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An assessment method of ecosystem services based on stakeholders perceptions: The Rapid Ecosystem Services Participatory Appraisal (RESPA)

Hélène Rey-Valette [a], Syndhia Mathé [b,c,*], Jean Michel Salles [d]

[a] Centre d'Economie de l'Environnement – Montpellier (CEE-M) and LAMETA, Univ. Montpellier, CNRS, INRA, SupAgro, Av. R. Dugrand, 34000 Montpellier, France
[b] CIRAD, UMR Innovation, TA C-85/15, 73 rue Jean-François Breton, 34398 Montpellier Cedex 5, France
[c] IITA Cameroun, 1st, Main Road IRAD, Nkolbisson, PO Box 2008 (Messa), Yaoundé, Cameroon
[d] Centre d'Economie de l'Environnement – Montpellier (CEE-M) and LAMETA, CNRS, INRA, SupAgro, Univ. Montpellier, Campus SupAgro, 2 place Pierre Viala, 34060 Montpellier Cedex 2, France

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ABSTRACT

Using a classification of existing approaches in environment economics and ecological economics, this article presents a method of valuing ecosystem services based on perception surveys. It assesses, on one hand, the level of familiarity with services among a diverse array of stakeholders, citizens and/or service users- and, on the other hand, appraises the relative importance of all the services pertaining to a defined geographical area using two indicators, citation frequency and hierarchical ranking of services selected. In accordance with pragmatist principles, the relative nature of the approach is designed to improve the quality of the assessment. The incentive role of information is given priority to identify learning and communication measures that encourage pro-environmental behaviour and voluntary, individual and collective measures in favour of ecosystem service conservation. The protocol proposed also enables additional information to be collected, especially on the rationale behind choices or the level of familiarity with services. An illustration provided by a case study attests to the pertinence and efficiency of the method which can be used as a tool for decision-making support at regional levels and assisting governance and the enhancement of ecosystem heritage.

1. Introduction

Environmental economics and ecological economics have both recognized, albeit in different ways, the complexity and multidimensional nature of the notion of value (Maître d'Hôtel and Pelegrin, 2012, Kenter et al., 2015). Both have raised the question of how to appraise the value of natural assets, amenities generated and, more recently, goods and services derived from ecosystems. There are, broadly-speaking, three approaches which, at least on a conceptual level, indicate a shift in the way the role of valuation in decision-making processes is understood. These approaches can be primarily characterized by both the level to which they consider the evaluation (individual or collective) and the importance of the monetization of the ecosystem services. Each approach includes a set of methods based on these characteristics.

The first approach is part of Environmental Economics which has broadened the classical concept of value based on utility and scarcity by including use and non-use values to measure the total economic value at individual level (contingent valuation, joint analysis methods). The ultimate aim is to add the value of ecosystem services to the process of rational arbitration and decision-making based on Cost-Benefit Analysis (CBA). However, CBA-based assessment appear to be of limited use in actual decision-making (Laurans et al., 2013; Laurans and Mermet, 2014; Banos and Rulleau, 2014).

The second approach, which relates more to ecological economics, has discussed the diversity of the criteria upon which are choices based and the incommensurability of the values of natural goods and services (Munda, 2004). It has called into question the prominence of monetary valuation by recommending multi-criteria and deliberative approaches (Norgaard, 2007; Bunse et al., 2015) at individual and collective level. This perspective involves studying not only the economic importance of nature

* Corresponding author at: CIRAD, UMR Innovation, TA C-85/15, 73 rue Jean-François Breton, 34398 Montpellier Cedex 5, France.
E-mail addresses: helene.rey-valette@umontpellier.fr (H. Rey-Valette), syndhia.mathe@cirad.fr, m.syndhia@cgiar.org (S. Mathé), jean.michel.salles@supagro.inra.fr (J.M. Salles).

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but also its social and cultural importance, as well as the ethical rules which govern the bonds between nature and society beyond those of mere utility. This approach appears better adapted to the context of decentralized institutions and participatory and deliberative processes. We thus move from a system of rationalizing the choices of a central decision-maker to approaches inspired by assessment of collective action which, also, take into account non-monetary aspects of ecosystem service assessment. This shift is accompanied by recognition of qualitative and expert assessment (including non-scientific), but the notions of preference and utility remain strong.

Even though the issues of the acceptability of measures and public policy design now occupy a greater place, these two first approaches conceive environmental policy in terms of economic incentives. Also, these approaches do not generally treat the problem of respondents' unfamiliarity with biodiversity and ecosystem services (Amigues et al., 2002; Teelucksingh and Nunes, 2010; LaRiviere et al., 2014), which is where our approach comes in.

A third type of approach, which has emerged more recently, focuses on assessment and action on behavior, and emphasizes the role of information. This approach, which relates to Dewey's philosophy (1939) and the principles of "nudges" (Thaler and Sunstein, 2008), focuses on information, training, learning and promotion of norms. Its aim is to raise awareness among the population and coordinate behavior using shared social models and the acceptance of bounded rationality. This includes new disciplinary such as behavioral economics, environmental psychology as well as information and education sciences, and thus involves additional decision-making tools. Information and training needs must be identified as well as sources of conflict and support for the co-construction of shared norms and their conservation. Support for decision-making revolves around the appropriation of certain values that encourage citizens to promote pro-environmental behavior and individual and collective implementation of voluntary measures.

