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# Classifying market-based instruments for ecosystem services: A guide to the literature jungle

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ABSTRACT

The definition and underpinning economic theory of market-based instruments (MBIs) for ecosystem services (ES) are yet unsettled matters. A refinement of their scope and a careful use of terms might facilitate communication among stakeholders and policy-makers. This article thus answers the research question: "How are MBIs for ecosystem services defined, reflected and assessed?".

We analyse a sample of 106 peer-reviewed articles, which is representative of the scientific literature. The sample is distributed in the categories of a published typology to map existing instruments; yet their multidimensionality is challenging. We further find that a great diversity of research methods and evaluation criteria, as well as terms, is used in the literature. It is also observed that a large number of articles does not use scientific methods with new data, but resort to mere advocacy instead. This lack of a common theoretical and empirical framework, as well as consensus or comparative studies that would strengthen their conclusions, makes it difficult for practitioners to draw robust policy-relevant results. Interestingly, the articles presenting positive, negative, and mixed results were in almost similar proportions in our review. Therefore the application of harmonized assessment methods to better defined categories of MBIs with key shared characteristics might support evidence-based policies. For instance funding, incentive and allocation instruments should be more consistently differentiated.



## 1. Introduction

While the public budget crisis in OECD countries prevents any major increase in Overseas Development Assistance (ODA) flows, the 10th Conference of the Parties (CoP10) to the Convention for Biological Diversity (CBD) in Nagoya in 2010 adopted a set of 20 targets to address biodiversity loss (Aichi targets)[1]. To achieve these a Strategy for Resource Mobilization was adopted (Lapeyre et al., 2012), whose article 8 stipulates a commitment to 'substantially increasing resources (financial, human and technical) from all sources, including innovative financial mechanisms' (Decision X/3). This commitment has been quantified at the CoP11 in 2012: international financial flows for biodiversity conservation and its sustainable management have to be doubled by 2015, using as reference level the average annual biodiversity funding for the years 2006–2010. Hence the necessity to mobilize 'innovative financial mechanisms' in a context of decreasing ODA was reiterated (decision XI/4, paragraph 21).

There is a clear trend in the conservation world in favour of market-based instruments (MBIs) (Pattanayak et al., 2010, Pesche, 2013)[2], and the ecosystem services'[3] discourse is widely promoted (Armsworth et al., 2007, Jeanneaux et al., 2012)[4]. However the

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[1] Included in the Strategic Plan for Biodiversity 2011–2020, the Aichi Biodiversity Targets are twenty headline targets guided by five strategic goals. The Targets reflect a strong political commitment and provide an incentive for global action as well as a flexible framework for implementation at the national and regional levels according to national circumstances and priorities. As a matter of illustration, Target 5 stipulates: "By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced".

[2] Pesche (2013), undertaking a bibliometric analysis of the scientific literature with the Scopus search engine, finds a significant acceleration since 2005 of the use of the term "market-based instrument" in scientific articles dealing with environmental policies. While 30 articles citing MBI were published in 2006, approximately 100 were published in 2011. Similarly, while the term "economic incentive" was used in 155 scientific articles about environmental policies published in 2005, this term was used within 400 articles published in 2010.

[3] In this article we mention ecosystem services but also include biodiversity. These concepts are closely related and our analysis intends to cover both as far as policy instruments are concerned.

[4] Jeanneaux et al., 2012 use the Web of Science search engine and find, that up to 2009, 2 751 published scientific articles include either the term 'environmental service', 'ecological service' or 'ecosystem service'. Interestingly, the authors observe a significant acceleration after 2006. While 200 articles citing the terms were published in 2005, after 2008 more than 500 articles on annual average cited these terms.

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scope of applicability of MBIs remains debated (Muradian et al., 2010), and their differences with other types of policy instruments are not obvious in all cases. The use of the term 'markets' is promoted by a number of initiatives, e.g. the prominent project 'The Economics of Ecosystem & Biodiversity' (TEEB, 2009); yet it actually faces contrasted understandings. The term commonly suggests that the role of law – associated with regulations – disappears in the process, and tends to reinforce the statement by Ruhl et al. (2007): 'the component that is least developed in the literature on ecosystem services is the law' (p. xviii).

The debate on the use of these instruments is lively and important. For instance, Europe is very strong in its support for these instruments as is reflected in key documents: the EU Biodiversity Strategy to 2020 states that '[Europe] will promote the development and use of innovative financing mechanisms, including market-based instruments' (EC, 2011, p. 9). Yet, contrasting positions are to be found in other parts of the world, where 'there remains much doubt, particularly in the Southern Hemisphere, about the ultimate desirability of markets' (Wunder and Vargas, 2005, p. 1). By way of illustration, negotiations on climate change in the framework of the UNFCCC (Climate Convention) have experienced great resistance from a group of countries led by Bolivia; this group fiercely opposed any reference to carbon markets for the implementation of the REDD+[5] mechanism.

