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1 4


2 **The role of expert reporting in binding together policy problem**
3 **and solution definition processes**



4 Magalie Bourblanc, Gabrielle Bouleau, and Philippe Deuffic

5 **Introduction**

6 Our objective in this chapter is to study expert reporting as a type of political work
7 that can powerfully link public problems with policy solutions. In particular, we look
8 at expert categorization as a type of binding process for policy problems and
9 solutions. Expert categories are both discursive and material arguments: they
10 represent complex discursive strategies that carry specific equipment. Our hypothesis
11 is that expert reporting and categories can play a powerful binding and cementing role
12 in problem definition and policy solutions since they display the same properties as
13 policy instruments (Lascoumes and Le Galès [2005](#)), that is, they implicitly carry
14 specific framings and perform lock-in effects.

15 In this chapter we focus on the expert category of environmental indicators.
16 The environment is a policy sector prone to scientific and political controversy, where
17 expert knowledge plays an important framing role (Jordan and Greenaway [1998](#);
18 Fischer [2000](#); Forsyth [2003](#); Miller [2004](#); Aykut and Dahan [2015](#)). Framing, here, is

1 the ordering process through which experts select and label the relevant features of
2 the situation. In this chapter, we first demonstrate that despite their relation to nature,
3 ecological indicators should not be taken for granted: they are not just neutral
4 technical categories but partly political constructions. Hence, more often than not,
5 negotiations around the elaboration of environmental indicators are politically
6 charged even though they use technical terminology and reasoning. They are seldom
7 pre-established categories but hybrid categories that indicators  promoters tweak to
8 adjust to various influences.

9 We selected three cases studies for examination, chosen because they
10 represent various degrees of competition  sometimes even controversy  in the
11 elaboration of ecological indicators. Looking at contested cases allows us to analyse
12 expert reporting in-the-making and prevents us from taking false assumptions for
13 granted. We chose contrasting case studies that could display the two types of
14 controversy distinguished by Gingras ([2014](#), pp 114–15) – that is, scientific
15 controversy, which happens in relatively confined spaces, and public controversy,
16 which mobilizes various actors, way beyond the circle of scientists (for example,
17 journalists, activists, political and economic actors and citizens). We thus successively
18 present the construction of indicators in the field of water pollution in rivers and at sea
19 and in the field of forest biodiversity.

1 We start by showing that, in order for environmental indicators to be
2 legitimated, multiple streams (administrative, policy, political, the media and so on)
3 need to be aligned around the expert category promoted. In other words, indicators
4 promoters strive to make their expert category compatible with the framing of the
5 problem but also with its adequate solution in various politico-administrative spaces
6 across government levels. We see that, in adverse contexts, when alignment across
7 streams and spaces proves to be challenging, the imposition of expert indicators may
8 occur through the rolling out of scientific programmes that feed indicators with data.
9 Once expert categories are informed with such knowledge and data, they become
10 more difficult to undo, hence binding together a specific way of seeing the problem
11 and of conceiving its policy solution. In the discussion section, we address the type of
12 framing and lock-in effects performed by expert reporting in such a cementing
13 process.

14 [Reorienting water-quality policy solutions through a discrete](#) 15 [medium: the biotic indicator in French rivers](#)

16 In the 1950s, the issue of poor housing in metropolitan France reached the top of the
17 political agenda (with Abbé Pierre calling for action in 1954) and the problem became
18 increasingly visible with the repatriation of populations from former colonies and
19 their search for housing. At that time, the Commissariat Général au Plan was in

1 charge of economic planning. As such, it provided a specific space for debate to link
2 public problems to policy solutions. It published intersectoral reports and policy
3 briefs. In one of them, the Plan's experts developed a causal argument in which they
4 linked the problem of housing to the management of water resources and the
5 management of these resources to water-quality indicators and eco-taxes. Indeed,
6 modelling the effects of a housing provision policy, which included improved
7 domestic access to tap water, the Plan's engineers and economists expressed concern
8 about a possible shortage of good-quality water by 1985 (Guillaumat et al [1962](#)).
9 They advocated an economic solution, based on a tax on the use of water, to finance
10 depollution. The definition and quantification of good-quality water were, however,
11 controversial issues. Water may be of good sanitary quality but in poor ecological
12 condition (poor environmental water quality). Some indicators can tell whether water
13 is polluted but cannot determine the cause of the pollution. Public health experts at the
14 Plan argued in favour of a health indicator: dissolved oxygen demand. This indicator
15 was an accurate surrogate for assessing the health risk due to water pollution.
16 However, it did not make it possible to locate the origin of pollution, did not
17 distinguish between authorized and illegal discharges, and did not take into account
18 the effects of pollution on fish and other animals.