In such approach, a study of the stakeholder perceptions of ecosystem services is vital in identifying their acknowledgement within society and their relative importance for a defined geographical area (Kaplowitz and Hoehn, 2001; Lamarque et al., 2011; Martin-Lopez et al., 2012; Maris et al., 2016; Couvet et al., 2016). Perceptions may be defined as "*systems of interpretation governing our relationship to the world and to others, directing and organizing our behavior*" (Jodelet, 2009). Sociologists often use the concept of representations (Moscovici, 2003) and agree that they are social constructions that depend upon history and interactions within social networks. They are also referred to in psychology and behavioral economics where the focus is upon psychological mechanisms and the role of interaction on decisions (Shogren, 2012), particularly to promote pro-environmental conservation and protection attitudes. Several authors (Dreezens et al., 2005; Dietz et al., 2007; Shwom et al., 2010, Becker and Felonneau, 2011) show that motives and perceptions of environmental conservation call upon the value of self-transcendence (Nunes and Schokkaert, 2003; Carlsson et al., 2007).

This study of stakeholder perceptions might consider two main conditions:

(i) To identify perceptions putting them in relation one to each other within a reference list. Indeed, Dewey (1939) showed that value judgement must combine a direct and immediate approach in which there is an emotional component, and a rational dimension to valuation. Perceptions allow this direct judgement. Dewey also emphasized the interactions between values and points out that things acquire value only in their relations, their connections with other things. Again, interests are so linked with one another that the valuation-capacity of any one is a function of the groups to which it belongs (Dewey, 1939). It is to fulfill this condition that we propose a trade-off between all the ecosystem services through ranking. It is not merely a question of characterizing perception of a service but understanding its relative position, compared to other services.

(ii) The diversity of respondents is crucial in collecting a wide spectrum of viewpoints. Many authors emphasize the interest of surveying several categories of people in order to grasp the widest possible diversity of points of view (Chan et al., 2012; Martín-López et al., 2012, Cáceres et al., 2015).

The method we propose and name RESPA (Rapid Ecosystem Services Participatory Appraisal) belongs to this third approach. RESPA: (i) requires setting up perception surveys among a diverse set of stakeholders, citizens and/or service users in an attempt to offer a more flexible and complementary approach than traditional economic valuation based on preferences; (ii) proposes, at an individual and/or collective level, a process revealing the perceptions that combines reflexivity and learning by drawing upon recent contributions from deliberative economics; (ii) identifies to what degree individuals are aware of the services and what importance they attach to their conservation.

The aim of this paper is to show the interest of this third approach for decision-making, to specify how it can be implemented through a simple and multidisciplinary-based method and to discuss advantages and limitations of such method compared to existing ones.

The first part is devoted to the construction of a typology of existing assessment methods, including ours, based on the main characteristics of the approaches to which they belong. The method we suggest is presented in detail in the second part. The third and final part deals with its importance for implementing environmental policy and the governance of sustainable development projects in a given geographical area.

2. Typology of ecosystem services assessment methods

Ten Brink (2011) distinguishes four degrees of ecosystem services assessment and appropriation: 1° identification, 2° quantification, 3° monetization and 4° marketing. The identification step falls mainly within the scope of ecology and specifies habitats and functions so as to characterize the provision of services. The second is their quantification which relies on inventories, mainly through geographic information systems, to study the mapping of these services. Identification and quantification then evolve towards the analysis of interactions between services, especially via the notion of ecosystem service bundles (Bennett et al., 2009; Raudsepp-Hearne et al., 2010). Simultaneously, the valuation of certain services in monetary terms (third degree) aims at rationalizing the decisions that impact them, particularly in the case of development projects. More recently, works on the way services might be included in national accounting (Weber, 2014) are developed. Finally, according to Ten Brink (2011), payment mechanisms for environmental services and institutional measures of governance to manage the flow of services constitute the latest type of approach.

From perusal of this literature, it would appear that economic studies tend to consider the issue of ecosystem services identification resolved or dealt with elsewhere. Valuations often focus on a single or small number of services (Seppelt et al., 2011), or adopt a more global approach to the benefits of nature without listing the whole services. To specify the interest of our approach, we will try to summarize and simplify existing approaches according to whether the notion of value is individual or collective and whether

valuation is monetary or not. The Fig. 1 presents a typology of existing ecosystem service assessment methods included the one we propose. We identify three main types of approaches in relation to which we situate our method. The latter does not pretend to replace the existing ones; it is positioned as an in-between method.

The importance of the individual approach for economics may be explained by the assumptions of standard microeconomic theory (Type 1). These postulate that subjects' preferences are (mostly) self-regarding and are part of a utilitarian perspective related to the consequences of choices upon well-being (Gsottbauer and van den Bergh, 2011). The effects upon other individuals, the phenomenon of behavioral mimicry, the role of convention and norms are unaccounted for from the outset or only indirectly through gains in social recognition or self-esteem. Preferences are also considered stable and exogenous. These approaches share a common appreciation of preferences (willingness to pay/willingness to accept) and therefore of values in monetary terms through valuation methods of non-market goods and services. It is possible in this way to measure the ecosystem service value but by means of cumbersome surveys in terms of sampling, questionnaire construction and statistical processing.