As discussed by Pirard (2012), the range of MBIs presented as such in the literature is very broad and includes a diverse array of policies. Just to name a few, this previous research describes fiscal policies with taxation or subsidies (e.g. carbon taxes or Agri-environmental Measures (AEM) within the Common Agricultural Policy), Payments for Environmental Services more or less related to the classical definition by Wunder (2005)·[6] and including prominent schemes such as the Costa Rican *Pago por servicios ambientales* (Sanchez-Azofeifa et al., 2007), certification schemes referred to as non-state market-driven governance systems by Cashore et al. (2004), or tradable rights or permits such as cap-and-trade systems for greenhouse gas emissions or Individual Transfer Quotas for fisheries.

With all these elements in mind, we argue that a clarification exercise is critical for several reasons. Firstly, theoretical confusion has led to lengthy discussions in international arenas resulting in delayed implementation of policies (Lapeyre and Pirard, 2013). As stated at the dialogue seminar on 'Scaling up Biodiversity Finance' organized by the Secretariat of the CBD in Quito in 2012, 'the issue of innovative financial mechanisms for biodiversity proved more difficult [at CoP10 in Nagoya] and was dropped, allowing agreement on the other issues (…)' (Farooqui and Schultz, 2012, p. 6). At the Rio+20 Conference, Presidents Evo Morales of Bolivia, Rafael Correa of Ecuador, and Jose Mujica of Uruguay denounced the 'new colonialism' of nature commodification through market mechanisms.[7] This eventually leads for instance to opposition by ALBA countries[8] to the development of payments for environmental services (PES) commonly presented as novel and efficient instruments relying on markets. This is counterproductive and ironic, as most PES experiments have little to do with markets. Hence, 'the terminology might be important for the further development of [lessons learnt on scaling-up finance for biodiversity]. Likewise, many felt the expression 'markets for biodiversity' should be avoided as this general concept includes a broad range of schemes […] and that in any discussion of markets, it is important to be clear about what kind of market is being discussed' (Farooqui and Schultz, 2012, p. 3). Our research also aims at reducing the side effects of such market rhetoric.

Secondly, dialogue and communication are at the basis of well-informed and appropriate policies. It is thus ineffective and even potentially damaging to lack agreed definitions and understanding as far as policy making is concerned. As stated by Landell-Mills and Porras (2002), 'policy-makers' enthusiasm for market development [for ecosystem services] is not matched by practical understanding' (p. i). The unsettled rhetoric of markets could probably divert funds from efficient traditional programs towards so-called novel market approaches, not necessarily preferable. Maintaining a certain level of illusion regarding the content, nature and scope of MBIs will do no good in the longer term to environmental management. And it might also generate backlash effects when many come to realize that in fact the rolling-back of the State with MBIs is largely a myth.

Thirdly, we assume that this confusion is not only the result of an excitement around new instruments, but also quite a conscious movement in favour of some approaches that lost popularity. Mostly, it refers to these policy instruments that heavily involve State interventions, and taxes and subsidies are a perfect illustration. Promoting these with new names might enable their enhanced implementation: the PES programme in Costa Rica, which is the emblematic example of the development of new market approaches to conservation, has been named a subsidy in disguise recently by Fletcher and Breitling (2012): 'While the program […] is commonly considered a paradigmatically neoliberal 'market-based' conservation mechanism, its actual operation to date has deviated substantially from this description' (p. 402). Yet, can such attempts to promote public policies with misleading terms and concepts globally improve policy making and the comparative evaluation of public policies that should prevail for optimal long term results?

For all these reasons, this article aims (a) at classifying market-based instruments, as described in the scientific literature, into several homogeneous categories based on the economic characteristics of these policy instruments; and further (b) at reporting how these scientific articles evaluate and describe MBIs. These steps are intended to answer the research question: "How are MBIs for ecosystem services defined, reflected and assessed in the scientific literature?".

The article is structured as follows. In the method section, we acknowledge previous attempts to define MBIs, propose a clarification of their scope and nature with the presentation of a recently published typology, and detail the process to gather a representative sample of the scientific literature in this field with 106 references (Section 2). Thereafter we undertake an analysis of this corpus in light of the typology in order to explore the diversity of MBIs, their economic features, their proposed justifications and the evaluation criteria and methodologies applied in the literature (Section 3). In the conclusive section, we discuss the multi-dimensional nature of these policy instruments and provide recommendations to move the research agenda forward and make it as relevant as possible to policy-makers (Section 4).

[5] REDD+ stands for Reducing Emissions from Deforestation and Degradation, and the role of Sustainable Management of Forests and Enhancement of Forest carbon stocks in Developing Countries. This mechanism is supposed to financially support the fight against deforestation in developing countries. The debate on the scope of "market-based instruments" as mentioned in Decision 2/CP.17 for the climate COP17 in Durban in 2011 is all but obvious (Pirard et al., 2012)

[6] According to Wunder (2005), payments for environmental services can be defined as a voluntary transaction where a well-defined environmental service (ES) is being 'bought' by a (minimum one) ES buyer from a (minimum one) ES provider if and only if the ES provider secures ES provision.

