.

Key words:

Case studies; Comparative analysis; Ecosystem services; Landscape planning; Participatory planning; Stakeholders.

1. Introduction

The ecosystem services (ES) concept, which emerged from ecological economics in 1990s, allows the explicit consideration of ecological processes and human activities in planning (Wilkinson et al. 2013). The general contributions by the ES concept to planning are, for example, better communicating the ways in which ecosystems contribute to human well-being (TEEB, 2010), finding new arguments for nature conservation and management (Fisher and Brown 2014), raising environmental awareness (Garcia-Llorente et al. 2016; Palomo et al. 2012; Palomo et al. 2014), facilitating innovative landscape assessments (Burkhard et al. 2012), and enabling better links to economic valuation (Hubacek and Kronenberg 2013). To this end, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) demands examples of ecosystem assessments that would facilitate national planning processes to become more effective in mainstreaming biodiversity and ecosystem services.

One of the most important contributions that the ES concept could provide is the support in planning processes. In the context of spatial and ecosystem management, specifically participatory planning processes are gaining momentum and thus receiving more attention from researchers and practitioners (e.g. Potschin and Haines-Young 2013; Arler and Mellqvist 2015; Reed 2008; Turnhout et al. 2010; Mascarenhas et al. 2016; Mukul et al. 2017). Several studies investigate the ES concept's role in participatory planning processes (Partidario and Gomes 2013; Saarikoski et al. 2017), showing its potential in this field (Opdam et al. 2015).

If the ES concept is well introduced, it can help to overcome obstacles in a participatory planning process by finding a common language among planning actors - comparable to Esperanto (e.g. Cowling et al. 2008; Adem Esmail et al. 2017; Palacios-Agundez et al. 2013). The ES concept can be then understood as a transdisciplinary boundary concept that helps to achieve a cohesive understanding, from a range of planning actors, of environmental issues (Reyers et al. 2010; Schröter et al. 2014). Thus, the ES concept can contribute to develop a common ground among actors taking part in the participatory planning related to important environmentally oriented planning issues, i. e. planning priorities, aims, and obstacles (Woodruff and Bendor 2016; Rozas-Vásquez et al. 2017; Dick et al. 2017) or conservation policies (García-Llorente et al. 2016).

On the other hand, a *potential challenge to utilize the ES concept* in participatory planning processes is that the concept might be too complex, that it does not meet the requirements for planning applications, and might be misinterpreted in practice (Balmford et al. 2011; von Haaren et al. 2014; Hansen et al. 2015; Sander et al. 2016). A potentially critical factor in using the ES concept in cooperation with diverse planning actors is the tendency towards biased attention to visible and directly usable ES, which are mainly provisional and cultural ES (Rodriguez et al. 2006). This could undermine the value of regulating and maintenance ES, as well as the ES which are located far away from benefiting areas (Tammi et al., 2016). Furthermore, there is the need to limit ES complexity to specific scales in order to avoid confusion, especially if non-scientific planning actors are involved (Jacobs et al., 2016).

Problem statement / research gap

Despite an increasing number of papers on ES in participatory planning, most of the studies so far have been conceptual (e.g. Opdam et al. 2015) or individual cases (e.g. Mascarenhas et al. 2016). There is a lack of a systematic integration of the ES concept into participatory planning (De Groot et al. 2010; Kabisch 2015, Albert et al. 2014). No systematic study exists that cuts across a larger number of empirical cases to identify more general implications of applying ES concept in participatory planning.

In our study, we explore how the ES concept can potentially contribute to finding a common language, similar to *Esperanto,* among planning actors. We hypothesize that the concept of ES can well facilitate communication processes in planning and contribute thereby to participatory planning. Our intention in this research is to look in detail into practical experiences in the ES concept implementation in the different participatory planning contexts.

Consequently, the aim of this paper is to enhance the understanding of options and implications of applying the ES concept in participatory planning based on evidence from several practical case studies. More specifically, our research objectives are:

1. to characterize the participatory planning context, where the ES concept has been applied;
2. to analyze common advantages and risks of using the ES concept in different participatory planning contexts;
3. to show how the ES concept can be operationalized to successfully support participatory planning processes.

In order to provide insights in using the ES concept in participatory planning, we performed a comparative analysis of several case studies with the help of two analytical tools - a balanced score card (Fürst et al. 2014) and comparative criteria table (inspired by La Rosa et al. 2015).