Other methods based on individual interviews use non-monetary metrics (Type 2). This is the case for the widely-used multi-criteria approaches, ranking methods and life satisfaction approaches and also for other less frequently used methods such as the Q method (Rodriguez-Vargas and Marburg, 2011; Pike et al., 2014) or the Delphi prospective approaches (Martin et al., 2012). However, as Kelemen et al. (2014) have pointed out, these non-monetary approaches remain non-standardized. Whereas the impact upon results of the type of method used influences the level of knowledge (Martín-López et al., 2014).

Deliberative economics is better adapted to recognize value incommensurability and to integrate ethical issue (Norgaard, 2007), i.e. the way in which individuals judge what is good and what is fair (Type 3). It involves interdisciplinary assessment. This orientation mobilized by ecological economics is in line with Dewey's pragmatist philosophy (1939) emphasizing the role of deliberation. In this way a collective valuation of ecosystem services is established through a process of discussion and information-sharing among stakeholders. In certain cases, the protocols combine the deliberative approach with monetary metric (Spash, 2007).

Whatever the approach, economic literature offers only scant recognition to the identification of services. Bagstad et al. (2013) assesses the readiness of 17 valuation tools and highlights the high level of resource requirement for their implementation. The focus on the question of utility in these approaches, their cumbersome protocols, and their limited role in the actual decision-making processes, have led us to look for an alternative approach based on perception surveys.

3. Procedures in the practical implementation of the RESPA method

The RESPA is primarily based on a framework for appraisal of the perceptions of diverse stakeholders which allows establishing a ranking of services. It aims to respond to the need for operational tools that integrate the perceptions of actors and inhabitants to help spatial planning decisions (Werner et al., 2014; Keune et al., 2015), and ease multidisciplinary approaches of ecosystem services (Jacobs et al., 2016). Indeed, we observe a wide variety of approaches characterizing the potential services, or their associations in services bundles (Bennett et al., 2009; Raudsepp-Hearne et al., 2010). Demand is often apprehended through the monetary valuation of some services or by more comprehensive approaches based on the spontaneous perceptions of citizens or stakeholders. The interest of our approach is to build a hierarchy of services which is relative to a systematic list. It makes it possible to analyze to which extent services can be considered a resource for territorial development and the welfare of the actors (Torre and Traversac, 2011).

3.1. The steps of the implementation of the RESPA method

The implementation of RESPA consists of six steps displayed in Fig. 2. Each step is described below and we illustrate the calculation steps using a case study we carried out in France[1] (Blayac et al., 2014).

3.1.1. Creation of a reference list of potential services for a given geographical area

The first step is to build a reference list of services provided by an ecosystem in a given geographical area. This can be done following the CICES (Haines-Young and Potschin, 2013), whose development has benefited from the experiences that preceded it[2]. The use of an a priori list of services allows comparisons between territories and avoids a dependence on the knowledge of services by the actors, thus a possible overestimation of those that contribute more directly to their well-being. It is essential that the list be co-constructed on the basis of multidisciplinary scientific knowledge and from the local knowledge of stakeholders. This co-construction between scientists from several disciplines and stakeholders reinforce the legitimacy and consistency of the reference list of services. This list has to be as exhaustive as possible. The discussions should make it possible to verify that the services are actually present in the territory and that there is some potential or de facto use for each.

3.1.2. Carrying out perception surveys among a diverse set of stakeholders

The next step is to create questionnaires and to carry out surveys with the intention of identifying to which services stakeholders give priority. The respondents are targeted through diversified local contacts and must be identified as actual stakeholders: the ones who can affect or be affected by the ecosystem service management (Freeman, 1984). However, being rather cumbersome to implement, it is necessarily limited to mobilizing some stakeholders by survey or focus group. The focus on perceptions adds a complementary point of view since they can be understood from an individual basis via a survey or collectively through focus groups. Several deliberation processes can be used (citizens' jury, companion modeling, participatory multi-criteria assessment, role-playing, participatory rural appraisal, participatory action research…), and the final hierarchy results from a tradeoff between the actors. This can result from a collective debate or the confrontation of individual choices with collective arbitration (with an electronic voting or group animation methods). The result then expresses a collective preference, and thus circumvents the problem of weighting for the aggregation of individual preferences. As we have emphasized, this type of approach is crucial when the

[1] A survey carried out in Lorraine, a French fish farming region, on ecosystem services provided by fishing ponds covering 7000 ha with a production of 854 tons (7% of total French production). 25 producers, 32 "other stakeholders" (18 institutional representatives (government services, districts, region, municipalities), 7 NGO representatives and 6 members of professional organizations and economic actors in the sector), 116 pond users (Participants in the annual fish festival on the site of one of the ponds, combining an annual fishery, nature observation routes, and a fish farming museum) and 497 residents from neighbouring villages were surveyed (Blayac et al., 2014).