[7] Proposal of the Plurinational State of Bolivia for the United Nations Conference on Sustainable Development (Rio+20): 'The Rights of Nature'.

[8] The Bolivarian Alliance for the Peoples of Our America, bringing together the countries of Latin America and the Caribbean led by socialist governments.

## 2. Methods: sampling the scientific literature and framing its analysis

### 2.1. Characterization and categorization of market instruments: previous attempts

It is not clear whether and how the terms 'economic instruments', 'market-based mechanisms', 'incentive-based instruments', 'environmental markets' and others overlap substantially. For the sake of clarity and usefulness, we contend that markets should be referred to for specific reasons rather than being just a substitute term for 'monetary' or 'economic'. Yet this is rarely verified in practice. By way of illustration, the eftec and IEEP (2010) report reviews the concepts and theoretical background and defines MBIs… before reminding us that the Rio Declaration on Environment and Development (UNCED, 1992) promoted the use of economic instruments. All in all, the only common characteristic for all these 'MBIs' seems to be the fact that nature is 'priced' to different degrees and in different ways that clearly go beyond the application of economic valuations in order to set a price or the exchange of environmental commodities.

Against this background, several attempts have been undertaken to characterize and to classify economic policy instruments as well as to differentiate them from other types of policy instruments that address environmental issues. Empirically, Emerton et al. (2006) define a spectrum that spans from non-market instruments on the one side – characterized by voluntary donations, NGO grants, government and donor budgets – to market-based mechanisms such as tourism charges, leases and concessions, carbon offsets, payments for environmental services, and resource-use fees (including bioprospecting). In between, the authors identify environmental funds as well as fiscal instruments that altogether display an intermediary level of market mobilization. Gutman and Davidson (2007) also empirically categorize 60 concrete, existing or potential, financial mechanisms (FM) into (1) traditional FM, (2) Innovative FM to increase government driven financing and (3) Innovative FM to increase businesses and market based financing. More recently and with a focus on economic instruments only, Mattheiß et al. (2009) make a distinction between taxes and charges (tariffs, environmental tax, environmental charge), subsidies (on products, on practices), markets for environmental goods (tradable permits for pollution, tradable permits for abstraction, compensation mechanisms), and voluntary agreements. Vatn et al. (2011) address specific and concrete schemes as payments for environmental services (PES), cap-and-trade systems, Conservation Trust Funds, the Clean Development Mechanism, ecological transfers or even the Tobin tax.

At the analytical level, Gustafsson (1998) classifies incentive mechanisms (as opposed to administrative mechanisms) into price mechanisms on the one hand and quantity, or market, mechanisms on the other, while Jack et al. (2008) differentiate between charges, tradable permits, market friction reductions, and subsidies. Going further, Coggan et al. (2009) define a three pillar typology of market-based instruments where (1) price-based instruments set or modify prices to reflect ecosystem services, (2) quantity-based instruments set binding targets to achieve or maintain ecosystem services, and (3) market friction instruments remove obstacles to the creation and expansion of markets for ecosystem services. Ring and Schröter-Schlaack (2011) and OECD (2013) oppose to regulatory approaches economic instruments on the one side as well as information-based and voluntary instruments on the other.

### 2.2. A new typology to frame the analysis

While we recognize the usefulness of such past exercises to categorise and analytically characterize environmental policy instruments, these typologies, we contend, tend to mostly build on inductive reasoning. They first consider already existing so-called market-based instruments, and their practical implementation, on which they base their categories. In contrast, we frame our analysis in this article on a previously published typology that follows a deductive reasoning instead (Pirard, 2012).

It explicitly starts from the intrinsic characteristics of instruments, the nature of their relations to markets, and the nature of the market' that is considered with the instrument (alternatively classified as competitive market, transaction, exchange, payment, etc.). Therefore the categories have generic names that avoid reference to the names of existing instruments such as mitigation banking, certification or payments for environmental services. For this reason, the typology is obviously not as detailed as a list of specific instruments would be. It is presented in Table 1, and readers are encouraged to refer to the initial article where details and theoretical explanations are provided. It is used as a lens through which we can understand important differences within such a heterogeneous and diverse group as are MBIs, and classify these in order to identify the pattern and most represented instruments labelled as market-based.

### 2.3. A representative sample of the scientific literature on market instruments

In a second step we constitute an extensive corpus of representative scientific articles presenting and analysing MBIs as a means to maintain environmental services and/or conserve biodiversity, which will be analysed in light of the selected typology. To this aim, we use the authoritative 'Web of Science' website and its 'Social Sciences Citation Index'.