2. Methods and case studies

The selection of the case studies was based on several steps. Firstly, to gain a general overview of available case studies addressing ES applications in participatory planning, a comprehensive literature analysis of using the ES concept in participatory planning was conducted. In a second step, we presented the results of the literature review during the EcoSummit conference 2016 in Montpellier, where the authors organized a workshop titled “Generating practical outputs from ES studies - an interdisciplinary exchange”. This workshop was open to all conference participants and we used this opportunity to increase the pool of case studies. The final set was based on eleven case studies with diverse spatial and planning contexts, covering ten countries and four continents: Europe (6 studies from Czech Republic/Poland, Finland, two case studies from Germany, The Netherlands, and Spain), Asia (1 study from Turkey), Africa (2 studies, both from Ghana), North America (1 study from Mexico) and South America (1 study from Chile) (Fig. 1). The criteria for final case study selection were both relevance to the research question as well as the availability of in-depth knowledge of the design and impact of participatory processes as gained from personal involvement in those cases. For all case studies identified, the respective key persons involved were invited to contribute to the case study analysis and manuscript preparation as co-authors to allow for first-hand reflections on experiences. The method used in this regard is similar to other publications reflecting on the impacts of participatory planning processes (e.g. Nassauer and Opdam 2008).

The diverse characteristics of the case studies gave us the possibility to compare the different experiences in order to present common advantages and risk of using the ES concept in participatory planning and to show how ES concept can be operationalized to successfully support participatory planning processes.

----------Fig 1 A global map with the location of the case studies around here----------

Two analytical tools were used in the comparative analysis of case studies. The first one is the *comparative criteria table (CCT)* which helped to gather, characterize and compare information from the case studies. We followed the comparative criteria approach represented by La Rosa et al. (2015). The CCT contains case study characteristics, the planning context, the planning scale, the ES framework, methodologies used, and deliverables (Tab. 1).

---------- Tab.1 Comparative criteria table (CCT) used in the study (around here) ----------

The second analytic tool is the *Balanced Score Card (BSC)* described by Fürst et al. (2014). The BSC is a matrix with questions related to the risks and advantages of using the ES concept in the participatory planning process, e.g. with regard to knowledge sharing, social networking, shared vision, actor inequality, supply-demand relationships, and the involvement of social, ecological and economic system components into planning. We divided the questions into two general groups (Tab. 2): 1) the advantages of implementing the ES concept in participatory planning and 2) the risks of implementing the ES concept in participatory planning. Additionally, we separated questions according to short- and long-term (temporal scale) as well as to local and regional scale (spatial scale). Each question was assessed by the survey participant with scores ranging from "0" (no advantage) to "5" (great advantage) scores for the advantages of using the ES concept in participatory planning and from "0" (no risk) to "-5" (high risk) scores for risks concerning implementation of the ES concept in participatory planning for their particular case study.

For each case study, one principal researcher (the survey participant) who was responsible for conducting the study was identified and asked to participate in our survey. The total amount of principal researchers is equivalent to the amount of analyzed case studies (eleven). Both BSC and CCT were filled by the principal researcher, but consulted with the whole research team working with the particular case study. Explanations of the questions in the BSC were presented in Fürst et al. (2014). In addition, further clarifications in terminologies used in the BSC and CCT were provided by the main authors. The total score of the advantages and risk levels was calculated as the average value for each matrix cell. The final score of the overall balance is represented by the sum of the positive and negative values.

----------Tab.2 The Balanced Score Card (BSC) for assessing how efficient the use of the ecosystem services (ES) concept was in facilitating the planning process by supporting consensus building and enhancing collective action (based on Fürst et al., 2014) (around here) ----------

Finally the BSC was combined with the CCT to show how the ES concept can be operationalized to successfully support participatory planning processes. The CCT provided background information to justify particular risk and advantages scores displayed in the BSC. As a final step, we analyzed the results from the BSC of particular categories of case studies described in the CCT. Particularly, we explored how the type of the case study or the number of assessed ES and actors might affect the perception of risks and advantages. We analyzed comparable criteria from the CCT by using descriptive statistics, visualized in box plots (in STATA version 13.1) and checked how it reflected the advantages and risks in implementing the ES concept in participatory planning as described by the BSC. We understand by "comparable criteria" the characteristics of the case studies, which were represented in more than two case studies.