[2] For a recent comparison of MA, TEEB, CICES in marine ecosystems see Liquette et al. (2013)

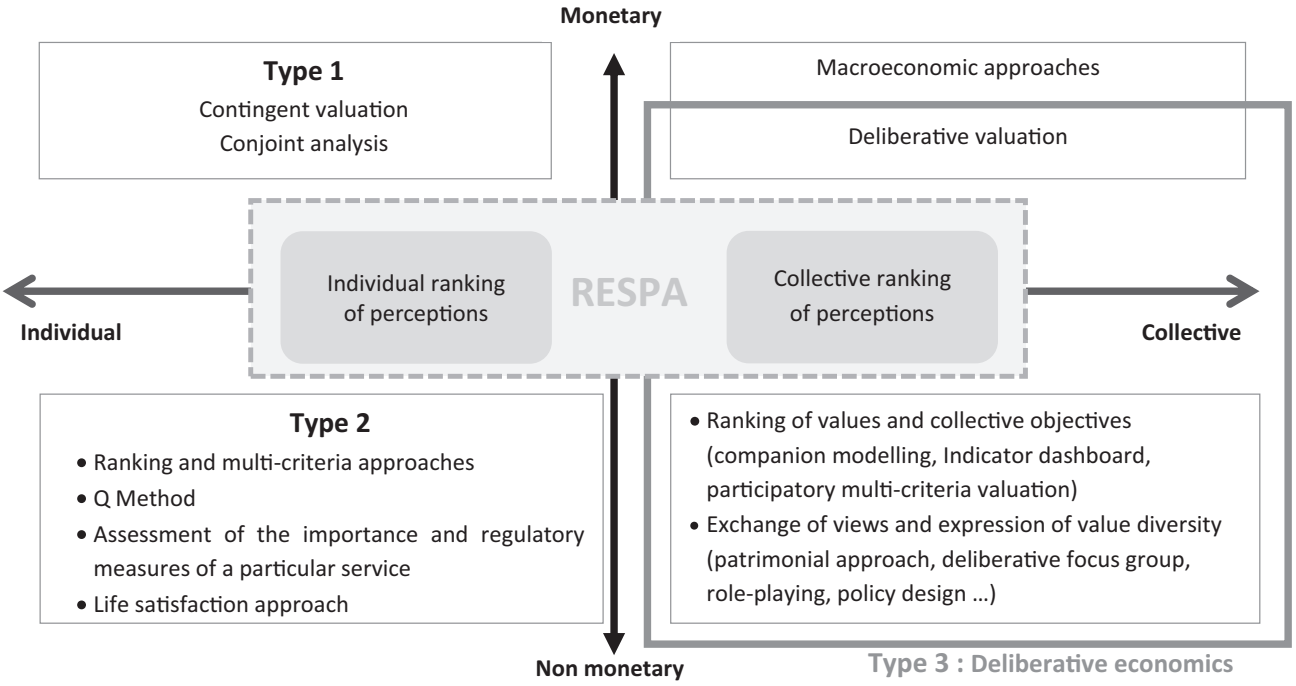

Fig. 1. Simplified cognitive mapping of valuation methods.

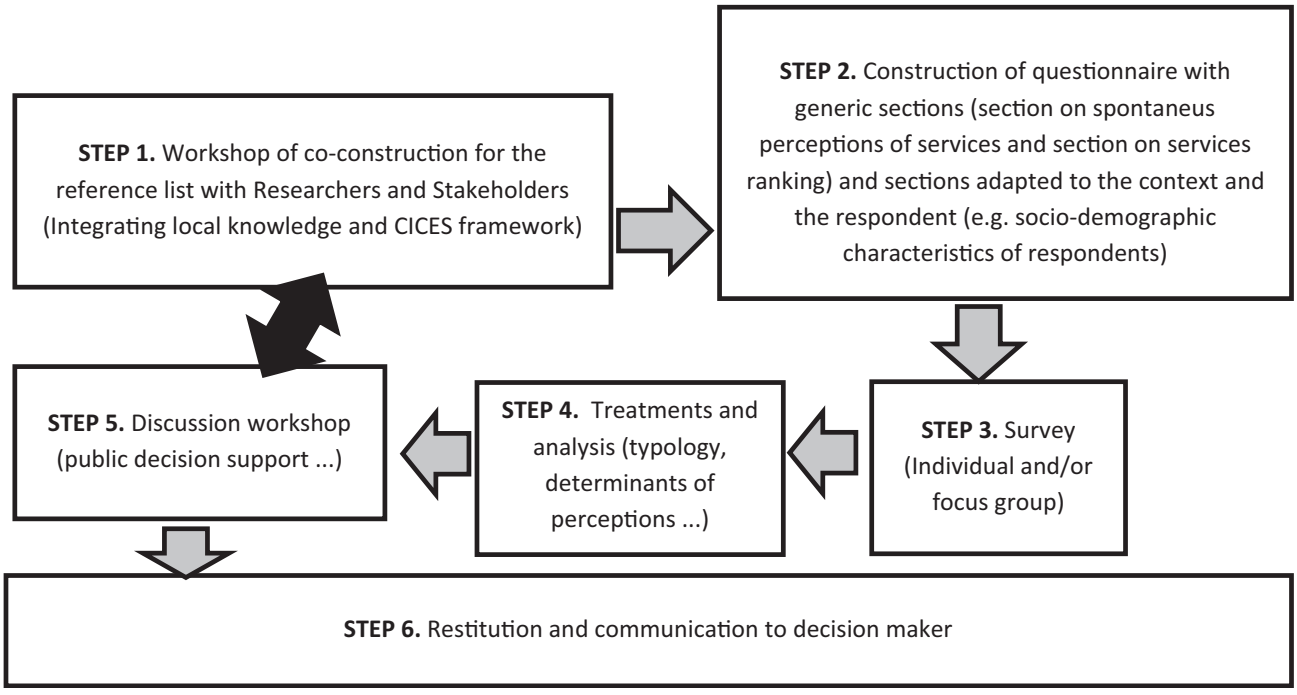

Fig. 2. Implementation process for the approach.

