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Main findings

1 The first section of this publication has looked at the challenges of assessing ecological services from the perspective of water management in France. The new requirements laid down by the Water Framework Directive (WFD) can be interpreted as calling for a transition from "small-scale" to "large-scale" water cycle management. By "small-scale" cycle management, we mean an environmental policy primarily concerned with the availability and quality of raw water. "Large-scale" cycle management focuses more on safeguarding and restoring the good ecological quality of aquatic environments.

Shifting our attention from the small- to the large-scale cycle implies making three complementary changes to the way water is managed:

- the management focus becomes living environments rather than just the water resource;
- prevention and restoration techniques need to be implemented with the development of ecological engineering;
- and lastly, political governance of the water industry needs to involve public stakeholders more closely.

We have identified the main problems created by changing the management focus to the "large-scale" cycle and gone into them in detail. We have shown that, in terms of using ecological services, progressing to the large-scale cycle calls for greater consideration to be made of non-market values associated with environments – and even of their existence values. Lastly, we have looked at the implications of changing over to the large-scale cycle for governing the water policy. The assessment of ecological services must play a double role of providing technical assistance for water stakeholders in their operational management and of prompting debate on the ecological and socioeconomic relevance of political options aimed at protecting aquatic environments.

This general diagnosis has then been put into specific perspective through two examples: implementation of the National Biodiversity Strategy (SNB) and background of the Water Management and Development Master Plans (SDAGEs), paying particular attention to the most recent SDAGEs as they are supposed to organise France's efforts to conform with the WFD requirements.

The first stage of the SNB (2004-2010) certainly incorporated the notion of ecological service, but has had little impact on the protection of biodiversity to date for two main reasons: highly centralised management that did not facilitate practical assimilation of its challenges by the stakeholders in the field and no public policy with appropriate means for protecting biodiversity. The SNB was designed from the outset as a support tool for giving direction to existing public policies without its own funding – which explains the very varied success depending on case. The recent revision of the SNB (2011-2020) shows that it is a key tool for getting all stakeholders involved. It steps up their mobilisation by calling for them to make a personal, significant, additional, measurable and revisable commitment to six strategic challenges. As a result, biodiversity and ecological services are now defining issues for national policy. At international level, this acknowledgement by the public and politicians of the consequences of biodiversity erosion and its ecological services has brought about the setup of an Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), established by the United Nations along the same lines as the Intergovernmental Panel on Climate Change (IPCC). This platform should be tasked with four missions: periodic knowledge assessments, support with formulating and implementing policies, generating knowledge and strengthening capacity in Southern countries. We can expect this to be a formative initiative for the implementation of stakeholders' commitments to the SNB between now and 2020.

The background of the SDAGEs shows a slow but significant assimilation of the issues at stake in protecting aquatic natural environments by local stakeholders and basin committees. Beyond the action taken by Water

Agencies, a whole host of initiatives have been developed by local and regional authorities to foster greater incorporation of environments in water management. These initiatives must be shored up in technical and political terms and this is one of the major challenges of putting the French law on water and aquatic environments (LEMA) into practice.

A certain number of conclusions have been drawn from this first section. For the stakeholders tasked with implementing the WFD, there is considerable need for assessment, both at local and national level.

Protecting environments has a price that must be weighed up as carefully as possible against the effectiveness of the measures considered for restoring the good ecological status. This price must also be distributed fairly and in an acceptable manner as regards taxpayers. The purpose of assessment is therefore to justify the relevance of socioeconomic choices made by revealing the benefits that the community will reap from improving the ecological quality of natural environments.

2 In the second section of the publication, we began by introducing the composite notion of hydrosystem to show that, from a practical point of view, defining the spatial unit whose ecological services we want to assess cannot be done through an objective approach on the part of the manager. Quite the reverse, the boundaries of this unit must be defined by taking account of the different ecological, economic and sociological dimensions of each specific project managing these services and the environments producing them.

We then stressed the need to apply a fairly restrictive meaning to the term "ecological services" – which does not exclude the use or assessment of broader notions such as "environmental services" (some of which do not depend on the biological functioning of the system) and "benefits created by ecosystems" (which include human investments in the economic valuation of these benefits). This distinction particularly sheds light on any contradictions between a policy recognising the merits of these broad notions and the development of ecological services in the strict sense of the term.

We have also pointed out how the assessment of services should not be viewed as an indicator of the good ecological functioning of environments; rather we need to see to the sustainability of such services by developing the functional analysis of these environments and summary indicators of their "good health".

Lastly, we have proposed a list and typologies of these services by highlighting that the most commonly used one – of the Millennium Ecosystem Assessment – is not the only possibility, but that the choice of which typology to use (as well as which spatial unit to consider) should be made as part of a global project.

3 The third section of the publication has focused specifically on the socioeconomic aspects of the assessment of ecological services. The notion of ecological services leads to a clearer distinction between the notions of capital, or natural "heritage", and environmental goods and services. Socioeconomic valuation therefore seeks to link the status of this capital – such as the quantity and quality of services it provides – to sociological categories concerning human "well-being" in the broad sense: benefits of utilising natural resources; health benefits; aesthetic satisfaction; preservation of the natural heritage of cultures and societies.

In socioeconomic terms, this well-being can be described as the result of comparing a supply of services from natural environments to a demand for services expressed within society:

- regarding supply, access to ecological services is rarely direct and is instead gained through diverse manmade developments. These developments combine different primary ecological services to provide users with secondary, developed, services. These services are the real subjects of socioeconomic valuations of ecological services. This characteristic of service supply precludes the attribution of an economic value to specific primary ecological services in practice – but does not prevent the assessment method from revealing what environments as a whole contribute to social well-being;

- regarding demand, we stress the importance of analysing the behaviour of individuals and society as a whole in our relations with natural environments. This is because the values attributed to environments depend considerably on social attitudes – which risk distorting perceptions or underestimating the value of some services. We warn against

taking a naive view of cost-benefit approaches applied to the management of ecological services. A significant proportion of the benefits we obtain from these services is not reflected by the way we use them, and in fact concerns what we call a collective environmental responsibility system that has been established by law and social practice and is partly independent in the strictly economic calculation field.