3. Results

3.1. Comparative criteria table (CCT)

3.1.2. Characterization of the participatory planning context where the ecosystem services concept has been applied

The results from the comparative criteria table (CCT) are presented in the Table 3 and in the annex (Tab. A1). Different ES classifications were used in the case studies. In order to allow a clear comparisons between ES types, the ES were translated into one common ES classification system. Here, the classification of the Millennium Ecosystem Assessment (MEA) was chosen because it was most often used among analyzed case studies (Tab. A2 and Fig. A1). All case studies, except La Araucania Region and Schaalsee Biosphere Reserve, contained continuous or discontinuous urban fabric including different kinds of settlements. The average size of the case study was 545,400 ha, although the sizes vary a lot. The smallest case study was located in northern Ghana (119 ha). The largest case study, and also having the lowest population density (0.30 inhabitants per ha), was La Araucania Region, in Chile (3,184,200 ha). The most densely populated case study was the Fuhrberg Watershed (21.67 inhabitants per ha). The largest amount of inhabitants was provided in the Basque Region (2,171,886 people), while the smallest amount of inhabitants was in UNESCO Biosphere Reserve Schaalsee (about 14,000 people). The project duration of 60 months in the Fuhrberg Watershed represented the longest among the analyzed case studies. The shortest duration was 8 months in La Araucania Region. The average duration of the project was 30 months. All case studies also contained forest and semi-natural areas, as well as land uses / covers related to agriculture. With regard to the use of the *ES concept in planning,* about 36% of the case studies used the ES concept in a theoretical approach (Tabasco Region, Northern Ghana I and II, and Omerli Watershed), while the remaining case studies presented a “practical” implementation of the ES concept.

During the survey executed for this paper in 2016 and 2017, we discovered that the ES concept was often used together with other concepts in the participatory planning process. *Priority planning objectives* of our case studies were strongly oriented towards sustainable development. Furthermore, planning objectives in all case studies included the ES assessment and prioritization for supporting development objectives and moving towards the integration of the ES concept into spatial planning. We have defined three main groups of actors involved in participatory planning:

- Stakeholders – are actors with a well defined interest (a stake) or important connection to the area related to the participatory process (e.g. a private company who invested money, a public administration).
- Researchers / experts – are the objective knowledge / expertise holders, who do not have a direct interest in the area related to the participatory process.
- Citizens – are people who live in the area related to the participatory process, but have no well defined stake in it.

About 64% of case studies worked with three actor groups (Tab. 3), namely experts / scientists, stakeholders and citizens, while 36% of case studies did not involve citizens. The biggest number of actors (562 people) was involved in the Omerli Watershed, while the smallest number of actors was in the Schaalsee Biosphere Reserve with 12 actors. On average, 130 people were involved in our case studies. With regard to the governance systems (Tab. 3), 36% of case studies implemented a top-

down approach, one case study implemented a bottom-up approach, and 55% of the case studies implemented a mixture of both top-down and bottom-up approaches.

The identified *obstacles in the planning process* (Tab. 3) show general problems, site-specific technical obstacles as well as methodological challenges related to the understanding of used scientific concepts. The most frequent *site-specific technical obstacle* identified in the case studies was the poor access to reliable data (36% of the case studies) and economic issues (55% of the case studies). The economic issues were mainly related to high political pressure on different investments, resulting in high pressure on ecosystems to increase economic benefits. Land pressure was often the result of the dominating role of powerful public or private planning actors (Omerli Watershed and Schouwen-Duiveland Island). This imbalance in power relations resulted in the situation where nature conservation goals were dominated by pure economic development goals during the planning process (Schaalsee Biosphere Reserve). Another obstacle relates to *organizational inconsistencies* that complicated the required transversality in the planning legislature (Omerli Watershed and Basque Region). These inconsistencies also occur in the cross-border context where planning legislature is not complementary across the border and was prepared without efficient cooperation between national actors (Czech-Polish borderland). Such inconsistencies were also related to the following: fragmentation and compartmentalization in the administrative structures (Basque Region), inconsistency of macro and local level spatial plans (Omerli Watershed) and non-availability of important actors for the planning process (Northern Ghana II). A frequent problem for participatory planning processes is to motivate actors to actively participate. Another specific kind of obstacle named here was the “not in my backyard” (NIMBY) phenomenon, which was clearly recognizable in the cross-border context because of the will of national actors who preferred to protect the interests of their own country (Czech-Polish borderland).