aim is to act on the knowledge and awareness of ecosystem services in order to generate proactive behavior for service protection. Since ecosystem services are assessed comparatively, it is critical that this evaluation is carried out within a finite set of services related to a given geographical area, so that all the respondents make a judgment from the same choice set and in the same context.

The respondents are first asked to identify from the reference list for their geographical area a limited subset (from 5 to 10) of services they deem important for the area. Then, from this subset they rank the services by order of importance from their viewpoint on a scale from 1 to 10.

The function of each service is explained to the respondents and illustrated by examples even using photos before they make the selection. This is important as certain services require ecological knowledge and respondents need to be offered balanced information on all services. In fact, the ranking process itself fosters awareness and social learning. The selecting/ranking exercise can also be

preceded by open-ended questions inviting respondents to express their opinions on the most important environmental resources for their geographical area. The matching of these resources and the services with which they are associated enables comparison between spontaneous perceptions corresponding to socially well-known services and services whose importance is revealed in the extra information supplied by the interviewer.

Two service importance indicators can be calculated:

- citation frequency, showing the number of times each service was selected, i.e. considered to be important
- an average score, corresponding to the total or the average of marks obtained in the ranking of services deemed the most important

Depending on requirements, other information may be drawn up by adding questions on the listed services, e.g., those deemed the most vulnerable, known services or services discovered during the course of the survey...

3.1.3. Identifying motives for choices and sources of bias

The development of the questionnaire is a crucial step because of possible biases in the formulation or ordering of questions. As with the survey of choice experiment (Aizaki, 2012), lassitude effects can occur if the list of services is too long. It may be useful to illustrate such list with pictures to complete the information and make the prioritization exercise less tedious. We tested the fact that a presentation of the reference list in the form of illustrated cards to be ranked facilitates the exercise. Moreover, this type of systematic evaluation from a list reduces the risk of bias in the formulation of the questions. Consistently with criticism of the anthropocentric character of ecosystem services classifications, the main limitation of this approach is that respondents may be reluctant to rank services if they prefer to see nature as an indivisible whole. In contingent valuations, control questions are designed to verify the credibility of the scenario (Arrow et al., 1993; Hausman, 2012), the validity of stated preferences (Cummings and Taylor, 1999), the justification for the absence of willingness to pay (Santos, 1998; Johns et al., 2006) and, more generally, the motives behind choices. Accordingly, it is important here that the selection/ranking exercise be accompanied by questions that identify not only the arguments and motives behind choices but also possible bias resulting from wording.

Following the prioritization exercise, in addition to the main socio-demographic characteristics of the respondents, it is important to incorporate more general questions on the uses of ecosystems (frequency of attendance for example) and on the respondent's interest in nature (one of the most widely used scales is the *New Ecological Paradigm Scale* proposed by Dunlap et al., 2000). These elements make it possible to identify the levels of proximity to the services and the motivations of the respondents. It is essential to determine (i) whether motives are altruistic or stem from an interest in conserving practices, (ii) the situated or generic nature of the choices in relation to respondents' place of residence or use, (iii) the more or less contextual nature of the choices depending upon the dynamics of issues in the local area or environment, and finally, (iv) the weight of social norms. It is also challenging to position the importance given to preference for conserving services compared to other issues such as social inequality, health or security... in order to measure the contribution of ecosystem services to well-being throughout the defined geographical area. Proximity and familiarity with the services chosen must also be understood in terms of practices to measure how deep values are anchored in daily life as well as references to norms shared within social networks. It is important to look into the differences shown by respondents compared to the preferences of politicians or relatives and to define their level of awareness of the causes of environmental degradation and the legitimacy of the institutions appointed to deal with conservation policies. Finally, in the spirit of mixed approaches that combine valuation and deliberation, observing the focus group discussing the results collectively helps to better understand how the preferences can be constructed through social interaction.

3.1.4. Statistical processing of the indicators proposed

Depending on specific purposes, different types of treatment for descriptive and multivariate statistics may be proposed. Firstly, two indicators are calculated for citations frequency and importance scores for each ecosystem service, both globally and by stakeholder category (inhabitants, tourists, stakeholders, users, farmers or fishermen...). Multivariate statistics are processed to (i) search for links between variables and thereby explain different perceptions according to socio-demographic characteristics, (ii) create, through multiple correspondence analysis and hierarchical ranking, perception typologies that define standard profiles. The latter correspond to the specific target groups for whom measures must be differentiated. Finally, modelling choices allows calculating choice probabilities according to perception types (Blayac et al., 2014). The econometrics of qualitative variables (logit, probit) is generally used here to analyze the results.