19 A more environmental framing to the problem of water quality was articulated
20 by anglers who had been mobilizing since the beginning of the 20th century to

1 denounce the depletion of fish stocks caused by accidental pollution. Their
2 associations, which represented up to five million fishermen in the 1950s, demanded
3 that these accidents be recognized as criminal offences and that pollution be measured
4 in terms of its effects on the environment. Contrary to the Plan's proposals for
5 sanitary water-quality indicators, they called for regulatory policy solutions that could
6 incriminate and prosecute polluters and not just tax them. But this moral and punitive
7 approach to pollution was discarded by the Plan's experts. When General de Gaulle
8 went to meet anglers' associations at the time of full powers to negotiate their support
9 for his Fifth Republic project, they seized the opportunity to call for the control of
10 accidental pollution. They obtained a ministerial decree (ordinance) making
11 accidental pollution punishable by law. However, this political decision, taken quickly
12 in January 1959, triggered a wave of panic among industrialists and elected municipal
13 officials who were under the threat of being convicted in the event of a wastewater
14 spill. The decree itself became a problem and in February 1959 the government asked
15 the Commissariat Général au Plan to devise a more consensual alternative. A 'water
16 commission' was created, with experts in economics, urban planning, and public
17 health who became the legitimate owners of the water pollution problem. They
18 validated the predefined framing of the problem as one of public health and promoted
19 an economic policy instrument to solve it. They proposed a tax, the amount of which
20 would increase according to the pollution estimated by the experts using indicators. It
21 led to the creation, in 1964, of river-basin agencies that levy such taxes. Since then,

1 these agencies have been responsible for measuring and acting on chronic pollution
2 and assessing policy outcomes through a pollution inventory. Anglers did not choose
3 to voice their dissatisfaction in the public space. They chose a more discreet strategy:
4 the development of another indicator carrying another framing. Despite this prevailing
5 public health problem framing, the anglers' representatives worked with their
6 supervisory administration (the High Council for Fisheries), which had a seat at the
7 water commission, to develop a 'biotic' indicator complementary to the one based on
8 dissolved oxygen that was so unfavourable to their cause. They developed this
9 research around a new indicator under the radar of the Ministry of Agriculture's
10 research authorities, which were concentrated at INRA (the national institute for
11 agronomic research), then dedicated to agricultural modernization. It was thus the
12 High Council for Fisheries rather than the Ministry of Agriculture that recruited
13 ecologists for this task. They developed a biotic index. Only when the biotic index got
14 published did the angling supervisory administration voice its existence and potential
15 use for the pollution inventory. The water commission acknowledged the authority of
16 published science and agreed to include the biotic index in the list of statutory
17 indicators that state services would regularly measure in all rivers. It became public
18 data. This made a real difference in terms of pollution control and prosecution. Before
19 its elaboration, when pollution occurred, people could only notice the accumulation of
20 dead fish downstream but not trace them to the origin of the pollution. Indeed, fish
21 circulate in a wide range of habitats and the presence of a dead species does not

1 indicate the precise location of the pollution, making it difficult to identify the culprit.
2 Anglers chose to focus on the invertebrate species thriving on river gravels to remedy
3 this problem. Invertebrates allow the identification of the pollution because they are
4 very different upstream compared with downstream and their recolonization is slower
5 once a pollution incident occurs. The biotic index provided a situation of reference
6 before pollution. In case of pollution, weakened or dead invertebrates would drift
7 away from their specific habitats and comparison with the situation of reference could
8 account for the exact origin of the toxic spill. Hence, the biotic index made the
9 environmental impacts of accidental pollution traceable and *visible*. Thanks to this
10 new visibility, the water and forest administration succeeded in making this indicator
11 mandatory in the decree setting out the technical provisions of the pollution inventory
12 and thus provided anglers and water police officers with expert evidence for their
13 legal actions against polluters, alongside the incentive action of the water agencies
14 through their taxes. Before biotic information was published on a regular basis, people
15 responsible for accidental pollutions would remain somehow invisible and therefore
16 enjoy impunity. In case of litigation, environmentalists would bear the burden of
17 proving the origin of pollution with their own means. The inclusion of this biotic
18 indicator in a 1967 decree guaranteed public monitoring of aquatic microfauna.