Most frequent *methodological challenges* relate to the low understanding of the used planning concepts in general, and the ES concept in particular, leading to a lack of willingness to implement the ES concept (Northern Ghana I and II, Fuhrberg Watershed). This problem seems to be caused by a lack of general knowledge and the belief in the empowerment of the planning process among stakeholders (Omerli Watershed). The lack of a cohesive understanding between actors of some specific approaches was disturbing the planning process. A specific methodological challenge, which appeared within the public – private partnership model, is related to the dominance of one particular actor over the planning process. The dominating actor, characterized by the financial strength, hindered the input of parties who provided less or no funding (Schouwen-Duiveland Island).

----------Tab.3 Comparative criteria of the case studies (around here) ----------

The characterization of the *planning scale* showed that 55% of the case studies focus on one type of planning, while the rest focus on two types of planning (Tab. 3). The dominant types of planning were policy planning and spatial planning. Management planning was the focus of 36% of the case studies. The dominant *spatial scale* among the case studies was meso-scale (82%). Concerning the *temporal scale*, 18% of the case studies reflected to the strategic scale (long-term) and 82% referred to the tactical scale (mid-term).

The ES which were considered in the case studies (Fig. A1) varied between 2 to 19 ES based on the MEA classification. Three case studies (Northern Ghana I, Northern Ghana II and Fuhrberg Watershed) did not include cultural ES, whereas others mostly dealt with recreation, aesthetics and knowledge & educational values as cultural services. On the other hand, food and fresh water

provision were assessed in all case studies, which means that provisioning services were the primary concerned ES.

A diversity of *assessment methods* and databases were used to put the ES concept into practice (Tab. 3). About 27% of the case studies used only qualitative assessment methods and databases. Among the *participatory methods*, 55% of the case studies used two participatory methods, while 36% of the case studies used one participatory method. The most widely used participatory method was regular group discussion (45%). In 36% of the case studies, different kinds of stakeholder workshops (Omerli Watershed, Basque Region, Czech-Polish borderland and Schouwen-Duiveland Island), including the design workshop (Czech-Polish borderland) were implemented. The surveys used in our case studies were always backboned with personal meetings of the involved actors, thus those surveys avoid "anonymity" aspect.

Written reports were the most frequent deliverables of the participatory planning processes, which were implemented in the frame of analyzed case studies (in 73% of the case studies, see Tab. 3). Two cases prepared strategies: development strategies in the Czech-Polish borderland and landscape design strategies in Schouwen-Duiveland Island. Moreover, regional planning guidelines (Basque Region), a map of protection zones (Omerli Watershed), and ES models as stand-alone tools with a strong visualization component (Fuhrberg Watershed) were prepared. Usually, the type of practical outcome was limited to one outcome (in 73% of the case studies) or two outcomes (in 18% of the case studies). Exceptionally in the Tabasco Region, a rich selection of deliverables was prepared including, besides written reports, metadata, training course, scenario workshop and academic exchange. In this context, a scenario workshop was the method which allowed actors to visualize the future impacts for conserving or not conserving the ES of their main surrounding ecosystem by developing and writing a story of such future states. Here, two main outcomes were identified: 1) identifying and understanding people's awareness about interactions between them and ES; 2) potential use of this method to plan actions from this future vision. Main financial resources to implement the planning outcomes (73%) were local public funds.

3.2. Balanced score card (BSC)

3.2.1. Common advantages of using the ecosystem services concept in different participatory planning contexts

The advantages across different temporal and spatial scales for each of the case study are presented in Fig. 2. The highest advantages were reported in Järvenpää City, Omerli Watershed, Fuhrberg Watershed and Schaalsee Biosphere Reserve, where the total positive score is higher than 15. A low level of advantages was identified in Northern Ghana I and II, Basque Region and Czech-Polish borderland with a score below 10. The lowest score was provided for Northern Ghana II. The complete BSC with detailed answers from participants is presented in the annex (Annex Tab. A3).

----------Fig 2 Bar chart presenting the summarized scores for the respective case study of advantages and risks in using the ES concept. Bars are separated according to temporal and spatial scales. Average scores inside the bars are based on subsequent questions from the Balanced Score Card (around here)----------

---------- Fig 3 Advantages identified for all case studies sorted by questions. Black bars show the median of all case studies. (around here) ----------

