CHAPTER TWO

An Overview of Policy Instruments

2.1 Introduction

Among scholars as well as among public planners there is a growing recognition that we need to adapt to climate change (Stern 2006, IPCC 2007, 2014) and that we are facing a biodiversity crisis as well. Five periods of mass extinction have taken place in the past 540 million years, and studies show that a sixth mass extinction wave may already be under way (cf. Pereira et al. 2010, Barnosky et al. 2011). TEEB (2009a,b) argue that two birds can be killed with one stone, as most policies that are aimed at improving biodiversity also help us to better adapt to climate change. For instance, preventing the disappearance of important ecosystems (e.g. due to agricultural intensification or deforestation) does not only have an impact on biodiversity and a variety of other environmental services, it usually increases opportunities for carbon storage and water safety as well.

Governments may choose to transfer adaptation responsibilities (such as taking flood protection measures or measures reduce urban heat stress) to citizens, civil organizations, and businesses (see Berkhout 2005, Fankhauser et al. 2008, Wilby and Vaughan 2011, Mees et al. 2014). They can also make a conscious choice to focus on the reinforcement of dikes and the procurement of land to develop (natural) climate buffers (e.g. broader river marshes to allow room for flooding; cf. Brouwer and van Ek 2004, van Stokkom 2005). The division of these responsibilities, and in particular the selection of policy instruments that is consistent with a chosen responsibility division, are classic dilemmas for policymakers and recurrent research topics in the literature (Howlett 1991, Glasbergen 1992, Bemelmans-Videc et al. 1998, Gunningham and Grabosky 1998, Gunningham and Sinclair 1999, de Bruin et al. 2009).

Identification of the appropriate governance mode is not straightforward, and although there are excellent studies that offer a broad perspective (see Adger et al. 2003, de Bruin et al. 2009, Brouwer et al. 2013), many of these studies employ an isolated assessment or focus on a narrow set of instruments (see Gunningham and Sinclair 1999, Lehmann 2012). In this chapter, we introduce a framework for the systematic exploration and assessment of public, private and interactive policy instruments using criteria that are derived from economics, legal studies,

13 In particular, agricultural intensification has caused substantial losses of biodiversity in Europe (cf. PBL 2010b, Hanley et al. 2012, Schouten et al. 2013).
and political science. The framework is intended to support public actors in systematically assessing and selecting policy instruments (or mixes).\textsuperscript{14} We showcase the usefulness of the framework with a case study in which potential instruments to stimulate the provision and maintenance of eco-friendly riverbanks are ranked on the assessment criteria by a panel of experts (the authors of Mees \textit{et al.} 2014). Note that this chapter is also intended to give the reader a broad perspective on the different governance choices that can be made before we shift our focus to the analysis of specific market-based instruments in the following chapters.

There are several reasons why a government might choose for a certain division of public/private responsibilities. Within both economics and political science, the most important consideration for public responsibility is market-failure (cf. Pigou 1920, Ostrom \textit{et al.} 1999), while the choice for private responsibilities is typically motivated by efficiency considerations (Laffont and Tirole 1993). To address market failures, a government typically needs to either limit a ‘negative externality’ (e.g. reduce greenhouse gas emissions by taxing fossil fuel consumption) or stimulate private parties to supply ‘positive externalities’ (e.g. offer subsidies for green roofs in urban areas) – government intervention is needed because the market prices of goods and services would otherwise not properly reflect the total societal costs and/or benefits. The efficiency gains usually stem from the private provision of goods or services that are too costly for the government to provide itself (cf. Holmström 1979, Laffont and Tirole 1993, Macho-Stadler and Perez-Castrillo 2001, Salanié 2005, van Soest and Dijk 2011). For instance, Jongeneel \textit{et al.} (2012b) show that the procurement of nature through agri-environmental contracting is far more efficient than ‘in-house production’ (i.e. cases in which government agencies procure land from farmers, convert it to nature, and make costs to maintain it). However, since agri-environmental contracts are temporary, and thus allow for more frequent switching between agricultural production and environmental service provision, these contracts are also deemed less effective in securing

\textsuperscript{14} See Mees \textit{et al.} (2014) for a more detailed version of the framework. The version presented here does not include Mees \textit{et al.’s} extension in which the multidisciplinary selection criteria are further specified for the four challenges to the governance of climate adaptation: uncertainty, spatial diversity, controversy, and social complexity. As we will see in Section 2.4, these challenges would unnecessarily complicate the analysis of our case study in which climate change adaptation and stimulating the supply of environmental services (such as increased biodiversity and improved water quality) go hand in hand.
environmental services by design (Schouten et al. 2013); but see Section 2.4. There are many of these trade-offs that can be found in environmental governance: ensuring the active involvement of private parties through information campaigns raises the political legitimacy of adaptation action, but comes with the ineffectiveness of free-rider behavior; the introduction of uniform building code restrictions for flood damage prevention improves legal certainty, but could lead to issues of fairness if some have more difficulties to adhere to the rules than other; etc. In the case study of Section 2.4, we will show that our framework can be used to systematically deal with these trade-offs and to identify an optimal mix of instruments – i.e. a mix in which the weaknesses of one instrument can be reduced by the merits of others (see also Taylor et al. 2012).