19 In short, two conceptions of water quality have opposed anglers and the
20 Commissariat Général au Plan around different problem framings and policy

1 solutions. The water commission initially favoured a health framing of the water-
2 quality problem and a policy solution based on economic incentive, that is, an eco-tax.
3 This linkage between a problem and a solution was done through a sanitary water-
4 quality indicator whose characteristic, among others, was that it could not identify the
5 source of pollution and therefore was not conducive to a command-and-control
6 approach and policy solution. Indeed, we know that in contexts of a high level of
7 uncertainty, regulatory policy solutions prove difficult to adopt (Bourblanc and Brives
8 [2009](#)). The water commission enjoyed a situation of legitimate ownership of the
9 problem and solution and was able to impose an economic solution that tackled
10 chronic pollution and ignored accidental pollution. This monopolistic space of dispute
11 was nevertheless subject to external influences that used an alternative expert
12 indicator to promote a different policy solution and their own definition of the water-
13 quality problem.

14 Indeed, a minority expert in the committee decided not to attack the discursive
15 framing of the problem or its solution, but to use his position within the water
16 commission to complement the existing expert indicator with an additional one, the
17 biotic indicator. Almost unannounced, this indicator ended up reconfiguring policy
18 orientations and power relations on water-quality issues. First, it would now allow to
19 discriminate among potential polluters and therefore would open the range of policy
20 solutions to regulatory instruments. Second, the data produced by this indicator made

1 it possible to provide evidence in the judicial space of dispute, for the benefit of the
2 minority angling coalition.

3 [Aligning and misaligning streams through expert categories: the](#) 4 [case of green macroalgal blooms in Brittany](#)

5 The case of green algae blooms on Breton beaches is a good illustration of how
6 scientific indicators hold an unsuspected potential to help bind a problem definition
7 and a policy solution together. Since the 1970s to 1980s, some beaches in Brittany
8 have been notorious for being covered with green algae (*Ulva armoricana* species) for
9 several months of the year. At first, this had been mainly considered a local problem.
10 Indeed, the phenomenon had been mobilizing riparian and small local environmental
11 associations from the 1980s; these mainly complained about the inconvenience of the
12 unpleasant smells generated by the algae and the aesthetic disfigurement of the
13 beaches. In 2008, the sudden death of two dogs and, one year later, the death of a
14 horse followed by the near death of its rider, on the beach of St-Michel-en-Grève
15 (Brittany, France), triggered a crisis that was suddenly resonating at the national level.
16 In view of the potential new health hazards linked with macroalgal bloom
17 decomposition on beaches, the French Prime Minister with several other ministers
18 decided to pay a visit to the green algae sites and a national plan to combat coastal
19 eutrophication was launched in 2010 (*Plan de lutte contre les algues vertes*). It was

1 accompanied by the commissioning of a new expert reporting on the phenomenon to
2 help guide public action. This triggered an unprecedented scientific controversy
3 around the identification of a relevant indicator in a bid to tackle the phenomenon. A
4 large coalition of scientists, some of them perceived to be close to environmental non-
5 governmental organizations (NGOs), defended the nitrates indicator, while the
6 opposing camp, also using seemingly scientific arguments and backed by agricultural
7 interest groups, promoted the phosphorous indicator. This controversy is no surprise
8 because intensive agriculture is a major contributor to the emission of nitrates in water
9 while it shares the responsibility of phosphorous emissions with municipalities and
10 their sometimes outdated wastewater treatment plants. Hence, privileging the nitrates
11 indicator is not politically neutral; it targets the intensive agriculture sector in
12 particular, which emits a lot of nitrogen surpluses. Although the 2008 controversy
13 episode was particularly acute, such controversy was not new. Indeed, the scientific
14 expertise around the proliferation of green algae on the Breton coast has been difficult
15 to stabilize and legitimize since the 1980s. The first attempts at designating nitrates as
16 a decisive element in green macroalgal blooms² proliferation were met with
17 considerable reluctance. This did not sit well with the public agenda setting of the
18 time, which was more concerned with water pollution arising from phosphates
19 (phosphorous) in detergent products. Indeed, in Europe, environmental interest groups
20 had been lobbying for the banning of phosphates in detergent products since the
21 1980s. More precisely, environmental NGOs with scientists on board were very much

1 involved in fighting pollution in Lake Geneva, a lake on the north side of the Alps
2 shared between Switzerland and France. Eutrophication was a major issue that had
3 wiped out most of the fish populations in the lake. Environmental NGOs obtained a
4 first victory in 1986 with the banning of phosphates from detergent products in
5 Switzerland while the French government signed, in the early 1990s, an agreement
6 with the detergent industry to limit phosphates to a maximum of 20 per cent in their
7 products. NGOs also succeeded in forcing municipal authorities in France to use
8 better water treatment technology before releasing wastewater into watercourses.