Different kinds of advantages in using the ES concept in participatory planning as identified in our case studies are illustrated in Fig. 3. *The greatest advantages* were that the ES concept 1) facilitates knowledge sharing, 2) supports the work on a shared vision, 3) contributes to include local experiences, 4) increases the awareness of on local potentials, and 5) helps local actors to identify as supplier or demander of services. In all but one case study, the ES concept was perceived as supportive for knowledge sharing and establishing a common vision. Authors reported, however, that a careful explanation of the ES concept would be needed, as the concept is still perceived as rather new (Northern Ghana I). Through applying the ES concept in planning, many datasets including reports and maps were compiled for and considered in planning for the first time (Järvenpää City). Considering a broader spectrum of services in planning was perceived as another benefit of applying the ES concept. In the Schaalsee Reserve case, the ES concept further helped structuring the participatory assessment and planning processes using a balanced set of economic, social and ecological sustainability criteria. Moreover, the ES concept seemed to facilitate the integration of different perspectives and to develop a common understanding among stakeholders (Tabasco Region), even in interdisciplinary teams (Schouwen-Duiveland Island) and complicated, cross-border contexts (Czech-Polish borderland). Finally, the ES concept supported fulfilling future regional objectives for development in a later stage of the participatory planning process (La Araucania Region).

A minor advantage from using the ES concept in participatory planning, characterized by a high variance of the assigned scores, was in regard to putting a vision into action. The *time factor must be considered while implementing the ES concept* in order to put a planning vision into action in participatory planning processes. We have identified a trade-off between the complexity of ES and the need for a holistic approach and the long period that is required for planning.

Further minor advantages come from the aspect of strengthening the role of local actors in regional perception. The ES concept helped to bring the knowledge of local stakeholders into the participatory planning process at the regional level (Schouwen-Duiveland Island, Schaalsee Biosphere Reserve). However, the influence of the local actors on the regional perception would depend on the practical implementation of the strategies discussed and prepared during the planning process and implementation success of those strategies (Northern Ghana I).

3.2.2. Common risks of using the ecosystem services concept in different participatory planning contexts

The risks of different temporal and spatial scales for the respective case study in using the ES concept in participatory planning are presented in Fig. 2. Highest risk is presented for the Tabasco Region case study. Lowest risk levels are identified for Omerli Watershed and Basque Region, which are, in addition, only related to short term-risks. In total, highest average risk scores are given for short-term risks (Fig. 4). Furthermore, our research shows that average advantage scores are in general higher than average risk scores (Fig. A2).

---------- Fig 4 Risks identified for all studies. Black bars show the median. (around here) --------

Overemphasized specific goods or services was *one of the major risks* of implementing the ES concept identified across the case studies (Fig. 5). All cases reported that some specific ES were overemphasized. The highest risk was reported in Järvenpää City, Tabasco Region, Omerli Watershed, Basque Region, Schouwen-Duiveland Island and La Araucania Region (scores > - 3.0). Usually, the reason for this was the stakeholder perception of *"my ES"* (Tabasco Region, La Araucania

Region), technical difficulties for specific ES assessments or valuation (Northern Ghana I, Fuhrberg Watershed), and ex-cathedra decisions taken by stakeholders to analyze only specific ES (Omerli Watershed). Some case studies proposed a roadmap to avoid this risk (Tabasco Region). While working with the ES concept in participatory planning, it happened that planning actors concentrate specifically at "their ES". The connotation of "my ES" is related to particular interests of some planning actors in the specific territory or emotional relations to particular ES offered by ecosystems being under their supervision or well-known to them. The challenge to overcome this bias as a kind of "not in my backyard" phenomenon seems to be an important issue to foster implementation of the ES concept (as mentioned in the Tabasco Region case study).

Exclusion of actors due to limited knowledge access or missing scientific background seems to be problematic in contexts where planning actors do not share a similar educational level. In most of the analyzed case studies, actors had similar educational and professional backgrounds. The case study with high disparities in the educational level faced this issue as significant risk (Northern Ghana I). Conversely, although stakeholders had different backgrounds in the Omerli Watershed, the careful management of the participatory planning process and the well-established explanation of the ES concept encouraged the sharing of knowledge and experience between stakeholders which increased dissemination of information for future collaborations in the planning process of other study areas. The careful management of the planning process included also effective measures to encourage actors to participate (Järvenpää City). Some minor issues concerning the overall understanding of the ES concept appeared in La Araucania Region, basically due to the multiple definitions of the concept and its perception mostly associated to a pure economic valuation. This experience indicates also that the ES concept is accessible for different stakeholders.

Little or no risks associated with the application of the ES concept in participatory planning were seen in the potential outsourcing of demands to other areas and the aggravation of globalization effects. This is also because some of the case studies did not consider globalization and outsourcing effects (as in Järvenpää City, Northern Ghana I, Omerli Watershed, and Czech-Polish borderland). On the contrary, some studies reported positive effects by "improving the globalization orientation" in the frame of the well-known saying "think globally, act locally" (Tabasco Region), by enhancing the energy transition of a local community (Schouwen-Duiveland Island) or helping to ease pressure on the global nutrient cycle (Fuhrberg Watershed).