Two searches were made on 28 March 2012:

i) all references that included 'market-based' AND ('biodiversity' OR 'ecosystem services' OR 'environmental services') in the 'topic' field. Practically this means these words were either in the title, abstract, author keywords or Keywords Plus®; the latter category refers to index terms created by Thomson Reuters from significant, frequently occurring words in the text of an article's cited references.
ii) all references that included 'market' in their title AND ('biodiversity' OR 'ecosystem services' OR 'environmental services') in the 'topic' field (see above for details).

We ended with a database of 146 peer-reviewed scientific articles after excluding several book reviews and articles we could not access. Out of this we identified 40 references that do not actually deal with the issue addressed in the present article, and that were therefore classified as irrelevant. In total, 106 references were thus included in our analysis.

At this stage, we need to emphasize the representativeness, as opposed to exhaustiveness, of this sample on which is based our analysis. While WoS has its own biases due to its incomplete corpus of journals, it is not assumed to provide any specific pro or con views on MBIs. Furthermore, it provides a focus on peer-reviewed scientific literature and excludes grey literature references, which allows us to base the analysis on a strictly scientifically-validated corpus.

For the analysis of such a corpus, we focused our attention on the most salient points that characterize each article: the method, the type of MBI discussed, the alleged rationale for such an instrument, the evaluation criteria on which the assessment is made (e.g. efficiency or equity), and the positive or negative conclusions of the assessment.

**Table 1**
Market-based instruments for ecosystem services: a theory-based typology (based on Pirard, 2012).

| Category | Exclusive characteristics | Specificities | Relation to markets |
|---|---|---|---|
| **Direct markets** | A market where an environmental product can be directly traded between producers and consumers (or processors) | Can be framed at the international level with specific rules for each country and a great variety of deals (genetic resources), or as a more classical market with more or less processed products (NTFP) | Proximity to the market definition depends on cases and the degree of commodification |
| **Tradable permits** | An ad-hoc market where users of an environmental resource need to purchase "permits" that can be further exchanged among resource users, thereby creating artificial scarcity | Designed to either serve a clear environmental objective (with bio-physical indicators) or based on acceptable social costs (market price for carbon) | Creation of a specific market for a given environmental objective, information are expected to be revealed |
| **Reverse auctions** | A mechanism whereby candidates to service provision set the level of payment (if accepted) in response to a call by public authorities to remunerate landholders | Aimed at revealing prices and avoiding free-riding and rent seeking | Creates an auction-based market that favors competition among bidders for achieving cost-efficiency |
| **Coasean-type agreements** | Ideally spontaneous transactions (free of public intervention) for an exchange of rights in response to a common interest of the beneficiary and the provider | Requires clear allocation of property rights, highly site-specific and difficult to replicate on a large-scale | Usually not following market rules, more of a contractual nature |
| **Regulatory price changes** | Consists in regulatory measures that lead to higher or lower relative prices | Part of a fiscal policy (including subsidies) with environmental objectives and complete control by public authorities | Based on an existing market |
| **Voluntary price signals** | Consists in schemes whereby producers send a signal to consumers that environmental impacts are positive (in relative terms) and consequently gain a premium on the market price | Still limited as an incentive for action due to relatively low willingness to pay by consumers | Uses existing markets to identify and promote virtuous activities |

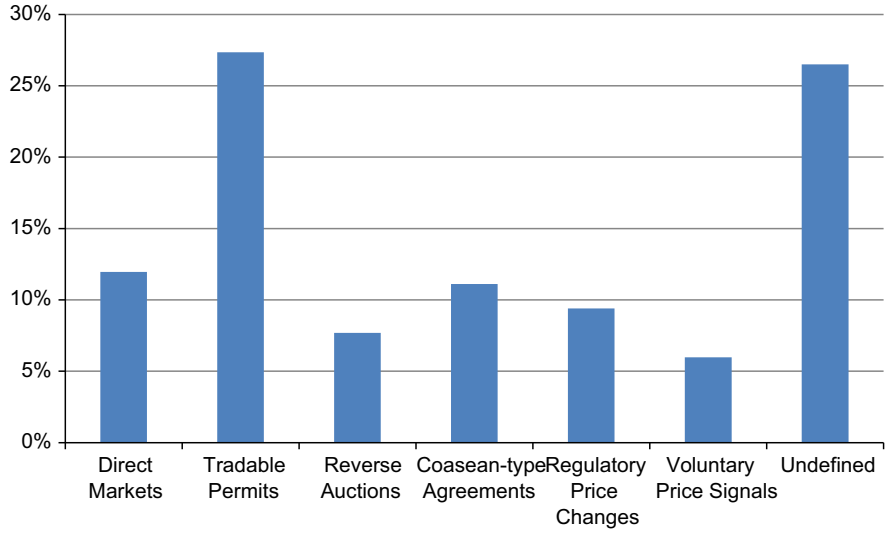


**Fig. 1.** Distribution of instruments discussed in the literature, based on the typology.

## 3. Results

### 3.1. How is the typology reflected in the scientific literature review?

Based on our analysis of the scientific literature and with a focus on the main characteristics of MBIs as presented in each reviewed article, we first located each instrument in one of the categories (Fig. 1) of the typology (Table 1).