9 Thus, the idea of trying to convince the public authorities to act on nitrates too
10 was not well received as it was perceived to blur the message around the fight against
11 eutrophication and to introduce complexity in the treatment of the phenomenon:
12 depending on the natural milieu ■ coastal waters or lake waters ■ ecological factors
13 provoking eutrophication might differ. In other words, the scientific indicator around
14 nitrates did not align with the political and media agenda at the time, which was
15 focused almost exclusively on the issue of phosphorous. Despite such misalignment
16 between the expert category and the problem and political streams, the nitrates
17 indicator progressively gained political support locally and a scientific consensus
18 around the nitrate thesis started stabilizing from the mid-1990s onwards. This was
19 made possible thanks to the rolling out of modelling programmes around macroalgal
20 proliferation that arguably were biased towards the nitrate thesis.

1 It also helped that in the mid-1990s, the issue still remained rather low-key,
2 and very localized. Because it was not yet featuring on the national agenda, no
3 ambitious public programmes imposing constraining policy solutions to tackle the
4 problem could be adopted. Indeed, the local scope of the issue mobilized departmental
5 and regional government levels that had no authority to impose stringent policy
6 solutions to the intensive agricultural sector. Together with water-managing actors
7 such as water boards and local water commissions, they were trying to enrol as many
8 farmers as possible in their voluntary public programmes (*Programme ProLittoral-*
9 *Bretagne Eau Pure*), which offered incentive measures. The renewed scientific
10 controversy that erupted in the aftermath of the 2008 crisis has to be understood
11 against such backdrop, that is, a problem with a newly national scope and with
12 potentially new far-reaching policy measures. When the nitrates indicator was only
13 being used among local managing circles, it seemed to be tolerated but it eventually
14 succumbed to adversity when circulating within the upper echelons in new
15 administrative and regulatory arenas.

16 This renewed scientific controversy allows us to shed light on another
17 important aspect of public action relying on scientific expertise, that is, the challenges
18 of working with expert categories that do not align with the frames emanating from all
19 three streams of the policy process (problem, policy, and politics). At first sight, the
20 nitrates indicator proposed to guide national public action, which seemed to be in a

1 better position than in the 1980s at the local level: indeed, the ecological indicator
2 proposed was well aligned with another major problem, already at the national public
3 agenda for the past 20 years, that is, nitrates pollution of drinking water. For that
4 matter, the nitrates indicator was also a well-known category for policy makers within
5 the Ministry of Agriculture ministry. Yet, it did not align at all with the political
6 stream, for which it was considered politically unacceptable because of the costs
7 incurred for major actors of the policy subsystem, that is, the majoritarian farmers
8 union.

9 Indeed, when this local coastal water issue met with the inland water pollution
10 issue around nitrates in the mid-2000s (Bourblanc [2019](#)), suddenly the stakes became
11 much higher for the representatives of intensive agriculture directly implicated as
12 policy solutions envisaged radically changed in nature. Preliminary modelling
13 exercises around the nitrates indicator have anticipated that to obtain a significant
14 decrease in macroalgal blooms' proliferation, the nitrates level would have to
15 dramatically drop to a level that only small-scale farming can meet (10 NO₃ mg/l).
16 The majoritarian farmers union was vehemently opposed to further regulation on the
17 nitrates level in watercourses, as such regulation was perceived to have potentially
18 devastating economic consequences for their production model, almost condemning
19 intensive farming in some river basins.

1 The majoritarian farmers' union intensely lobbied local and national
2 politicians, ministers, and representatives of the state at the regional level (regional
3 prefect). Refusing to admit the nitrates thesis, they started boycotting negotiation
4 meetings with public authorities until further clarity could be given on what they
5 labelled a scientific controversy around the relevant indicator to retain. To avoid
6 public action paralysis, public authorities ordered new expert reporting against the
7 advice of a large coalition of scientists claiming the existence of a scientific consensus
8 around the nitrates indicator despite the farmers' union's allegations. The new expert
9 report published in 2012 (Chevassus-au-Louis et al [2012](#)) settled the controversy by
10 reframing the scientific debate: in a bid to escape the stalemate, the latest expert
11 reporting promoted new expert categories in a bid to be able to identify alternative
12 indicators. In particular, the concept of 'control factor' replaced the concept of
13 'limiting factor', opening up the possibility of targeting elements other than nitrates,
14 depending on the local ecological context. Later on, this new expert category would
15 allow a reorientation of public policy towards more accommodating solutions for
16 intensive agriculture. Indeed, the new scientific framing enabled public authorities to
17 focus on a different policy target and solution: for more than 15 years, public policies
18 dealing with pollution from agriculture had strived to tackle the problem of the
19 pollution of water resources by reducing nitrates/nitrogen production, hence a herd's
20 size and ultimately the intensive nature of agriculture. After settling the scientific
21 controversy, public authorities and scientists started focusing on reducing nitrogen

1 leakage, in pedo-climatic conditions of particular sites that are vulnerable to the
2 pollution of water resources, instead of focusing on the intensive nature of agriculture
3 activities per se.