The indicators on citation frequency and importance scores for each ecosystem service can highlight heterogeneity in perceptions according to stakeholder category as we identify it in our survey (Blayac et al., 2014). Table 1 illustrates differences in perceptions which occur in our illustrative case. These differences prove the usefulness of having a diverse range of stakeholders whether

Table 1
Selection and ranking results depending on type of stakeholder.

	Citation percentage				Ranking score			
	Prod.	SH	Users	Local.	Prod.	SH	Users	Local.
Fish production	72%	81%	72%	52%	7,3	7,2	7,3	7,3
Plant production	8%	0%	16%	16%	3,5	0,0	4,4	5,7
Freshwater reservoir for irrigation or other	32%	28%	29%	31%	7,1	5,3	6,2	6,7
Hydrological regulation	68%	81%	30%	33%	8,0	6,4	5,6	6,7
Pollution retention & depollution	28%	44%	4%	16%	4,3	4,6	4,4	6,3
Raising environmental awareness	56%	50%	32%	37%	4,1	4,7	4,5	5,4
Hunting & fishing	48%	41%	53%	34%	5,8	5,3	6,1	6,4
Leisure	64%	75%	37%	50%	3,6	3,8	4,3	5,5
Landscape	32%	62%	28%	57%	5,3	4,7	4,4	5,3
Sanctuary & nesting zones	44%	78%	67%	64%	6,1	6,5	6,5	5,7
Spawning and reproduction grounds for aquatic animals and plants	68%	59%	56%	36%	5,8	6,3	5,7	4,5
Biodiversity conservation	72%	94%	72%	62%	6,4	7,6	7,4	6,6

Prod. = Producers; SH = other stakeholders; Local. = local inhabitants.

Table 2
Typology of services related to perceptions.

	Selection percentage		Ranking score	
	Average	Rank	Average	Rank
Group 1: Services considered as major				
Fish production	69%	2	7,3	1
Biodiversity conservation	75%	1	7	3
Sanctuary & nesting zones	63%	3	6,3	4
Group 2: Services considered as minor				
Plant production	10%	11	2,3	11
Pollution retention & depollution	23%	10	4,5	8
Group 3: Moot services				
Freshwater reservoir for irrigation or other	30%	9	6,3	4
Water regulation	53%	6	7,1	2
Raising environmental awareness	44%	8	4,4	9
Hunting & fishing	44%	8	5,7	6
Leisure	56%	4	3,8	10
Landscape	45%	7	4,9	7
Spawning and reproduction grounds	55%	5	6	5

directly or indirectly involved. Analysis of these differences allows for:

- accurate identification of information needs depending on target groups,
- anticipation of possible future conflicts caused by different priorities for services requiring protection or preferential promotion.

The relevance of such a method mostly depends on the diversity of respondents. The assumption is that diversity enables a more accurate picture of the whole range of decisive services for the geographical area in question, both for the services that are characteristic of the area and those that affect it at various interlocking scales, migratory birds or landscapes, for example. This deliberate and informed combination of survey categories must fit in with traditional criteria for representative sampling among users and citizens.

An average per service can also be calculated for each of the two proposed indicators, by weighting individuals so as to account for differences in sample size of stakeholder categories (Table 2).

In our illustration case, cross-analysis of the two indicators indicates several groups of services.

Group 1. Services considered as major: Services that have both a high score and high frequency can be considered as major services (biodiversity conservation, fish production or nesting role in our example)

Group 2. Services considered as minor: Services that have both a low score and low frequency can be considered as minor (plant production, pollution retention)

Group 3. Moot services: Services whose frequency and scores diverge cover several situations:

- services considered as average whatever the indicator, such as the role of spawning grounds or landscape
- services often cited but ranked low, which is the case for leisure services in our example
- services that are not very often selected but considered quite important by those that select them (water regulation et reservoir). This seems to show a lack of general recognition and thus a need for raising awareness. In our approach, this category confirms the importance of the knowledge-gap issue in defining values. Individuals who know these services consider them important but few people actually have this kind of knowledge. To understand the information gap, we need to know whether it is a feature of a particular type of stakeholder.

These categories correspond to different and increasing awareness needs. It may be noted that when comparisons are made between the two types of indicators by stakeholder category, ranking is closer, which strengthens the impression of greater homogeneity between perceptions within categories due to the socially-constructed nature of perception and the influence of the level of familiarity.

3.1.5. Confronting perceptions with scientific knowledge in discussion workshop

Being, by essence, subjective and situated, analysis of the various categories of stakeholder perceptions must be confronted with scientific and historical data (resources or ecosystems diagnosis, territorial planning document) so as to characterize differences in the relative weights observed and, whenever the case, complete research work on certain services. The scientific knowledge, especially on the relative vulnerability of services, must be used to endorse the various means of promoting services in development projects for the defined area.

3.1.6. Restitution and communication to decision maker

This final step does not mean that decision-makers are not involved in the other steps. This step is dedicated to the translation of the results into policy recommendation and actions.