We end by presenting the main existing methods for the economic valuation of services – paying particular attention to their operational potential, limits and methodological difficulties for implementation.

In the space of a very few years, both academic communities and international negotiators have been convinced by the merits of the socioeconomic valuation of ecological services. Initiated by the work of the Millennium Ecosystem Assessment in 2005, the assessment of services made in the report presented to the Nagoya Conference in 2010 was a highlight of this event.

In scientific terms, however, assessment protocols and the reliability of their findings both need improving. What's more, the current assessment of services bears on what aspect of them can most easily be measured – leaving a great many important scientific questions unanswered as to how to understand and measure ecosystem functionalities. The same applies for the strictly socioeconomic aspects of assessment – since a carefully considered implementation of cost-benefit approaches applied to the value and management of natural environments still relies on fairly unstable analytical frameworks. Moreover, these frameworks are currently being overhauled with the increasing use of behavioural approaches in economic sciences – and, indeed, all the social sciences.

Specific progress in scientific investigations is therefore necessary. It goes without saying that this above all concerns those disciplines coming under human and social sciences – which are naturally in charge of the social and economic dimension of assessments – but it also concerns disciplines in the field of environmental sciences. These investigations will be multidisciplinary in nature and the assessment questions should not be addressed solely by a handful of assessment "specialists" or "experts", but also involve the whole of the scientific community of environmental researchers.



Political & operational challenges of assessing ecological services

We have focused our attentions on the conceptual and methodological aspects of service assessment, but have merely scratched the surface of the issue of how these assessments are to be used by the various water and aquatic environment management stakeholders. This question is both an important and complex one: it is relevant when drawing up policies and when programming actions (for example when writing SDAGEs, at which stage and with whom?).

Assessment also serves a purpose in discussions on the possible modification of intervention tools (pricing policies for example) and, more generally, on the directions to give to the "politico-economic model" of the water policy. It can also help to raise the public's awareness of the issues at stake in water management. This all points to the fact that an assessment of ecological services should not be handled in isolation, but included as part of a global project that has defined both the procedure and objectives of this assessment with all the stakeholders concerned.

We often hear the regrettable fact that public decision-making as a whole suffers from a lack of any real grasp of the methods for assessing its action – both upstream and downstream, retrospectively speaking. Many reports hope and pray for the emergence of reflexive approaches to public intelligence – in which the diagnosis of whether actions have succeeded or failed in the past is used to enlighten the decisions that must be made today. This will help to improve justification and efficacy of public policy.

This is where the assessment of ecological services comes in – designed as one way to usher in a culture of informed environmental action. The experiences described in the first part of the report show, for all that, that the development of expertise and evaluative practice is only a prerequisite, and isn't sufficient in itself to bring about a fully-fledged culture of assessment in public decision-making.

Indeed, two opposing criticisms are often directed at assessment by policy makers: on the one hand, it is not considered to be reliable or comprehensive enough to shore up decision-making but, on the other, it strikes as overly directive when it comes to the decisions to make and too impervious to the needs for both political compromise and a peaceful resolution of conflicts of interest that can pit together environmental users, campaigners and economic stakeholders.

Developing environmental assessment approaches thus prompts the role that experts – scientists in particular – play in political decision-making and deliberations to be considered. This is an issue far beyond the sole context of public environmental action, and although our report highlights its importance, it does not intend to propose ready solutions to this complex problem. The example of the SDAGEs is nevertheless cause for measured optimism in the subject as the local water management stakeholders have successfully adapted to the new framework laid down by the WFD and taken on the complex technical and scientific questions raised by ecological environmental management in numerous basins and sub-basins. It is this proactiveness that we should be encouraging through increased cooperation between scientists and decision-makers on the sustainable protection of aquatic environments.

The key to successfully adopting the approaches for assessing the ecological services provided by aquatic environments at local level is to harmonise these approaches, share experiences and capitalise on know-how – all processes that question the role of such national organisations as Onema and of the ministry in steering assessments. This question goes hand in hand with that of reporting for the WFD, which should, in theory, be fuelled by assessments of the socioeconomic and ecological impacts of measures taken to meet the objectives of this Directive.

In more scientific terms, one of the major advances to come out of the Nagoya Conference has been the setup of a global scientific network for observing and assessing the services provided by biodiversity – along the same lines as the approach initiated by the IPPC on the challenges of climate change. The question of harmonising and coordinating assessment approaches is therefore relevant at operational and scientific level both nationally and internationally.

In our conclusion, we would like to stress the importance of not dealing with these scientific and operational aspects separately. Many recent public debates and controversies provide abundant proof of how important it is to involve all the stakeholders, as well as the general public, as far upstream as possible in the decision-making processes guided by scientific approaches that concern complex and poorly understood phenomena.

Because of this, we haven't tried to present an exhaustive rundown of the studies available on assessment of ecological services in the water domain. Instead, we have examined the best ways to take the results, what we expect from these studies and their potential for use for the purposes of management. At a time when decision-makers and stakeholders are making high demands for assessment of environmental actions, it seemed important for us to give a few guidelines that could be viewed as a user's doctrine for assessment. Assessment of ecological services must meet both scientific and operating requirements, hence the importance of clarifying the whole issue of assessment for the purposes of both designing and conducting it and being able to put its findings usefully into practice.