Instruments are seldom used in isolation, and a theoretical reason for this observation can be found in the ‘Tinbergen rule’: the need to apply a separate instrument for every policy objective that a government strives to achieve (Tinbergen 1952, Johansen 1977). Another explanation can be found in the inherent nature of the identification of appropriate policy instrument mixes – it strongly depends on what criteria are considered most important in a particular context, the weights that are put on these criteria, and the extent to which compensation between criteria is considered feasible or desirable (cf. de Bruin et al. 2013). In a similar vein, Braathen (2007) argues that ‘separate instruments’ – in the sense of the Tinbergen rule – exist within almost all ‘individual instruments’ because the majority of environmental problems have multiple criteria to attend to (e.g. efficiency and effectiveness, but also a fair distribution of individual costs and public benefits). It therefore seems somewhat beside the point to define what exactly should be labeled as a mix or a separate instrument – the latter is a rather exotic find in practice.15 In any case, a general rule to adhere to when adding more instruments to the mix should be to check whether the expected benefits of adding an instrument outweighs the costs (including transaction and administration costs; see Jongeneel et al. 2012b) of doing so. Let us first summarize a variety of instruments that can be used to

15 For instance, energy taxes usually have different rates for low or high consumption categories, and a number of exemptions and refund mechanisms; most tradable permit schemes include flexibility mechanisms such as banking and borrowing provisions and/or restrictions on trade; command-and-control regulations (e.g. technical requirement or performance standards) typically include different legal requirements and/or exemptions applying to different environmental and economic situations; etc. (see also Braathen 2007).
address environmental problems before we introduce the criteria (Section 2.3) that will be used to evaluate their expected performance in a case study on eco-friendly riverbanks (Section 2.4).

2.2 Categorizing the policy instruments

In recent decades, a range of market-based environmental policy instruments has been developed besides the more traditional ‘command and control’ (or legal) instruments (cf. Jordan et al. 2003, 2005, Ferraro 2008, Perman et al. 2011). Wurzel et al. (2013) show that this development has not led to a rigorous shift from legal instruments to market-based instruments, but rather that market-based (or economic) instruments and communication instruments have supplemented traditional regulation, resulting in a dominance of policy mixes that contain the ‘old’ and the ‘new’ modes of governance. Richardson and Wood (2006) suggest that the ‘modern era’ of environmental law started in the 1960s. Changing economic conditions and improved scientific understanding embedded in the liberal political climate of Western nations created the foundation for more public awareness and willingness to solve environmental problems. It is argued that, especially with respect to climate change policy, environmental law has not yet transformed as much as the ‘new’ practice of environmental governance has (Thrower 2006). Craig (2010) goes on to argue that the 'stationary attitude' of preservation and restoration in environmental law should move towards one of bimodal regulation – i.e. promoting flexible and informed arrangements to deal with the unavoidable impacts of climate change, but simultaneously take a precautionary approach when dealing with other environmental issues (e.g. mitigation, biodiversity policies) in order to avoid the worst-case climate change scenarios.  

Let us now look at the strengths and weaknesses of some specific policy instruments that helped shape (or will shape future) environmental policies.

In Table 2.1, we categorize policy instruments as legal, economic or communication instruments and organize them by their most fitting governance arrangement: public governance (command and control), interactive governance (co-regulation), and private governance (self-

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16 Mees et al. (2014) touches upon this subject as well and suggests that strict (but flexible) environmental laws can help reduce the uncertainties surrounding the benefits of adapting to climate change.
regulation); see for instance Thompson et al. (1991), Kjaer (2004), Weber et al. (2011), and Taylor et al. (2012). Note that we only include those instruments that are typically used to address environmental problems (see Glasbergen 1992, Vedung 1998, Lockie 2013), and exclude those that are not appropriate for our case study.\(^{17}\)

| Table 2.1. Policy instrument categories. |
|-----------------|-----------------|-----------------|
| **Public governance** | **Interactive governance** | **Private governance** |
| **Legal instruments** | - Technical requirements | - Negotiated agreements (or Covenants) |
| & - Performance standards | & - Smart subsidies |
| & - Negotiated agreements (or Covenants) | & - Procurement auctions |
| **Economic instruments** | - Taxes | - Insurance fee differentiation |
| & - Subsidies (or Tax exemptions) | & - Procurement auctions |
| **Communicative instruments** | - Public information campaigns | - Corporate Social Responsibility (CSR) |

The legal instruments are founded in environmental laws, regulations and agreements at the international, nation-state or local government level. Environmental laws and regulations are the central vehicle for environmental protection, because of their ability to create authoritative standards and decision-making procedures for spatial planning, pollution control and nature conservation (Richardson and Wood 2006). The government can formulate either uniform substantive or procedural rules of behavior (technical requirements and performance standards) and/or regulations for specific groups that might feature exceptions and waivers (e.g. zoning laws, best available technologies or best practices).

Technical requirements can for instance be applied to new building projects (e.g. require contractors to take specific isolation measures based on ‘best available technologies’). Performance standards on the other hand can

\(^{17}\) Mees et al. (2014) list more instruments such as mandatory/private labeling, product information and tradable permits/quotas. Since these instruments are not suitable in the procurement and maintenance of eco-friendly riverbanks (see Section 2.4) they are not discussed here.
relate to the quality of a provided service (e.g. storm water retention capabilities and biodiversity improvements per hectare regardless of the measure taken to achieve these targets), or for instance emission levels in production processes (see also Perman et al. 2011). These requirements can be uniform rules implemented by governments (public governance), but they can also be negotiated agreements between governmental organizations, NGOs and private parties (interactive governance), or agreements between private parties to introduce standardization (private regulation) such as the introduction of a new label for climate-proofed products (not included in Table 2.1; see Footnote 17).