In the first place we need to mention that one quarter of scientific articles only mention 'market-based instruments' and 'incentive mechanisms' without any further definition and thus could not be related to any of our categories.

Direct markets represent 12% of all MBIs addressed in the corpus. The literature shows that biodiversity and ecosystem provisioning and cultural services, including agricultural production, venison and recreation, are directly sold on markets. In this context, by valuing ecosystem goods and services and contributing to local livelihoods, markets can provide economic incentives to sustainably manage resources and ecosystems, whether those that are traded (e.g. rubber) or those that are associated with the

traded product (e.g. natural forest and its biodiversity with jungle rubber). Testing this hypothesis in the context of Mediterranean cork forests, Ahlheim and Frör (2011) show for instance that the willingness from wine consumers to specifically buy bottles closed with cork stoppers could help preserve depleted cork forests as their sustainable cultivation would become profitable for southern European farmers. Similarly, Kirkby et al. (2010) demonstrate that ecotourism activities in the Peruvian Amazon can have higher financial returns than currently practiced alternatives – including unsustainable logging, ranching, and agriculture – and thus can help preserve the Amazon forest. Very recently, Biggs et al. (2013) have thus called for the removal of the Convention on the International Trade of Endangered Species ban on the trade of rhino horn. According to the authors, 'a legal trade could simultaneously supply horns, fund rhino protection and provide an incentive for their sustainable use and long-term survival' (p. 1038).

Tradable permits represent 27% of reviewed instruments. In the well-represented field of carbon sequestration and mitigation, articles are mostly devoted to either the Clean Development Mechanism or REDD+, which are both more or less related to the cap-and-trade system negotiated at the international level for reducing greenhouse gas emissions. The other well-represented field is mitigation banking and its various applications and derivatives (biodiversity banking, species banking, habitat banking, wetland banking) where a regulatory rule and/or cap is set on ecosystem or biodiversity degradation with economic actors compelled to compensate. Notably, the U.S. Clean Water Act has fostered the emergence of mitigation markets and the associated exchange of tradable permits. Hence, Robertson (2006, 2009) and Robertson and Hayden (2008) show that entrepreneurial wetland banking has particularly thrived and is now increasingly perceived as an efficient approach to reach biodiversity targets; this latter view was however more recently challenged in the case of species banking (Pawliczek and Sullivan, 2011).

Reverse auctions represent 8% of MBIs in the scientific literature, and are particularly studied in Australia. The BushTender and EcoTender programs have attracted a lot of interest (Salzman, 2005; Eigenraam et al., 2007). In the State of Victoria, Lowell et al. (2007) present a process whereby landowners identify areas on which they are willing to establish forest plantations, and then bid (tender) the amount of money they request from the government. Based on scientific and economic models that estimate the quantity of ecosystem services provided for one monetary unit, the State government thereafter chooses the successful bidders. According to most authors, auctions thus enable the revelation of farmers' opportunity costs and better allocation of public resources.

Coasean-type agreements represent 11% of reviewed instruments. Referring to negotiation processes between stakeholders to reach a deal, articles include mostly payments for upland, watershed and forest services, as well as conservation easements. Empirically, Corbera et al. (2007) give evidence from Meso-America that payments directly negotiated and paid act as a significant incentive for local farmers' participation and hereby for forest and biodiversity conservation. Quite paradoxically, theory-oriented articles (e.g. Abildtrup et al., 2012) push in the opposite direction and tend to downplay the applicability of the Coase argument on the ground with real negotiation conditions.

Regulatory price changes make 9% of all MBIs in the corpus. Most articles in this category remain theoretical and modelling/scenario-making exercises. They test either the potential impacts of subsidies to eco-friendly capital and agro-environmental subsidies, or Pigouvian and land taxes. Seidl et al. (2003) for example describe federal subsidies in Switzerland that support farmers and argue that ecologically sound practices in agriculture highly depend on subsidies. Interestingly, other articles discuss State-funded programs of so called 'payments for environmental services' (theoretically normally in the previous 'Coasean-type agreements' category) which are actually best characterized as subsidies for forest conservation. On the contrary, we find very few articles dealing with the critical issue of agri-environmental measures (AEM) as implemented in Europe under the Common Agricultural Policy (CAP) and in the USA. Far from proving that taxes and subsidies are not an important part of the scientific literature and environmental policy (see for example Feng et al., 2005, for an analysis of the US Conservation Reserve Programme (CRP)[9]), the scarcity of such empirical case studies might rather inform us that these instruments are usually not viewed as MBIs by scientists.

Finally, voluntary price signals represent 6% of reviewed MBIs. Articles analyse price premiums for positive externalities or reduced negative externalities. They address eco-labelling in organic farming and in the coffee industry (e.g. shade-grown) for most of them. Perfecto et al. (2005) assess the ability of shade coffee certification programs in Mexico to link environmental and economic goals for the sake of feasibility and effectiveness of the scheme.