3.3. Operationalization of the ecosystem services concept towards successful implementation in participatory planning

About half of the case studies (Järvenpää City, Omerli Watershed, Schouwen-Duiveland Island, Fuhrberg Watershed and Schaalsee Biosphere Reserve) suggest a general benefit in using the ES concept in participatory planning. Only for one case study (Northern Ghana II), the integration of the ES concept was not perceived to be beneficial. As a next step, we compared the criteria from the CCT with the BSC for all case studies. On average, the ES concept is more frequently perceived as an advantage in practice-oriented case studies than in those with a theoretical approach (Annex Fig. A3). Especially the enabling of knowledge sharing and working on a joint vision had low advantage levels for the case studies with a theoretical approach. Similarly, regarding advantages, case studies with practical use of the ES concept showed lower risk levels in implementing the ES concept in participatory planning than those with theoretical use (Fig. 5).

406 ---------- Fig 5 Risks for practical use versus theoretical use of the
407 ecosystem services (ES) concept in participatory planning. (around here) ----------
408 Lower risk levels are also presented by using equal or less than seven types of ES in the participatory
409 planning process (Fig. 6). Especially, using many ES types could lead to higher pressure on the supply
410 side or to areas with high provisional potential. In addition, economic motivations could be hidden if
411 many ES are considered.
412 ---------- Fig 6 Risks for many (> 7 ES) versus few ecosystem services (ES) types
413 considered in the participatory planning process. (around here) ----------
414 Based on the results from the case study analysis, it seems to be advantageous to involve citizens
415 (including farmers) in the participatory planning process (Fig. 7), for example to work on a shared
416 vision, to facilitate knowledge sharing and social networking, to build a common understanding, to
417 develop shared interests, to strengthen local-regional collaboration, and to include local experience.
418 A clear trend could not be identified by analyzing many actors versus a low amount of actors. The
419 involvement of many actors led to more pressure on the supply side or to areas with high provision
420 potential. Furthermore, the consideration of many participatory methods (e.g. surveys, participatory
421 mapping, group discussions, and training) versus only group discussion did not show a trend for
422 advantages or risk levels.
423 --- Fig 7 Advantages of involving local actors in the ecosystem services (ES) concept. (around here) --

424 **Discussion and conclusions**

425 Our case study analysis has shown that the ES concept has the capacity to become an *Esperanto*
426 among different actors in the participatory planning processes under specific, strongly context-
427 related preconditions. Complexity in the participatory planning processes and the high diversity of
428 contexts, where the ES concept is being used or is planned to be used in participatory planning,
429 makes subsequent generalizations difficult. However, we highlighted and discussed general trends
430 concerning the advantages and risks involved in using the ES concept as an Esperanto in
431 participatory planning.

432 **General assessment of the proposed research method**

433 The self-selected and voluntarily contributed selection of case studies in this study provided insights
434 into experiences with the ES concept rarely described in peer-reviewed literature. However, the self-
435 selection has some limitations, since the breadth of cases clearly influences the results. For example,
436 our sample of case studies represents mainly the global north context, and the limited number of
437 cases does not allow for statistically robust analyses. Replies to the BSC and CCT are reporting the
438 views and considerations of the researchers and planners who worked on the planning process, but
439 do not reflect the views of all other actors who took part in the planning process. We are aware of
440 the risk of subjective answers obtained from BSC and misunderstandings involving questions coming
441 from BSC. We reduced those risks by means of a careful discussions among the co-authors,
442 concerning to the research methodology and to the content of the two analytical tools (CCT and
443 BSC).
444 Due to the specificity of the case studies, it was not possible to present the results by each actor
445 group. Each of the case studies have worked with diverse actors, but without discussing the specific
446 advantages and risks of the ES concept with representatives of all actor group. Nevertheless, in most

of the case studies, representatives of 3 actors groups were involved, except Northern Ghana I and II, Basque County, La Araucania Region where citizens were not included.