Croci (2004) defines *negotiated agreements* as contracts between a government agency and one or more (representatives of) private parties. He notes that each side can start the bargaining process, NGOs can also participate in such negotiations, and that agreements can be open to participation by other parties in the future. Furthermore, an agreement can stipulate specific environmental targets (i.e. negotiated performance standards) or the supply of specific environmental goods (i.e. negotiated technical requirements). Note here that negotiated agreements can be binding, such as is the case for Dutch *covenants* (Bressers and de Bruijn 2004), and that private parties can have an incentive to start such negotiations to try and avoid (uniform and stricter) environmental law in the future.

Traditionally, the economic (or market-based) instruments consist of environmental taxes and subsidies (Pigou 1920). They are categorized as public governance instruments in Table 2.1. Instruments that belong to the category of interactive regulation are ‘smart subsidies’ (or so-called menus of contracts; see Chapter 3) and environmental procurement auctions (see Chapters 4 and 5), while creating incentives in the insurance market (e.g. a lower flood insurance fee for those that take precautionary measures) are added to the category of private governance. Compared to the legal instruments, the main benefit of economic instruments is higher efficiency (typically at the expense of effectiveness; see also Weitzman 1974).\(^{18}\) Usually these instruments are best at minimizing the costs to reach a set environmental goal. Instruments such as taxes and tradable emission permits

\(^{18}\) For instance, Goulder and Parry (2008) estimate that emission taxes, fuel taxes or tradable permit systems would reach similar levels of pollution abatement as opting for technical requirements or performance standards, but at an abatement cost that is 40-95% lower.
(that put a price on an environmental bad) also stimulate innovations that reduce negative externalities (e.g. investments in cleaner technologies to avoid emission taxes; cf. Kosonen and Nicodème 2009).

**Subsidies** are straightforward in the procurement of environmental services: an agent receives a subsidy in case she provides services such as storm water retention (e.g. by installing agricultural retention basins) or biodiversity conservation (e.g. by converting agricultural plots to suitable habitats for wild plants and animals). **Taxes** are slightly less straightforward because in many instances it is difficult to envisage that an agent is taxed when he/she fails to provide such services – consider for instance taxing an agent who is reluctant to invest in water storage tanks. In those instances in which taxes can be applied (think of taxing water use or energy use), they tend to be the economist’s preferred instrument. The main reason for this is that, if the tax is set equal to the (expected) damages associated with the use of an extra unit (evaluated at the desired level of consumption), agents are induced to internalize the negative externalities their activities give rise to (Pigou 1920). Similarly, a ‘Pigouvian subsidy’ is set equal to the (expected) positive externalities an extra unit of environmental services creates. Hence, subsidies are in many respects the mirror image of taxes – agents are rewarded a fixed per-unit subsidy for every unit of service they provide (cf. Kosonen and Nicodème 2009, Perman et al. 2011).

Smart subsidies and procurement auctions are primarily intended to reduce the informational rents associated with fixed per-unit (or uniform) subsidy schemes (see also Chapter 1). In any compensation scheme, only those agents who stand to benefit will subscribe to the program, and those are essentially the ones who can provide the environmental services at lower cost than the subsidy offered. Hence, if agents differ in the costs of supplying environmental services, a uniform subsidy is only marginally profitable for some agents while others earn substantial profits. Subsidies can however

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19 We do however discuss tax exemptions in Section 2.4. In our case study, we discuss offering farmers tax exemptions (e.g. on the national levy on water pollution, the regional water board fees, or the provincial tax on surface water extractions) if they are contracted to install and maintain an eco-friendly riverbank.

20 Note here that taxes do not have this problem. While some taxpayers are faced with higher costs than others (e.g. classic car enthusiasts that do not want to drive cars with more fuel efficient technologies), the tax is beneficial for government as it raises revenue. With the uniform subsidy, since the costs are incurred by the government, and assuming that some environmental services providers have lower costs than others (see also Section 2.4), the government can increase efficiency with a menu of subsidies that is specifically targeted at these different cost types (see below).
also be presented in the form of *smart subsidies*, some of which are targeted at the low-cost agents, and others at agents who can provide the requested services at higher costs (but not so high that they exceed the benefits obtained).\(^{21}\) Hence, a menu of contracts is set such that the informational rents of environmental service providers are reduced, implying that more services can be purchased with the same budget, or the same amount of services at a lower budget. *Procurement auctions* also intend to reduce informational rents (so-called windfall profits) and do so by organizing competition between potential service suppliers – the ‘winners’ in the auctions are the agents who ask the smallest amounts of compensation for offering the requested environmental service.\(^{22}\)

*Insurance fee differentiation* is categorized as private regulation in Table 2.1. For instance, discounts on flood insurance for those that take precautionary measures, can be placed on the market by the government, but can also be introduced by the market. In any case, purchasing insurance is voluntary and insurance contracts are provided by the private sector. In theory, insurance policies are an efficient instrument if the size of insurance fees is based on an individual’s flood damage risk: this creates an incentive to reduce flood risk or move to areas with lower risk of flooding if possible.\(^{23}\)

Communication instruments focus on educating and informing about the need for and benefits of (voluntarily) providing environmental services through for instance *public information campaigns*. The main drivers of these instruments are the assumptions that individual preferences can be changed and/or that by changing the attitudes of individuals towards the environment, the private sector will find it optimal to change behavior in the same direction (*cf.* Kerr 1995, Biel *et al.* 1999, Frey and Stutzer 2006, Braathen 2007). A potential shortcoming of communication instruments is their ineffectiveness (*cf.* Gunningham and Sinclair 1999) – educating and informing agents about the benefits of environmental services does not

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\(^{21}\) See Chapters 1 and 3 on the menu of contracts approach.