4 Binding without cementing: shortcomings of the dead-wood 5 indicator in French forests

6 Until the end of the 1980s, forest policies and their instruments were defined by the
7 Ministry of Agriculture and Forestry, in relation with the representatives of the forest
8 stakeholders, that is, forest owners' unions and forest industries. As the genuine and
9 unique definers of forest policies, they framed forest issues around the general idea of
10 a shortage of wood and conifers, in particular, for a growing forest sector (paper,
11 timber) after the Second World War. To bind this problem with a solution, both policy
12 makers and the representatives of forest industries established a simple causal chain:
13 the less productive broadleaf forests should be substituted with even-age and
14 monospecific conifer stands and the forestry techniques should be modernized by
15 actively developing mechanization, fertilization, genetic selection, the use of
16 pesticides, and so on. A policy to entice forest owners to plant conifers and to adopt
17 these modern silvicultural techniques was then enacted in 1947 through the National
18 Forest Funds. The national forest inventory (IFN) created a set of indicators focusing
19 on the productive dimensions of the policy only (tree species, surface, forest structure,

1 and wood volume) in order to assess the efficiency of this policy on the ground. At
2 that time, we could see an alignment of the politics, problem, and policy streams
3 around an intensive and modernist framing, which translated into a policy solution
4 incentivizing forest owners to plant as many as 2.2 million hectares' worth of conifers
5 between 1947 and 1991.

6 Forestry issues started being perceived through a different frame at the end of
7 the 1970s. Some environmental NGOs challenged the productivist orientation of the
8 French forest policy (Cauwet et al 1976; Balabanian 1980; Moriniaux 1999), in
9 particular afforestation with conifers and the use of fertilizers and chemicals, clear
10 cutting, and so on. They strived to put new issues on the public agenda, requesting
11 more consideration for ecological issues such as species and habitat conservation. In
12 this attempt, they largely relied on the emergence of the concept of 'biodiversity' in
13 1986 in the scientific community (Takacs 2001). With this biodiversity motto,
14 environmental NGOs found both a new flagship for their claims and new allies within
15 the scientific community to try to redefine forest policies in France. While the French
16 Ministry of Agriculture and professional forest organizations disregarded
17 environmental claims and carried on focusing mainly on the productive dimension of
18 forestry, this alternative network of NGOs coalesced with the Ministry of the
19 Environment to take emerging issues such as biodiversity conservation more
20 seriously. Owing to the mobilization of influential advocates such as national and

1 international environmental NGOs – the World Wide Fund (WWF), the Ligue de
2 Protection des Oiseaux (LPO) (French society for the protection of birds), and French
3 Nature Environnement (FNE) (Chartier and Ollitrault 2005; Berny 2018) – and the
4 support of Green Party politicians, the French government eventually agreed on
5 ratifying the Convention on Biological Diversity (CBD) in 1992. Around the same
6 time, a conferences cycle – the Pan-European Ministerial Conferences on the
7 Protection of Forests in Europe (MCPFE) – was initiated by the ministries in charge
8 of forestry to define a common forest strategy at a European level. On the initiative of
9 France and Finland, the first MCPFE in Strasbourg in 1990 promoted the concept of
10 ‘sustainable management of forests in Europe (Resolution H1)’ and suggested
11 improving forest monitoring by developing common tools to assess wood stocks,
12 surface, species, and so on. In the wake of the CDB, the parties of the second
13 conference (in Helsinki in 1993), in particular under the influence of the Scandinavian
14 countries, enacted a General Guideline for the Conservation of the Biodiversity
15 (Resolution H2). Hence, the ratification of the CDB and the MCPFE resolutions was a
16 strong signal in favour of biodiversity conservation and monitoring but the
17 constraining dimension of these soft laws was rather weak. In other words, if forestry
18 problem definition was gradually aligning with new political forest orientations
19 towards more sustainability, regulatory policy measures were still missing. Against
20 that backdrop, the adoption of a new set of 35 indicators including, among others,
21 biodiversity aspects during the Lisbon conference (Annex 1 of Resolution L2) in 1998