4. Discussion on the specifics and interest of the “RESPA method

4.1. Specifics of the « RESPA » method

The aim here is not to offer a detailed description of the wide range of methods for which we have provided a classification (Fig. 1) but the specifics and the complementary aspects of our approach. Table 3 synthesizes the main characteristics of various approaches. The emphasis is placed on supporting public decision-making. Of course, linking to decisions must take into account that these links can take many forms and be related to different stages or aspects of the decision-making process (Laurans and Mermet, 2014). Monetary valuations are consistent, for example, with the rationalization efforts of New Public Management (Bezes, 2007). In the same way, the interest of certain planning projects may be revealed by valuing the economic benefits generated by visits to sites. Valuation of the contribution of an ecosystem to the welfare of a community linked on different spatial scales to that ecosystem is the issue for which the greatest number of methods exists, with a noteworthy recent increase in multi-

Table 3
Simplified comparison of valuation methods categories.

	RESPA	Monetary valuation	Multi-criteria approaches	Deliberative monetary valuation
Aim	Valuing the existence, the importance of services and need for awareness	Monetary estimation of ecosystems or of certain of their attributes	Assessing the best option possible according to a combination of criteria	Collective estimation of the value provided by ecosystem services
Level	Whole range of services	Generally based upon one or small number of services		
Type of survey	Individual or collective perception surveys	Surveys of individual preferences	Surveys of individual ranking of criteria	Deliberative groups
Type of importance indicator	Citation frequency rate and service ranking score	Individual Willingness to pays or Willingness to accept	Ranking scale by class	Arbitrated social Willingness to pays/Willingness to accept

criteria approaches. These approaches do however come up against the problem of weighting services (Fontana et al., 2013).

To support decision-making, RESPA identifies information and service recognition gaps by proposing a ranked list of all the services considered important by a broad spectrum of stakeholders. It thereby identifies targets and strategies for awareness and, in doing so, facilitates proactive behavior for service protection. It has points in common with multi-criteria approaches through its classificatory nature, and also, when it is used on a collective and participatory basis, with deliberative valuations that enable social arbitration for the aggregating and ranking of values (Hattam et al., 2015; Cáceres et al., 2015).

The RESPA method is part of the renewal of ecosystem service assessment methods towards the more integrated ones suggested by Jacobs et al. (2016). By its simplicity, the method is easily appropriable and can foster interdisciplinary and transdisciplinary approaches involving a wide range of stakeholders. Focused on perceptions, it allows an inventory of the way each stakeholder category ranks the services. This concept of perception includes various aspects (information, stakeholder socio-demographic characteristics, as well as their integration into social networks, set of norms and values...) which determine the viewpoints and behaviors of stakeholders. RESPA responds to the priorities highlighted by Jacobs et al. (2016) such as the inclusion of a wide range of stakeholders (users, civil society, decision maker), can be easily combined with other methods, and facilitate reflexivity and transparency in decision.

Due to its wider scope and the simplicity of the indicators, the RESPA can also be a complement to identify beforehand the most important services for which a monetary evaluation can then be carried out. Depending on the modules that can be associated with the ranking, the RESPA approach makes it possible to identify the relevant criteria for a multi-criteria analysis.

4.2. Providing information to facilitate appropriation and adaptation to environmental policies

One interest of the RESPA method comes from the relative nature of the selection procedure which meets the obligation for choice from among a finite and supposedly complete set of options, consistent with a pragmatic approach (Dewey, 1939). The provision of information during the survey on the diversity of services helps to give meaning to the services themselves. In keeping with mixed approaches (Hattam et al., 2015), the results may be discussed.

Pointing out differences in knowledge, recognition and perceived importance helps administrators to identify information and awareness needs according to types of citizen and scales. Differentiating target groups makes information campaigns more efficient and ecological appropriation more effective. Shared viewpoints are quite often observed, for example, between farmers and producers who are directly linked by one or several services, between stakeholders at different scales, and between users and inhabitants depending on level of interest and familiarity. Several surveys have revealed the influence of age, education and knowledge of ecosystems (Blayac et al., 2014). By using attachment to place and services, changes can be generated on a local scale towards behavior in favor of conservation of these services and closer ties to nature in general (Roche et al., 2016). It is important to remember however, the gap underlined by psychologists between recognition and attitudes to nature and real change in behavior, a gap that has led to the school of 'committing communication'. The work in this field shows a greater influence of collective commitment which encourages collective approaches for focus groups. The type of questionnaire we propose can easily include modules that indicate relationships with the environment (Dunlap et al., 2000).

Use of spatialized perception indicators may also help to understand area-defined environmental and ecosystem service management based upon zoning and area specifics by showing the differences in perceptions related to scale (Hauck et al., 2013) or to subzones according to their characteristics.

In addition, we have shown that knowledge and awareness of services through perception surveys are strategic for the implementation of environmental policies; but research on this matter is still little developed. The reality of an ecosystem service depends on the existence of an actual (direct or indirect) use, a potential demand, or the recognition of value (non-use value). All the methods for ecosystem service valuation have to deal with the fact that their contribution to social welfare is determined by demand or actual use; even if beneficiaries are not always aware of it. According to Brussard et al. (1998), "Ecosystem management is managing areas at various scales in such a way that ecological services and biological resources are conserved while appropriate human uses are sustained". Identifying perceptions helps policy measures and incentives to be more specific and therefore better accepted by the population. Determining which services are considered important by stakeholders leads to a more precise understanding of perceptions and thus of stakeholder value. We need to identify (i) particular target groups that require specific accompanying measures and (ii) the level of knowledge of services so as to define awareness campaigns which should not be limited to the publishing of information. It is not simply a question of transforming practices but changing and enriching thereby the values upon which these practices are based.