\(^{22}\) See Chapters 4 and 5 on repeated procurement auctions and wildlife corridor auctions. Also, see van Soest and Dijk (2011) for a non-technical description of the incentives of environmental service providers under different auction institutions and the menu of contracts approach.

\(^{23}\) In practice, little insurance coverage against flood damage is available through the private insurance market. For example, homeowners’ insurance policies in Australia and the Netherlands exclude flood damage, and in Germany flood coverage is seldom bought (Browne and Hoyt 2000). Furthermore, experiences with flood damage in the Netherlands show that public pressure for compensation of damage by the government is considerable and results in significant compensation payments (Botzen and van den Bergh 2008).
guarantee that agents will actually increase the provision of these services (but see Chapter 6).

The final instrument we discuss here is Corporate Social Responsibility (CSR). The private sector has three incentives for CSR: (i) it ‘pays to be green’, (ii) acting in accordance with the social norms reduces the probability of future regulation, and (iii) CSR can be used to offset ‘corporate social irresponsibility’ (cf. Strike et al. 2006, Lange and Washburn 2012). While a majority of studies finds a positive correlation between CSR and a multitude of indicators of financial performance, many studies find no correlation, or even a negative correlation (see for instance Heal 2008). Furthermore, the literature lacks consensus on problems of endogeneity. For instance, one might ask whether CSR improves financial performance or that increases in financial performance make available resources for companies to engage in CSR. Nevertheless, there is much empirical support for the hypothesis that companies are penalized if they are believed to conduct business in ways that conflict with social values (Konar and Cohen 2001). When the inconsistencies between social values and conduct are large and there is sufficient public awareness, it will be optimal for companies to anticipate the social pressure. In fact, taking a proactive stance toward lessening the potential for conflict in this case can reduce the probability of being confronted with environmental regulation in the future (Lyon and Maxwell 2008, Portney 2008). In this sense, while companies might appear to act on behalf of the public good, their performance on environmental services may well be suboptimal, and society would in this case be better off with strict government regulation.

2.3 Assessment criteria for the policy instruments

To rank the policy instrument we discussed in the previous section, we employ a multidisciplinary set of the most commonly applied assessment criteria for policy analysis as derived from economics, legal studies, and political science (Nelissen 2002, Crabbé and Leroy 2008; see also Mees et al. 2012). Table 2.2 summarizes how we define the six criteria that we will use to assess the instruments (presented in Table 2.1) in the case study in Section 2.4.

From legal studies, we derive the criteria of legal certainty and fairness. Legal certainty ensures that there are grounds on which governments can
take legislative and administrative measures. Legal certainty is internationally recognized as the main requirement for the rule of law: it provides agents the ability to regulate their conduct based on clear, understandable and stable laws (cf. Fuller 1969, Radbruch 1970, Popelier 2000). *Fairness* is closely related to equity and justice and has three components: substantive, procedural and distributive fairness. Substantial fairness requires an instrument to be fair to each party as far as its content is concerned. Procedural fairness requires that an instrument is open to all parties (*i.e.* it should offer sufficient possibilities for participation). And distributive fairness entails that an instrument ensures an equal allocation of benefits and costs (cf. Fuller 1969, Rawls 1972).

From economics, we derive the criteria of efficiency and effectiveness. *Efficiency* is about the optimal allocation of scarce resources, and measures whether an environmental good or service is provided at lowest societal cost (thereby minimizing windfall profits and negative externalities; cf. Perman *et al.* 2011). Furthermore, it measures the extent to which an instrument requires public funds (that are raised through distortionary taxation; cf. Mirrlees 1971), and in particular whether an instrument also requires public funds to monitor behavior. *Effectiveness* is commonly understood as the extent to which policy goals are achieved (cf. Braathen 2007, Kosonen and Nicodème 2009, Perman *et al.* 2011). In the case study that follows, this can entail a target set at *x* km for the procurement of eco-friendly riverbanks, or less specific performance requirements such as biodiversity and water quality improvements.24

From political science, we derive the criteria of legitimacy and accountability. *Legitimacy* is about the acceptance of authority and the justification of power (Bernstein 2005, Bekkers and Edwards 2007, Dingwerth 2007). Here we operationalize it as a measure of the freedom of choice agents have in fulfilling environmental goals, and the extent to which an instrument takes into account the interests of those that are affected by it – both directly and indirectly (*e.g.* the latter due to positive/negative externalities; Few *et al.* 2007, Paavola 2008, Howarth 2010, Tennekes *et al.* 2014). *Accountability* measures whether an instrument allocates responsibilities to the principal and the agents in a transparent way, and whether it enables the principal to monitor the agents, and vice versa

24 Note that effectiveness thus also measures the positive externalities an instrument is able to realize (see Section 2.1).