### 3.2. The raison d'être of MBIs and their impacts

In a second stage, we attempt to uncover the main justifications for MBIs that are proposed in the literature, as well as synthetize the knowledge on the impacts of their implementation.

#### 3.2.1. Three justifications for MBIs

Three main arguments are most frequently proposed in the literature in order to allege the superiority of MBIs as compared with alternative instruments for biodiversity conservation, e.g. coercive and prescriptive laws: (1) the provision of incentives, (2) better resource allocation and efficiency, and (3) their capacity to fill the gap between existing and sought biodiversity funding levels.

Firstly, 55% of reviewed articles mention the provision of economic incentives as a driving force in the development of MBIs (Ferraro et al., 2005; Jack et al., 2008). Incentives are economic signals sent to agents who would voluntarily adapt their individual profit-making strategies towards socially optimal equilibrium. Decisions are not imposed through coercive measures (e.g. command-and-control) so that the flexibility of incentives theoretically allows for better and faster adaptation to changing economic circumstances. Besides, incentives are sometimes believed to be more effective in reducing the rate of non-compliance by agents, especially in contexts with poor law enforcement. In other words, MBIs purportedly focus on achieving results through the self-interest of private entities.

Secondly, 28% of academic papers in the literature argue that MBIs help achieving a better allocation of resources (Rolfe and Windle, 2011; Reeson et al., 2011). Indeed, MBIs purportedly allow buyers of ecosystem services to more efficiently find and choose providers with the greatest and most cost-effective contribution. Moreover, the market approach is temporally and spatially more flexible and allows biodiversity projects to periodically adapt and change their geographical location based on locally changing ecosystem services' values and opportunity costs to produce services (this point is clearly made by Wissel and Wätzold (2010) for habitat banking).

[9] Important is to note that this article, among many others dealing with the US CRP, did not appear as a result in the WoS search, certainly because 'market' and 'market-based' were not included as keywords and title by the authors themselves.

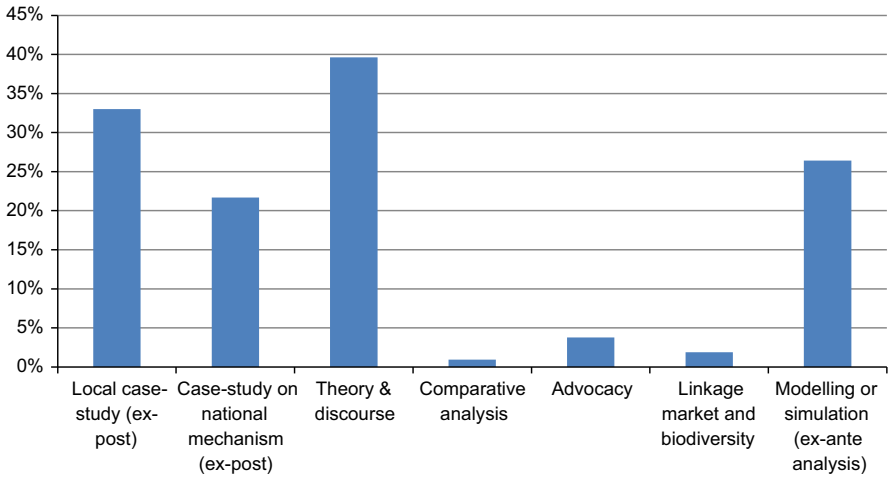


**Fig. 2.** Distribution of methodologies used in the literature to analyse MBIs.

Third, 13% of reviewed articles designate MBIs (mostly bioprospecting or carbon finance) as an innovative approach to fill the existing funding gap for biodiversity conservation (Walsh, 1999; Ebeling and Yasue, 2008). This gap between the cost of achieving the biodiversity conservation targets and the available funding has long been identified, although the quantitative figures remain debated (Pirard, 2012, p. 62; Lapeyre et al., 2012). It was for example estimated that implementing policies to reach the Aichi targets in developing countries would require between 74 and 191 billion dollars worldwide,[10] which is a much higher number than available funding so far. The European Council also cited the low levels of ODA funding when promoting MBIs in the EU Biodiversity Strategy to 2020.

Interestingly, 25% of reviewed articles do not specifically mention and analyse the economic rationale that underlies the rapid emergence of MBIs as a better alternative to regulatory instruments for biodiversity and ecosystem services. In these cases, the superiority of MBIs is merely assumed and their promotion as a policy instrument is possibly driven by ideology rather than scientific evidence.

### 3.2.2. *Diversity in terms, methods and evaluation criteria*

Our systematic literature review reveals that academic research on MBIs is very heterogeneous and diverse and therefore lacks a uniting framework that would allow researchers and policy-makers to draw robust lessons from a common set of methods and associated results.