In our illustration case in Lorraine, when we organize the discussion workshop, moot services were really debated relating to the category of stakeholder. Particularly for water regulation services, which were highly ranked by fishfarmers and researchers by not by decision makers. These debates highlight the need for complementary information. A PhD work has been initiated on the role of fishpond on water regulation. Related to this debate, it more generally positive impacts of fishfarmer practices on ecosystem and biodiversity that need to be emphasized comparing to abandon areas where hunting activities are predominant. As a results of the debate, the territorial administration of Lorraine,

has bought ponds to rent them to fishfarmers to avoid negative impact of abandon areas.

4.3. Strengthening area-specific governance and multi-scale coordination

The RESPA approach is a useful tool in the collective and concerted construction of objectives for the conservation and enhancement of ecosystem heritage, applying the same logic as Ostrom's polycentric management (1990) or research showing the interest of concerted processes and network governance for environmental conservation (Lucas et al., 2014). The protocol for selection and ranking of services that we propose can be used as a tool for organizing or mediating collective action in area consultation schemes (Lardon et al., 2008; Torre and Traversac, 2011). Identifying differences between types of perceptions points up potential conflicts between different types of stakeholders (Blayac et al., 2014; Mathé and Rey-Valette, 2015) and thereby enables targeted measures to bypass conflict or create comprise. As the definition of the services is connected to human well-being, it is easier to include conservation measures in development projects (Cáceres et al., 2015; Bierry and Lavorel, 2016). Indeed, in territorial development projects, this framework facilitates the definition of integrated and sustainable projects due to the positive approach of ecosystems conservation that it offers. These approaches could thus help renew the conception of well-being indicators which, at present, do not fully integrate interactions between the environment, the quality of life and natural assets. Enhancing the recreational value of natural areas, for example, has the potential to create green jobs in leisure activities and encourage diversification in traditional activities, especially farming. These activities are a positive argument in development projects as long as they are accompanied by attendance management and forms of urbanization consistent with the maintenance of services.

In line with recommendations encouraging local arrangements for sustainable development policy and biodiversity protection (Wittmer and Gundimeda, 2012), the area-specific nature of our approach is an asset for local people in raising awareness and appropriation of the benefits from ecosystem. Local arrangements, however, may run the risk of influencing perceptions and choices in favor of local populations and to the detriment of citizens from wider scales. In the same way, Mongruel et al. (2016) underline the risk of undervaluing indirect services, for which, therefore, information and learning measures are decisive. Heterogeneity among service contributions depending on scale is at the very heart of the issues and research in area-specific governance. The latter may be defined by its multi-stakeholder and multi-level nature in the sense that coordinating local issues must include problems from wider scales as well as the issues of coordination between scales in the aim of integrated management. Though many regulatory measures have strengthened multi-level integration, knowledge of interaction between scales must be reinforced to increase awareness and recognition of the benefits derived at wider scales. Inter-scale coordination addresses the question of the links between the common good and area-defined collective interests. In the field of environmental and biodiversity protection, the difficulty of 'local-global' coordination has produced research work on scale sustainability since sustainability of one area must not generate negative externalities in other areas. More recently, this problem has led to a line of research known as '*green on green*' (Warren et al., 2005) on the difficulties of implementing local projects with wider environmental issues at stake. In the example of the introduction of wind farms that comes up against the local problem of landscape conservation, it is important to bear in mind that spatial coordination, which includes spatial equity and solidarity, has given rise to numerous institutional innovations both for regulatory measures and the mechanics of public consultation.

Jacobs et al. (2016) highlight that ecosystem degradation is related to choices and trade-off that are not explicit or are based on conflict. In our illustrative case in Lorraine, the recognition of services diversity has reinforced the interest for an environmental label for fishfarming system, to improve the image of fishfarming activity and to increase the contribution of the activity to the patrimonial value and attractivity of the territory. In this sense, an organic label has been set up associated with a large communication on the positive impact of fishfarming activities. And a network of local restaurant has also been set up to develop the market for this activity.

5. Conclusion

Faced with a broad spectrum of possible approaches, RESPA constitutes a complementary tool with several precise and interesting properties. Its area-specific dimension can operate at varying spatial scales but remains within a rationale of proximity to the managed ecosystems, even though the beneficiaries of certain services may belong to other scales. RESPA proposes a relative valuation of a complete range of services for a defined geographical area, which is difficult to achieve through monetary approaches. The complexity of the protocols makes it difficult to accumulate steps for each service. Moreover, the monetary valuation of all the services has to overcome the bias of embeddedness and the difficulty of creating scenarios that explore the full scope of the future changes. The RESPA approach may provide a first stage in identifying a subset of services suitable for later monetary valuation. Finally, it highlights the diversity of viewpoints according to stakeholders categories, and to spatial scales, issues whose importance is pointed out by Hauck et al. (2013), and which can be critical for improving collective action procedures and governance measures for the defined area.

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