**Table 2.2.** Criteria for assessing the performance of policy instruments.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legal certainty</strong></td>
<td>The extent to which an instrument has clear, understandable and stable rules of a general character.</td>
</tr>
<tr>
<td><strong>Fairness</strong></td>
<td>The extent to which an instrument is fair to each party (as far as its content is concerned); is open for all interested parties (there are adequate possibilities to participate and gain relevant information); ensures the equal allocation of costs and benefits (including externalities).</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>The extent to which an instrument selects the least cost parties (or they select themselves) to provide environmental goods/services; leaves windfall profits with private parties; uses public funds (raised through distortionary taxes) to procure environmental goods/services; requires monitoring of behavior (using public funds).</td>
</tr>
<tr>
<td><strong>Effectiveness</strong></td>
<td>The extent to which an instrument is expected to achieve the environmental goals (<em>e.g.</em> set target of <em>x</em> km of eco-friendly riverbanks; habitat, water quality and/or water retention capacity improvements).</td>
</tr>
<tr>
<td><strong>Legitimacy</strong></td>
<td>The extent to which an instrument gives agents a freedom of choice in fulfilling an environmental goal; takes into account the interests of those that are affected by it (directly and indirectly).</td>
</tr>
<tr>
<td><strong>Accountability</strong></td>
<td>The extent to which an instrument allocates responsibilities to the principal and the agents in a transparent way; enables the principal to monitor the agents, and vice versa.</td>
</tr>
</tbody>
</table>

In the case study that follows, we will first employ a relative ranking in which we score policy instruments vis-à-vis each other per criterion. Due to the absence of a commonly agreed-upon benchmark against which the legitimacy, efficiency, *etc.* of policy instruments can be assessed, we will use a three-point ordinal scale. This means that each instrument receives a high, medium, or low score on each criterion. The second step is to look for combinations of instruments that score well on different relevant criteria, thus complementing each other or compensating for each other’s weaknesses.

### 2.4 Case study: Eco-friendly riverbanks

In this case study, we will focus on the main governance challenges in the procurement and maintenance of Eco-friendly Riverbanks (ERs) on the edges
of farmland in the Province of Zeeland, the Netherlands. ERs have been used for centuries to improve water quality and to decrease eutrophication (cf. Davies and Nelson 1994, Costanza et al. 1997, Meuleman et al. 2003, Parkyn et al. 2003). They also offer a variety of other environmental services such as suitable habitats for wild plants and animals, storm water retention and recreation (see also Provincie Zeeland 2009, 2014, Stowa 2009, 2010, PBL 2014). ERs are most effective in increasing the biodiversity of wild plants and animals if they are contiguous – fragmentation is however unavoidable since some riverbanks are obstructed by bridges or roads (Provincie Zeeland 2009, Stowa 2009; see also Chapter 5). Figure 2.1 presents one ‘before’ and two ‘after’ examples of converting a typical agricultural riverbank to an ER.

ERs in the Province of Zeeland are required to be 10 meters wide (or 5 meters wide on each side of a river), which translates to 1 hectare (ha) per kilometer (km). The Province of Zeeland, the regional water board ‘Scheldestromen’, and the municipalities have a joint assignment of 375 ha (or km) of ERs within the European Water Framework Directive (KRW), of which 120 ha coincide with the assignment for the Netherlands Water Policy for the 21st century (WB21). The latter is a policy framework that funds small and large-scale water retention and climate change adaptation projects. A large part of the 375-ha assignment also overlaps with goals for the National Ecological Network (NEN) and Natura 2000. These frameworks are mainly concerned with habitat creation, water quality improvements, and sediment de-nitrification in waterways (Provincie Zeeland 2009).

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25 In Dutch, ERs are called ‘natuurvriendelijke oevers’.
Figure 2.1. Eco-friendly riverbanks (before and after).

Riverbanks are procured, converted to ERs, and maintained by the regional water board or a farmer. In the following, we offer some background information on these three assignments. The procurement process – based on negotiations between the Province, the regional water board Scheldestromen, and (groups of) farmers – can involve a monetary transaction, but can also involve ‘redistribution of land’ (‘ruilverkaveling’ in Dutch). Kavelruilbureau Zeeland (a government agency) executes land redistribution in Zeeland. Scheldestromen can organize trades between farmers (and also offer parcels they own themselves) to ensure that riverbanks become available for conversion to ERs. The
Zeeland varied between €40,000 and €55,000 per ha in 2010, and €50,000 and €65,000 per ha in 2013 (DLG 2011, 2014). Note that these prices are based on farmer-to-farmer transactions (or transactions between a farmer and a private party). The price ranges indicate what a hectare of farmland is worth on the market and can be considered as a price floor – the costs for the procurement of land for ERs are most likely higher (cf. Jongeneel 2012b, DLG 2014). Furthermore, a budget of €20 million (shared by the Province, Scheldestromen, and the municipalities) is available for converting riverbanks to ERs in the 2010-2015 period (Provincie Zeeland 2009). Typically, it is Scheldestromen that executes these conversions (i.e. the regional water board hires contractors to convert agricultural riverbanks to ERs). For instance, a conversion plan with a total length of 5 hectares on previously procured plots (at eight different locations) is budgeted at €1.5 million, or €300,000 per ha.  

Note that farmers can also initiate conversions on their own properties. In this case, they can apply for a subsidy that compensates them for the conversion costs.  

Finally, Zeeland has a yearly budget of €1.5 million that is available for maintenance arrangements under agri-environmental contracts. In the future, monitoring costs will also be claimed on this budget (Provincie Zeeland 2014). The maintenance rules in the agri-environmental contract for ERs are the following: the ER is to be mowed at least every two years, and at most once a year; the use of nutrients and pesticides is not allowed on the ER; livestock is not allowed on the ER; it is not allowed to apply dredged sediment on the ER; and mowing is only allowed between 15 July and 1 March. The subsidy for this contract is equal to €52.31 per 100 meters per year (or €26.16 per 50 m per year; see opportunity costs per 50 m below).  