Firstly, scientists consider MBIs through a broad range of lenses and analytical methods (Fig. 2). A majority of articles (nearly 40%) are theoretical discourses that expose ideology-driven arguments, favourable or critical, about existing MBIs in general. Scientific evidence and empirical data are not truly at the centre of the analysis. In an additional 4% of reviewed articles, MBIs are even only advocated and promoted without any sort of analysis and caution. Besides, 26% of reviewed papers are ex-ante modelling/scenario-making exercises that aim at predicting general economic impacts on prices, market-entry, welfare and environmental results of the implementation of a range of instruments, by using theoretical models and simulation (and occasionally testing these models against empirical data).

On the other side of the spectrum, 33% of the reviewed literature is composed of case studies that provide an ex-post analysis of the impacts. These case studies typically address a local experiment, supervised by a NGO, an international donor or local authorities. Most of these articles use empirical data collected at household and community levels, and provide assessments of these experiments. In addition, 22% of reviewed articles discuss a specific instrument at the sub-national or national levels. In these instances, the instrument tends to be analysed in an institutional/governance perspective, or with the comparison of several sites.

Diversity in the research agenda is even more striking when one analyses the terminology and wording used in the literature. While we attempted to categorise most of the instruments presented in the literature into six categories as presented in the typology, the variety of terms and their lack of precision emerged as a challenge. On the one hand, as said earlier, about 25% of reviewed articles remain general about the instruments that are analysed and mention these broadly as 'economic incentives', 'market-based instruments' or 'innovative incentive mechanisms'. On the other, the variety of terms for each category is spectacular. Indeed we found around 50 different names to designate market-based instruments, with many of them applied to a single instrument. In an attempt to clarify and organize this diversity, only 10% of articles propose some sort of typology, yet with different scopes, varied rigour and associated justification, and most of the time in an extremely simple way (e.g. MBIs versus government regulations and 'persuasive strategies').

In line with such a great variety in terminology, wording, definitions and methods of analysis, our literature review also shows a vast range of criteria that serve as a basis for impact assessment of MBIs (Fig. 3). While more than half of the articles (51%) assess MBIs' environmental effectiveness (i.e. has the environment eventually benefited from their implementation) and about one third do focus on efficiency (or cost-effectiveness, i.e. assessing impacts against the costs of implementation), many other criteria are applied: equity (13%), feasibility (11%), potential for poverty alleviation (10%), adoption and participation (9%), contribution to development (3%), legitimacy (3%), food security (2%), freedom of choice (2%), governance (1%), etc.[11]

From a methodological point of view, the assessment of MBIs' impacts against such criteria however fails to build on clear indicators. While environmental effectiveness lies for instance at the core of half of articles in our corpus, more than one third of these (36%) remain theoretical and discursive and do not propose measurable indicators as proxies for the provision of environmental services on the ground. Besides, many of the articles presenting

[10] Document UNEP/CDB/COP11/15/Rev.2 2012.

[11] These various terms were chosen as 'umbrella' criteria in order to reflect various indicators and evaluation criteria found in the articles.