1 and confirmed in Vienna (Resolution V4) in 2003 was instrumental in realigning
2 diverse policy problem framing with more stringent policy solutions preserving such
3 biodiversity. While the national forest policy arenas were under the monopolistic
4 control of the Ministry of Agriculture and forest professionals' lobbies, the MCPFE
5 conferences were opened up to other policy ownership coalitions including the
6 Ministry of the Environment and international environmental NGOs such as WWF,
7 Greenpeace, and the International Union for Conservation of Nature (IUCN) (Barthod
8 [2012](#)). By opening up the spaces of disputes to new parties, problem definitions and
9 policy solutions could be significantly reframed. The head of French forest services in
10 the Ministry of Agriculture gradually admitted that forest issues could not be defined
11 at a national level only or with one's own socioeconomic forest stakeholders group
12 only and that they needed to be opened up more to scientific and public debates
13 (Bouleau [2016](#)). If they wanted to stay involved and continue to shape the definition
14 of policy problems and solutions, they needed to develop a more ecosystemic
15 approach and new monitoring tools. The elaboration of such new eco-friendly
16 indicators conceded by the dominant forest policy coalition was the opportunity that a
17 coalition of scientific and environmentalist actors seized to elevate deadwood as a key
18 indicator of biodiversity. This was not an easy task, but rather a *tour de force*. Indeed,
19 this coalition succeeded in transforming an old-fashioned, useless, and inadequate
20 index into a referential indicator as deadwood is presently one of the two indicators

1 out of 35 that has been selected to assess biodiversity for forests ecosystems by the
2 French national office for biodiversity.

3 The Ministry of Agriculture decided to actively contribute to the definition
4 and implementation of this new set of indicators for strategic reasons. If it wanted to
5 remain the owner of the problem and the solution definer, it was crucial to participate
6 and possibly control the elaboration of the new indicator. Moreover, its initial set of
7 indicators mainly focused on the productive dimensions of forestry and, consequently,
8 France performed poorly in benchmarking with the other 21 European countries. In
9 particular, it ranked last on deadwood, with only 1–2m³ of deadwood per hectare.
10 Considering the new political objectives towards biodiversity conservation that
11 French authorities adhered to, this ranking was seen to be very problematic in front of
12 their European counterparts. In order to improve this indicator, the Ministry of
13 Agriculture in charge of forests initiated an expert committee in 2007 under the
14 supervision of the IFN with a clear mandate: to create a new indicator that would
15 more favourably report on the actual level of deadwood in French forests. In line with
16 the proceedings of the two first symposiums specifically dedicated to deadwood in
17 North America (Laudenslayer et al 1999) and in Europe (in Umeå in Sweden in 1999)
18 [[(Jonsson and Kruys, 2001)], French scientists who participated to the expert
19 committee underlined the role of deadwood as a habitat for a large proportion of
20 forest insects and fungi (so-called ‘saproxyllic biodiversity’), a factor in soil fertility

1 due to humus production, and even a key element in restoring forest resilience
2 (Vallauri [2000](#)). But their discourses were inaudible to traditional forest policy
3 makers. For forest stakeholders as for forest policy makers, deadwood was a shelter
4 for pests and pathogens, a source of contamination, a fire starter for forest blazes, and
5 a waste that is indicative of poor and inefficient management. However, discussions at
6 the MCPFE conferences, and later in the national expert committee, significantly
7 reframed the social meaning of deadwood, not as a problem but as part of the solution
8 for both parties. By including new categories of deadwood (stumps, branches more
9 than 7.5cm, decaying wood, lying and standing dead trees, and so on) and improving
10 its monitoring, the new deadwood indicator soared from 1–2m³/ha to 23m³/ha without
11 any significant changes in forest management. Finally, it turned out to be a perfect
12 indicator of carbon stock from the point of view of timber production promoters and a
13 good surrogate for biodiversity richness for environmentalists.

14 Eventually, if a coalition of scientists, environmental NGOs, and
15 representatives of the Ministry of the Environment managed to present to the Ministry
16 of Agriculture the deadwood indicator as a key element of forest biodiversity, this can
17 only be considered as a half-victory. The mobilization of metanorms and master
18 frames such as the CDB and transnational agreements such as the MCPFEs greatly
19 contributed to their success, especially as few counter-arguments were developed at
20 the same global political level by forest authorities. Yet, an important battle was lost

1 at the technical policy level. Largely opposed to the conservation of deadwood (which
2 they consider tricky to manage), forest and landowners' unions mobilized and
3 invested in arenas where there would be better-defined practices on the ground and
4 discussed the implementation of deadwood thresholds, that is, an optimal volume of
5 deadwood to be conserved for the good functioning of the ecosystem. Thanks to an
6 intensive lobbying in the national, regional, and even local arenas where thresholds
7 were defined, private and public forest representatives finally succeeded in limiting
8 the number of deadwood trees to one or two trees per category (lying/standing)
9 without any specific volume in official recommendations, guidelines, and directives
10 about biodiversity conservation. The metric used to revise the deadwood indicator
11 therefore managed to neutralize change at the policy level, enabling the forestry sector
12 to continue its 'business as usual'. In the absence of a favourable metric, the
13 deadwood indicator could not reach its lock-in potential, and no cementing effect
14 occurred between the problem definition and the initial policy solution envisaged
15 around better biodiverse forest policy.