ERs provide societal benefits through the environmental services they provide, but they infer costs on farmers – i.e. they involve moving lanes dedicated to agricultural machinery further away from the riverbanks, thus decreasing the amount of land that is available for cultivation, and bring administration costs of land redistribution are subsidized: farmers pay a net amount of €125 per ha (see also http://www.kavelruilbureauzeeland.nl/pages/subsidie.aspx).  

27 See http://www.scheldestromen.nl/actueel/nieuwsberichten/@217730/waterschap_legt/.  


29 At this point, a uniform monitoring framework for agri-environmental services has not yet been formalized. It is expected to be finished at the end of 2015 (Provincie Zeeland 2014).  

about (additional) restrictions on the use of fertilizer close to the riverbank. Figure 2.2 offers an indication of the opportunity costs of Dutch farmers. It is derived using the Standard Profit Capacity (SPC) coefficient (van Everdingen et al. 2014). The SPC is calculated using farm-level data on the Dutch agricultural sector from the ‘Landbouwtelling 2014’ database. We assume that farmers will be asked to maintain an ER that is 10 meters wide and we present their opportunity costs in €/50 meters of ER-length. We select only those farmers from the database for which the full share of income stems from agricultural production and who have at least 0.05 hectares of land. This selection results in a database of 5253 farmers. The horizontal axis counts the number of farmers (each with a 0.05 ha plot), and the opportunity costs (in € per year for the 0.05 ha plot) are sorted from high to low. The figure shows that only about 350 farmers (6.7%) in our database will make a loss when they receive €26.16 per 50 meters per year – the majority will make a (large) profit. The average farmer has an opportunity cost of €7.33 per 50 meters per year. Hence, on an ER with a length of for instance 500 meters, the average farmer will make a profit of €188.30 per year (excluding mowing costs). Note that these windfall profits may be higher given that the procurement strategy has mainly been one of procuring marginal lands, which have low opportunity costs (Jongeneel et al. 2012b).

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31 The ‘Landbouwtelling 2014’ database is used to calculate revenues (excluding subsidies) for the Standard Revenue (SR) statistic (Standaardopbrengst or SO in Dutch). The farm-level SR statistic is then multiplied by its corresponding farm-type SPC coefficient (Standaard Verdiencapaciteit or SVC in Dutch) to take into account that different farm-types have different profit margins (see van Everdingen et al. 2014 for details).

32 We removed 100 farmers from the sample: 50 farmers with the highest and 50 with the lowest opportunity costs.

33 Another reason why these profits may be higher is that ERs are on the margins of farmland; the SPC is based on a farm-level average per hectare. On-site differences in opportunity costs are unfortunately not available.
The costs for the procurement and conversion of land, the monitoring costs, and the subsidies for maintenance of ERs are for the largest part reimbursed from EU budgets. Hence, before we assess the policy instruments (see Table 2.1), we offer some background on the (new) Common Agricultural Policy (CAP) in Box 2.1.

For the ranking of the policy instruments, we will assume that the ownership of the riverbanks is not transferred to the regional water board. Instead, farmers are contracted (or required under ‘Technical requirements’) to convert their riverbanks and maintain them for a limited period of time under agri-environmental contracts.\(^\text{34}\) One might argue here that, at the end of an agri-environmental (maintenance) contract, the conversion costs will have been to no avail. However, these high costs will also be incurred to re-convert an ER to an agricultural riverbank (and they are not subsidized in this case). The farmer thus has the option to either incur these high re-conversion costs, or secure a new agri-environmental maintenance contract. Hence, the permanency that is ‘in-house’ production (i.e. procurement of farmland for ERs, and maintenance by contractors that are reimbursed by the regional water board) may ensure more biodiversity improvements (cf.

\(^{34}\) Performance requirements, Public information campaigns and CSR are exceptions, as they do not require a farmer to convert their riverbank to an ER per se.
Schouten et al. 2013), but it seems farfetched to assume that all (or most) farmers will re-convert ERs to farmland at the end of their contracts. That is, as long as future agri-environmental contracts have subsidies which are higher than the farmers’ yearly opportunity costs of keeping their ER intact.


For the Netherlands, the new CAP for the 2014-2020 period entails a significant change from ‘single farm payments’ intended as income support, to payments per ha (or a regional flat rate) with ‘greening’ components (EC 2013). It is estimated that the average Dutch farm received subsidies equal to about €440 per ha (Jongeneel et al. 2012a) or €550 per ha (DLG 2014). In particular, these subsidies range from €90 per ha on horticultural farms to €610 per ha on starch potato farms (Helming and Peerlings 2014).

Both the old and the new CAP have two ‘pillars’. While the new first pillar is still mainly designed for income support (€220-280 per ha; about 70%), farmers now only receive the remaining part (€120 per ha; about 30%) if they take several greening measures (cf. DLG 2014). The total budget of the first pillar is €800 million for 2014. The new design of the second pillar (called POP3 or ‘Plattelandsontwikkelingsprogramma 3’ in Dutch) entails a yearly budget of about €70 million of which 50% is funded by the EU and 50% is on the national government budget. About €60 million is available for agri-environmental contracting, and this is expected to increase to about €95 million in 2016 – part of this will be funded by expected surpluses in the first pillar (DLG 2014, MinEZ 2014).