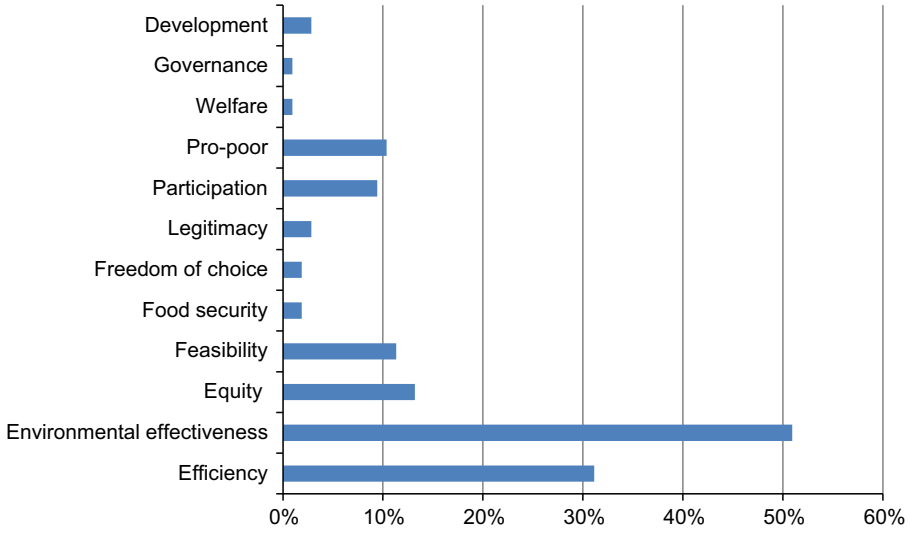


**Fig. 3.** Evaluation criteria used in the literature (among others).

empirical case studies at the local and national levels also actually lack any precise measurable indicator for testing in a robust way the environmental impacts of programs under scrutiny. In most cases research methodologies use the area reserved for conservation or restoration (Robertson and Hayden, 2008; Lourival et al., 2008), the number of animals or trees surviving (MacMillan and Phillip, 2010; Bennett et al., 2011), the amount of carbon sequestered (Kirkby et al., 2010) or the rate of land use change (Van Hecken and Bastiaensen, 2010), as proxies for environmental effectiveness. Only few articles elaborate methodologies (whether local case study ex-post or modelling and simulating ex-ante) with more complex indicators such as species richness (Perfecto et al., 2005), Biodiversity Index (Ebeling and Yasue, 2008), Trophic Level Index (to assess water quality increase, see Abell et al., 2011), Normalized Difference Vegetation Index (to evaluate forest and canopy density, see Lybbert et al., 2011) or grassland condition score (Gordon et al., 2011). Additionality of the environmental assessments is never tested specifically in our corpus.

Similarly, almost two-thirds of articles discussing MBIs' contribution to poverty alleviation (64%) actually assess their pro-poor potential only based on theory and discourse. Indeed most authors build on the Sustainable Livelihoods theoretical approach to analyse potential increase or decrease in the households' five types of assets (financial, physical, human, social and natural). Few unbiased and measurable indicators are actually proposed and tested empirically, with the exception of Lybbert et al. (2002, 2011) who statistically analyse the contribution of the argan oil value chain to poor households' consumption, physical capital (goats) as well as human capital (number of children per family going to school) based on household level panel data.

Heterogeneous methodologies, diverse criteria for assessments with very few clear indicators, and an ill-defined set of terms for the instruments altogether prevent researchers and practitioners to easily compare MBIs in terms of design, costs and benefits. Strikingly enough we could not find any clear evidence of a positive or negative trend for MBIs' impacts. The articles presenting positive, negative, and mixed results were in almost similar proportions in our review of 106 scientific references.

## 4. Discussion and conclusive remarks

The deconstruction of the term MBI, as undertaken in this article, is justified as an important research objective in several ways: mitigating ideological influences in favour or against policy instruments commonly labelled market-based but having little to do with widespread conceptions of markets; informing policy-making especially on transnational issues, which trigger passionate debates in international forums, by enabling enhanced comparative studies between equivalent types of policy instruments; and tackling the tendency to present the old recipes as *nouvelle cuisine* because such attempts are unlikely to improve the effectiveness and acceptability of policy making in the longer term.

The heterogeneity of MBIs has triggered previous attempts to elaborate typologies based on various criteria, but it proves challenging to have truly mutually-exclusive categories that encompass the entire range of complex instruments. Most policy instruments are multi-dimensional as public policies seem to combine rather than choose between different approaches. Any given instrument may possess many characteristics that simultaneously relate to regulation, free market exchanges, negotiations, distribution of monetary rewards, etc. For instance (i) mitigation banking ('tradable permits' category) provides a regulatory framework for exchanging biodiversity offsets, (ii) these biodiversity offsets can be produced through contracts with land owners ('coasean-type agreements' category), and (iii) the selection of the service providers can rely on reverse auctions for the sake of cost-effectiveness.

Our analysis, based on a corpus of 106 relevant references from peer-reviewed journals, documents the lack of consensus regarding the positive and negative outcomes of these instruments. Even more confusing and important to notice, the diversity of research methods in all reviewed articles makes any comparison challenging, if not irrelevant. From empirical case studies to modelling, from ex-post assessments of national schemes to ex-ante theoretical analyses, how can one draw general lessons from the literature? Furthermore, the ideological stances in both directions tend to affect the credibility of many of these scientific articles. Our review found extremely few comparative studies in the literature; this then calls for further robust research and harmonization of research methods applied which would help to compare MBIs against each other based on a common research agenda.

We would for instance welcome that more comparative research is undertaken in order to provide more robust conclusions and associated recommendations to policy-makers. One way to achieve this goal is to promote the use among researchers of agreed terms referring to similar objects: 'payments for ecosystem services' as a broad and vague category would for example be substituted by either 'direct negotiated payments'

(Coasean agreement category) or 'subsidy programs' (regulatory price changes category) depending on the genuine characteristics of the policy instruments being assessed. Another way to generate less disputed research results would be to replicate assessments in many sites using the same methods such as household surveys, lab and field experiments or randomized control trials.

In addition to these propositions, there might be several crucial distinctions to make between instruments for the sake of understanding their impacts, positive prospects and risks. We suggest the following broad distinctions: (i) funding mechanisms that aim at generating new sources of finance (e.g. carbon markets, water funds, biodiversity offsets), (ii) incentive mechanisms that aim at orienting agents towards environmentally-friendly behaviours (e.g. subsidies, certification), and (iii) allocation mechanisms that aim at ensuring the cost-effectiveness of measures (e.g. reverse auctions). Due to their contrasted objectives, and also due to the different agents they target, there is no reason to either generalize their impacts (which is a tendency among those who either promote or criticize MBIs in general) or use the same methods for assessing their specific impacts. Yet having unified research methods within each category specifically should be a matter of careful consideration.

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