On the other hand, the small sample of case studies represents detailed and highly diverse planning contexts and different ways in which the ES concept was implemented in participatory planning. In this study, it was the intention to illustrate a more differentiated picture of the current state in the implementation of the ES approach, rather than to propose a representative sample for statistical analysis. Similar works have been implemented under the same sample conditions (e.g. Partidario and Gomes 2013; Mascarenhas et al. 2015; Rozas-Vásquez et al. 2017). They have provided significant insights into a potential integration of the ES approach in decision-making. Our bottom-up approach allowed us to analyze also practical and on-going case studies that have not described yet in scientific literature and that are not reachable through scientific databases. Thus, we deliver first-hand experiences and lessons learned. A main advantage of this approach is the collection of a high diversity of participatory planning contexts.

A promising next step in this research could be the development of an online user guidance tool as a platform for exchange by different actors (planners, scientists, citizen) using the ES concept in participatory planning. The tool should be dynamic and flexible and, at the same time, allow users to add more results within the framework of the CCT and BSC. The tool could help new-comers in the application of the ES concept in planning to detect most suitable (similar) case studies for their field of interest in order to experience training by example.

The ecosystem service concept in participatory planning processes

Our study confirms the prior finding that participatory planning processes are complex and context-dependent (Arler and Mellqvist 2015). Participatory tools, often strongly recommended for a successful implementation of the ES concept (e.g. De Groot et al. 2010; Fagerholm et al. 2012), need to be carefully selected and adapted to the local context. Different governance regimes would require different participatory tools to successfully apply and implement the ES concept.

In order to reduce risk in using the ES concept in participatory planning, the concept should be integrated from the beginning of the planning process together with the planning aims. This should be supported with institutionalization of the participatory planning process and the time spent during the process to build trust among planning actors. Additionally, the process of participatory planning needs to have clearly defined objectives, preferably involving connotations to the ES concept that are understandable for all involved actors (Reed 2008). Our study confirms that properly explaining the importance of ES is an important precondition for the success of participatory planning.

Using the ES concept in participatory planning processes *has to consider different spatial and temporal scales*. While analyzing the spatial scales and stakeholder types involved in the participatory planning process we discover the complexity of interrelations that are different between stakeholders acting in different spatial scales and their sizes (meaning capacities, operation abilities, range of influence over the landscape). Also Hein et al. (2006) emphasized the differences in stakeholder interests and valuation of ES dependent on the spatial scale.

Before and during the participatory planning processes, the use of the *ES concept has to be considered in relation to the bundle of other mechanisms,* such as education and competence development, to strengthen the role of local actors in regional perception and to amplify the vision of local actors. Our study shows that attempts to build the ES culture could be implemented by two

main types of actions as provided in the case studies Tabasco Region and Czech-Polish borderland. The first general type focused on the micro scale (local – urban scale) and the implemented actions aimed to assist stakeholders to understand what, how, where and when ES help to improve their well-being. This can be done through i) education: this is the integration of the ES concept in the primary and secondary education system (investing for the future), and ii) competence development: to encourage economic units (e.g. stretching from local stakeholders through public agencies to big private stakeholders) to include the ES concept in their acquired environmental awareness and thinking. The second main group of actions should concentrate on issues related to policy design and should intend to build a bridge between providers and beneficiaries of ES. Such actions need a legal framework, resources and ES awareness of respective actors. Actors need to deal with more than one ES in order to incorporate a holistic approach of different landscape systems into participatory planning. Therefore, we recommend to assess and manage ES in a set (ES bundle) – possibly from the beginning of the participatory planning process. However, planning actors have to be aware of the higher risk of failure related to the high complexity of this process.

Different ecosystems (e.g. natural, agricultural or urban) offer different services. Interactions of those ES with society exemplified by urban development, agricultural development, or protected areas, are very special. Therefore, during the participatory planning process, the time-consuming and challenging part is to learn how to integrate these services into a set of complementary planning actions. Obviously, the development of holistic actions would require a lot of resources, a good understanding and sufficient amount of time, which has to be considered during the participatory planning process.

Our research also exemplifies that a clear analytical differentiation between advantages and risks specifically related to the usage of ES concept in participatory planning is challenging. This is due to the fact that participatory planning approaches are often used to implement landscape or land use planning (e.g in the frame of national planning legislature).