Most importantly, as of 2016, new agri-environmental contracts will no longer be assigned to individual farmers, but provinces will transfer funds for agri-environmental contracting to certified agri-environmental collectives (DLG 2014, MinEZ 2014). These collectives (about 39 regional collectives and just one for the Province of Zeeland) will receive the funds from the second pillar and allocate the contracts to individuals (or groups of) farmers (Provincie Zeeland 2014). It is expected that these collectives will be more efficient and effective in the provision of environmental goods and service than contracting on an individual basis has proven to be, due to lower administration and transaction costs (cf. DLG 2014).

* See also http://www.scan-collectieven.nl/*.
Let us now translate the general instruments that are presented in Table 2.1 to the specifics of this case study. First, a tax exemption can be offered to farmers that (convert their riverbank to) and maintain an ER. For instance, one could think of exemptions on the national levy on water pollution, the regional water board fees, or the provincial tax on surface water extractions. Second, one could introduce insurance fee reductions (e.g. on extreme weather insurance for crops) for those that (convert and) maintain an ER. The latter can stem from CSR activities by insurance companies, but can also be placed upon the market by the government. Third, we assume that the negotiated agreements are based on negotiations between the agri-environmental collective ‘Agrarisch Natuur Platform Zeeland’, the Province of Zeeland, and the regional water board Scheldestromen. We assume that the collective’s will bargain for (sufficiently) high compensation payments for ER conversions and maintenance. On the other side of the table, the province and Scheldestromen will focus on ensuring that contiguous and thus effective ERs are realized at a reasonable burden on public funds. Fourth, public information campaigns are assumed to catalyze the provision of ERs by promoting the benefits of ERs to the general public and to farmers specifically. The remaining instruments are rather straightforward and do not differ from their descriptions in Section 2.3. For instance, performance standards are assumed to require a certain level of service: storm water retention capabilities and biodiversity improvements per hectare whether the farmer converts his riverbank to an ER or not.

In Table 2.3, we offer a ranking of the policy instruments that we introduced in Table 2.1. It is based on the considerations that are summarized in Table 2.2. The ranking has been performed in 2012 by a panel of experts: the authors of Mees et al. (2014). An example of the details that are behind the ranking of a particular instrument can be found in Mees et al. (2014). We present the ranking of the instruments on a three-point

35 ER maintenance contracts are based on a national uniform subsidy at the moment (€52.31 per 100 meters per year; see above), but bargaining could be worthwhile since regional differentiation of subsidies for agri-environmental (maintenance) contracts are possible in the future (cf. Jongeneel and Smit 2013). Note that this is actually an instrument mix of negotiated agreements and uniform subsidies, which will be the national policy as of 2016.

36 Note that we merged smart subsidies and auctions here as they deliver similar efficiency gains and have the same ranking on all other criteria as well.

37 See the Appendix of Mees et al. (2014) at: http://www.ecologyandsociety.org/vol19/iss2/art58/. Details on the ranking in Table 2.3 are available upon request. The key results are discussed below.
ordinal scale: an instrument is assessed to score low, medium or high vis-à-vis the other instruments on a particular criterion.

Table 2.3. Ranking of policy instruments.

<table>
<thead>
<tr>
<th></th>
<th>Legal criteria</th>
<th>Economic criteria</th>
<th>Political criteria</th>
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<tbody>
<tr>
<td></td>
<td>Legal certainty</td>
<td>Fairness</td>
<td>Efficiency</td>
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<tr>
<td>Legal instruments</td>
<td></td>
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<tr>
<td>Technical requirements</td>
<td>H</td>
<td>H</td>
<td>M</td>
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<tr>
<td>Performance standards</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>Negotiated agreements</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Economic instruments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsidies</td>
<td>H</td>
<td>H</td>
<td>L</td>
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<tr>
<td>Smart subsidies and</td>
<td>M</td>
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<td>auctions</td>
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<tr>
<td>Insurance fee reductions</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>Tax exemptions</td>
<td>H</td>
<td>H</td>
<td>L</td>
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<tr>
<td>Communication instruments</td>
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<tr>
<td>Public information</td>
<td>L</td>
<td>L</td>
<td>H</td>
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<tr>
<td>campaigns</td>
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<tr>
<td>CSR</td>
<td>L</td>
<td>L</td>
<td>H</td>
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H = highest relative score, i.e. this instrument scores best on that criterion vis-à-vis the other instruments, M = medium relative score, L = lowest relative score.

For the legal criteria, we find that legal instruments have the highest rankings, economic instruments have average scores, and communication instruments have the lowest rankings. In general, laws and rules offer most legal certainty. The scores on fairness more or less follow the same pattern, suggesting that formal rules also promote a fair treatment through impartiality because the rules apply equally to everyone. Negotiated agreements form an exception in the legal instruments category. The instrument scores medium on fairness as it tends to apply only to those
stakeholders that are part of the negotiations and tends to exclude others (e.g. farmers that are not a member of the ‘Agrarisch Natuur Platform Zeeland’ collective). Obviously, public information campaigns and CSR have a low rank on legal certainty and fairness, because they do not offer general rules of conduct to the farmers, and they also do not ensure an equal distribution of costs and benefits.

Regarding the economic criteria, a clear trade-off is visible between efficiency and effectiveness: instruments that are highly effective are least efficient and vice versa. This negative correlation is consistent with the results of the seminal analysis of Weitzman (1974). Legal instruments are coercive in nature and most effective in the provision of ERs. The exception being performance requirements, because they do not require an ER by design – farmers are assumed to be free in how they reach a certain level of habitat creation, water quality, etc. On the other hand, the legal instruments rank poorly on efficiency because it is very difficult for the province and the regional water board to select the least-cost parties; legal instruments can force certain farmers to participate, but it is by no means certain that they are the ones who can provide ERs at least cost.