16 Discussion

17 To be sanctioned, actors promoting specific ecological indicators need to align their
18 expert category with categories emanating from multiple streams. In that respect, the
19 green algae blooms case study is interesting because it illustrates that an alignment
20 with the category circulating within the problem stream alone was insufficient to

1 retain policy makers' attention. Because it could not fit with framings coming from
2 the political stream, and especially because it was perceived to be not compatible with
3 potential solutions envisaged within the policy stream, the nitrates indicator was
4 vigorously challenged. As Wagemans ([2002](#), p 00) puts it, 'problems, opportunities,
5 and solutions are only relevant for policy-makers as far as they can be handled within
6 the institutional system'. A scientific controversy thus re-emerged and new expert
7 categories had to be built in order to escape the stalemate and public action paralysis.
8 This point demonstrates that despite their relation to nature, ecological indicators
9 partly represent political constructs. They are seldom pre-established categories but
10 hybrid categories that have to be adjusted according to different influences. In
11 actuality, they represent a way to divert political competition to impose specific
12 policy solutions within more discrete settings. This is the case because indicators
13 embody a specific way of seeing the world and of perceiving policy problems that
14 ultimately favour particular policy solutions.

15 As for the biotic indicator, the case study shows that power balance was
16 clearly unfavourable to the environmental framing of the problem and of its
17 command-and-control solution (penalizing offenders), yet the indicator managed to
18 overturn this power equilibrium. Indeed, the water commission first ignored the
19 environmentalist problem framing that anglers raised on the public agenda, and their
20 demand for a regulatory solution to water pollution. The way that anglers used to

1 reintroduce this problem and solution framing was to rely on expert indicators,
2 although the biotic indicator was supposed to be used to report on the outcomes of a
3 public health problem favouring taxes as policy solutions. Eventually, the biotic
4 indicator discreetly reconfigured policy orientations on water quality.

5 Two cases (the deadwood indicator and macroalgal blooms) illustrate the
6 importance of the issue of scales in the alignment process across streams. In the
7 macroalgal bloom case, the problem moved up government levels with the health
8 reframing of the issue. This up-scaling was a determining factor in the sense that it
9 changed the potential solutions that could be adopted, that is to say, solutions
10 favouring a less intensive agriculture as the preferred policy remedy to the
11 eutrophication problem. If the nitrates indicator managed to impose itself for a few
12 years within management circles at the local level, scientific controversy was now
13 reinstated with a potential health risk at stake: all the political work around expert
14 indicators (enrolment of supports, alignment of multiple streams, and so on) had to be
15 built again.

16 After having presented how analysing the alignment of multiple streams
17 across scales better predicts the fate of indicator imposition, we would now like to
18 demonstrate how expert indicators powerfully bind together policy problems and
19 policy solutions once adopted. To evoke such compelling effects, let us first mention
20 the question of visibility. The visibility aspect we refer to here relates to what Gould

1 ([1993](#)) calls a ‘secondary visibility’. ‘Primary visibility’ involves a direct relationship
2 with surrounding natural objects and systems since it reflects the ‘extent to which a
3 particular environmental problem is readily detectable through first hand observation
4 of the phenomenon’ (Gould [1993](#), p 00). An example of primary visibility would be,
5 for instance, the shift from nitrates pollution to eutrophication pollution in the case of
6 the struggle against intensive agriculture in Brittany, as unlike nitrates in fresh water,
7 green algae are directly visible and therefore can help mobilize people more easily
8 around the cause. ‘Secondary visibility’ stresses a more social and indirect visibility,
9 often mediated through knowledge mobilization. As Gould ([1993](#), p 00) states:
10 ‘Increased access to certain information makes an environmental problem more
11 socially visible, in a secondary sense, by allowing people to recognize either the
12 existence or impacts of particular environmental threats.’ However, Gould ([1993](#), p
13 00) notes that: ‘Despite the fact that social visibility of pollution does increase the
14 level of local awareness of the existence of environmental degradation, this awareness
15 does not necessarily translate into organized local political mobilization.’ We agree
16 with most environmental sociologists that environmental problems do not
17 automatically make it to the political agenda, yet, for us, such visibility is far from
18 insignificant. We argue that secondary visibility in particular is an important
19 characteristic not only for agenda-setting prospects but also for influencing policy
20 solution design.