“My” ecosystem services

The “My ES” phenomenon reflects the situation in which one or a few ES are overemphasized due to particular interests of influential planning actors. “My ES” practices lead to exclusion of diverse actors from the benefits of the construction of a bridge between providers and consumers of ES (Galler et al. 2016; van Wensem and Maltby 2013). Such a situation often results in a misdirected implementation of the ES concept in participatory planning, where just a single or only a few ES are considered in planning and, therefore, overemphasized. We have experienced such a phenomenon in separate case studies but have not identified a straightforward solution to deal with it. However, other studies suggest using a step-by-step approach to tackle this problem (Levrel et al. 2017; Olander et al. 2017). In these approaches, subsequent steps taken in the participatory planning process should firstly help to build the necessary knowledge basis among the planning actors and the ES concept. As the next step, measures should be taken to carefully discuss the ES concept oriented towards planning goals (Plant and Ryan 2013;). Such steps are not linear and could be placed according to individual requirements. Nevertheless, planners and other planning actors have to be aware about the issue of intentional exclusion of selected ES.

The operationalization of the ecosystem services concept in participatory planning with regard to policy frameworks

Existing policy frameworks and planning systems can play a fundamental role in fostering or hampering an effective operationalization of ES in participatory planning processes. One relevant aspect is the lack of institutional guidelines at different planning and administrative levels to incorporate ES in a spatial planning process (Rozas-Vásquez et al. 2017). For example, some recent reviews highlighted a big gap in the explicit use of ES in spatial planning processes to clearly inform planning and to derive decisions on land use (Cortinovis and Geneletti 2018; La Rosa 2018; Rozas-Vásquez et al. 2018). This could be partly due to the absence of a mandatory inclusion of ES in planning processes by planning systems (i.e. national/regional planning laws). For spatial planning, this aspect reflects the historical relation between planning and national/regional norms and planning systems that shape scopes and contents of each plan. This issue therefore highlights the opportunity to normatively and mandatorily embed ES in new forms of policy planning frameworks, regulations and standards. Our study confirms that the ES concept provides an opportunity to improve landscape planning by recognizing and explicitly placing the relationship between ecosystems and well-being. However, to achieve this potential, new standards for high-quality ES plans should be set (Woodruff and Bendor 2016). To this end, Pelorosso et al. (2016) advocate new standards for spatial planning based on ecological processes and relative functions of areas and ecosystems delivering the ES, which should be grounded in new measurements able to quantify these services at different scales (from the municipal to the district scale).

Can the ecosystem services concept become a new Esperanto to facilitate participatory planning processes?

Using the ES concept as a new Esperanto or boundary concept to facilitate participatory spatial planning processes often represents a challenging and ambitious endeavor. At the same time, using the ES concept offers opportunities to improve collaboration between diverse actors and to reduce disparities between them. Our study shows that the ES concept has the capacity to facilitate the communication and interaction among planning actors as well as to build a sustainable relationship between ecosystems and society. From the analyzed case studies, the following recommendations can be outlined to better exploit the opportunities of using the potential of the ES concept to support participatory planning:

- A clear understanding and a case-specific definition of the ES concept is needed by the different stakeholders or actors involved in the planning process, since it is still seen as a new concept and open to different and sometimes conflicting interpretations.
- The expected added value must be clearly described, and transparently communicated in participatory planning process to justify extra efforts needed for understanding and translation.
- Using the ES concept in participatory planning could be fostered if its application was embedded in legal instruments such as laws, regulations and planning standards at respective planning levels. However, the change of such planning contexts and instruments is often unlikely in the short term, and the high diversity of planning contexts, legal situations, case-specific objectives and politics, hinder a standard interpretation and application of ES concept definitions, methods, and procedures across different geographical contexts and decision-making levels.
- Local and indigenous knowledge should be actively identified and used to support stakeholders involved in the planning processes through the establishment of on-going learning

mechanisms. Those mechanisms could then be able to facilitate a kind of planning and decision-making which would be closer to local needs and more likely to gain public support.

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Annex (appendixes)

--------- Fig. A1 Ecosystem services and ES types considered in the case studies (design inspired by Schröter et al. 2016) (around here) ----------

----------Fig. A2 Overall balance of average scores assigned to advantages and risks in the analyzed case studies (numbers inside the bars refer to the case studies)----------

----------Fig. A3 Scores of advantages by case studies with practical and theoretical use of the ecosystem services (ES) concept in participatory planning (around here) ----------

----------Tab. 1A Information from the Comparative Criteria Table. LULC= Land use and land cover, ES= Ecosystem services (around here) ----------

----------Tab. 2A Reclassification of ecosystem service (ES) types considered in the case studies. Reclassification according to the Millennium Ecosystem Assessment (MEA), and the Common International Classification of Ecosystem Services (CICES). SDGs= Sustainable Development Goals, TEEB= The Economics of Ecosystems and Biodiversity (around here) ----------

----------Tab .3A Complete results from Balanced Score Card (around here) ----------