Economic instruments hold the middle ground for both efficiency and effectiveness. For instance, insurance companies can offer the same reduced fee to all farmers that convert their riverbanks to ERs. Hence, in this case the least-cost farmers will select themselves to convert and maintain these riverbanks. However, given that the instrument does not subsidize the conversion costs of the riverbanks to ERs, it is not very effective. Uniform subsidies score relatively poor on efficiency, because of their high burden on public funds and because they give rise to high windfall profits. Figure 2.2 shows the potential efficiency gain that can be achieved by employing auctions for agri-environmental subsidies instead of a uniform subsidy (see also Chapter 4). Since there is heterogeneity in opportunity costs, ‘smart subsidies’ (or a so-called menu of contracts) are expected to be more efficient as well. Note however that these efficiency gains can be at the expensive of contiguous and thus effective ERs (Provincie Zeeland 2009, Stowa 2009). Hence, negotiated agreements, in which the province and the

38 See also Chapter 3. In this chapter, we show that these contracts may actually be very efficient (or ‘first-best’ in specific cases) if there is enough heterogeneity in the up-front conversion costs and the yearly opportunity costs (see Figure 2.2 for the latter). With regard to the up-front costs, it seems reasonable to assume that conversion costs vary between contractors and agricultural riverbanks.
The water board will bargain to ensure contiguous habitat, are more effective than offering subsidies on a least-cost basis – e.g. using auctions or smart subsidies (but see Chapter 5 for a ‘wildlife corridor auction’ that is specifically designed for such settings).

For the political criteria, we see a similar trade-off as with the economic criteria for the legal instruments: technical requirements and performance standards rank well on legitimacy and poorly on accountability, or vice versa. A positive exception is the instrument of negotiated agreements, which has a high rank on both criteria. This is because the instrument offers a higher freedom of choice (i.e. the collective has more bargaining power than the individual), while the party can be held accountable on a similar level (e.g. a complaint made by an individual farmer about misconduct of the water board or the province will probably be less successful than one that comes from the collective that represents the farmer. Economic instruments rank average on legitimacy and accountability, while communication instruments rank rather poorly.

Let us now discuss an appropriate mix of instruments. It has been decided on a national level that, as of 2016, certified collectives will allocate uniform subsidies for agri-environmental contracts to individual farmers. It is likely that the collective approach will reduce transaction and administration costs of the water board and the Province of Zeeland, especially since there is only one collective that spans the entire province. Also, the collective will most likely be more effective in ensuring contiguous ERs than subsidies that are allocated on a first-come, first-served basis (cf. DLG 2014). However, our assessment shows that negotiated agreements combined with uniform subsidies are not expected to be efficient at all. Although transaction costs may be reduced, the use of uniform subsidies will result in large windfall profits for those that can provide ERs at low cost (see also Figure 2.2). The instruments that show promise in reducing these windfall profits, while also scoring reasonable on all other criteria, are auctions and smart subsidies. Alternatively, one could require (certain) farmers in the collective to convert their riverbanks to ERs (i.e. employ the ‘technical requirements’ instrument).

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39 Coase (1960) argues that, in theory, bargaining will lead to an efficient outcome regardless of the initial allocation of property rights (if transaction costs are significantly low). However, if we look at the relative performance of the ‘negotiated agreements’ instrument, and the way the instrument has been implemented in practice, it seems to be a move towards more bargaining power for the farmers – i.e. we expect windfall profits and thus the burden on public funds to increase under this instrument when it is combined with uniform subsidies.
A uniform technical requirement is not very legitimate. However, by requiring those farmers that put a large strain on the environment to convert their riverbanks to ERs, one can apply the fair ‘polluter pays principle’ (cf. Tobey and Smets 1996). Furthermore, while we gave subsidies a medium score on legitimacy, a 2013 survey by the European Commission on the “Europeans, Agriculture and the CAP” shows that 35% of Dutch respondents agrees with the statement that the subsidies that farmers receive are too high (EC 2014). Hence, it seems reasonable to assume that a large minority thinks that a technical requirement to convert riverbanks to ERs is more legitimate than offering subsidies. However, the greening of the first pillar, and increasing the budget for agri-environmental contracting under the second pillar seem to be very legitimate as 44% (41%) of Dutch respondent state that this is a very (fairly) good development.

2.5 Conclusion

In this chapter, we present an analytical framework for the systematic identification and assessment of public, private and interactive policy instruments that can help policy practitioners in selecting appropriate instruments for the provision of environmental goods and services. The framework is based on assessment criteria that are derived from economics, legal studies, and political science. The relevance and relative weight of these criteria will obviously depend on the characteristics of the environmental goods or services that are required. A case study on eco-friendly riverbanks in the Province of Zeeland showcases the usefulness of the method in finding a successful policy mix – a combination of instruments that scores well on different relevant criteria, thus complementing each other or compensating for each other's weaknesses. We find that the Dutch policy under the new CAP – that will let agri-environmental collectives allocate uniform subsidies as of 2016 – has not been a choice that promotes efficiency. Although these collectives will likely reduce transaction and administration costs, so-called smart subsidies (i.e. menus of contracts) or the auctioning of agri-environmental contracts may help reduce the windfall profit that are left with farmers that can provide and maintain eco-friendly riverbanks at low cost. The following chapters will discuss the conditions under which menus of contracts (Chapter 3) and procurement auctions (Chapters 4 and 5) are able to do so.