1 Indeed, environmental issues are complex issues wherein social and natural
2 elements are fundamentally intertwined. Against such a backdrop, ecological
3 indicators have a pragmatic objective: they help circumscribe environmental
4 complexities, creating easy-to-monitor benchmarks that can direct public policies
5 (Kimmins [1990](#); Dale and Beyeler [2001](#); Turnhout et al [2007](#)). The experts in charge
6 of designing indicators rely on a categorization process. It is well known that such a
7 categorization process excludes a number of phenomena that will go unnoticed in the
8 reality constructed by the indicators. We have shown, for instance, that had not the
9 biotic index been introduced in the 1967 decree, the environmental effects of
10 accidental pollution would have been excluded from monitoring and, as a
11 consequence, control instruments would have been much less effective. This is
12 because oxygen demand is a category of pollution that does not distinguish between
13 authorized and illegal pollution. By measuring pollution using this oxygen demand
14 indicator, experts construct a reality in which responsibilities are masked. As a result,
15 ecological indicators constitute powerful framing tools for both problems and policy
16 solutions. They somehow constitute environmental realities by making some of them
17 visible while casting a shadow on other environmental aspects just by leaving them
18 outside their spectrum.

19 Second, we can mention institutional lock-in effects. Indeed, like policy
20 instruments, ecological indicators can create institutional lock-in effects. Such lock-in

1 can occur for several reasons, one of them being because the indicators chosen to
2 report on policy are financed by public funds. As use progresses, the chosen
3 indicators are increasingly fed with data. Actors who consider that these indicators do
4 them no justice have to bear the burden of proof to show another reality, that is,
5 construct a more suited indicator but also provide relevant data that can challenge the
6 already existing ones. Conversely, actors who benefit from the framing provided by
7 the indicators enjoy publicly produced data. Hence, once expert categories are
8 informed with such knowledge and data, they become more difficult to undo.
9 Furthermore, their distributive effects increase with time.

10 Finally, the deadwood indicator illustrates the fact that to really secure the
11 binding of a problem and of a policy solution together through an ecological indicator,
12 one has to invest in the metrics system. Indeed, the binding process occurs through
13 securing the indicator with data that will eventually cement the preferred policy
14 solution and orientation. We have seen in the case study that after betting on the
15 wrong indicator candidate, the policy ownership coalition around the deadwood
16 indicator did not succeed in promoting a more ambitious policy solution around forest
17 biodiversity, despite a conducive political framing and the decision to go ahead with a
18 seemingly favourable indicator. This is because the pro-biodiversity coalition did not
19 sufficiently invest in the decisive step of fine-tuning the indicator with the relevant
20 data. This demonstrates the role of uncertainty around environmental indicators and

1 the undetermined process, which may produce surprising associations and prevent
2 matters from moving in the preferred policy direction. Like any policy instrument,
3 expert indicators have effects of their own, which are sometimes difficult to
4 anticipate.

5 Conclusion

6 Our objective in this chapter was to study expert reporting as a type of political work
7 that can powerfully link public problems with policy solutions. Rather than taking
8 expert reporting as discursive arguments only, we also wanted to focus on the
9 technical and material dimensions of expert reporting and on its equipment, namely in
10 our case, expert categories (ecological indicators in particular). More precisely, we
11 first showed the political work taking place around ecological indicators, which are
12 far from a neutral representation of the natural world. They are hybrid expert
13 categories that indicators' promoters tweak to adjust to various influences. Against
14 that backdrop, we demonstrated how a dephasing of the multiple streams is an
15 impediment in the quest of indicators' promoters to institutionalize their specific
16 expert category and how much these promoters strive to remedy such misalignment,
17 sometimes using data to produce different framings and categorizations.

18 Second, we focused on how indicators can produce effects of their own. Other
19 researchers have also considered instruments' role in the construction of policy

1 problems and solutions (see Crespin [2009](#) in particular) but relate this role to the
2 capacity of instruments through their use to naturalize the problem definition,
3 implicitly referring to the perceived proximity of indicators to scientific matters. In
4 the cases we selected, however, science is often disputed and scientific authority
5 cannot account for indicators' compelling effects on the policy-making process. We
6 rather argue that indicators produce visibility and institutional effects. The visibility
7 effect relates to how indicators can frame a political debate by shaping and
8 materializing specific environmental realities. The institutional effect relates to a path
9 dependence linked to the cost of producing and feeding such indicators. In that sense,
10 these indicators act as policy instruments: they implicitly carry a specific framing of
11 the problem and of its desired solution; they lock in such a policy solution through an
12 accumulation of data.

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