



Research, part of a Special Feature on [Toward More Resilient Flood Risk Governance](#)

Distributional effects of flood risk management—a cross-country comparison of pre-flood compensation

[Willemijn J. van Doorn-Hoekveld](#)¹, [Susana B. Goytia](#)², [Cathy Suykens](#)³, [Stephen Homewood](#)⁴, [Thomas Thuillier](#)^{5,6}, [Corinne Manson](#)⁵, [Piotr J. Chmielewski](#)⁷, [Piotr Matczak](#)^{7,8} and [Helena F.M.W van Rijswijk](#)¹

ABSTRACT. We seek to examine the manner in which either the EU member states of France, the Netherlands, Poland, and Sweden or parts of them, such as the country of England in the UK or the Flemish Region in Belgium, deal with the distributional effects of the flood risk management strategies prevention, defense, and mitigation. Measures carried out in each of these strategies can cause pre-flood harm, as in the devaluation of property or loss of income. However, different member states and authorities address this harm in different ways. A descriptive overview of the different compensation regimes in the field of flood risk management is followed by an analysis of these differences and an explanation of what may cause them, such as the geographical differences that lead to differences in the way that they interfere with private rights and the dominant legal principles that underlie compensation regimes. An elaborated compensation regime could lead to more equitable and legitimate flood risk management because the burdens are fairly spread and all interests—including those of injured parties—are considered in the decision-making process. Our aim is to stimulate the hardly existent discussion on the financial harm that is caused by measures to prevent floods (pre-flood), in addition to the already existing discussion on the ex post flood distributional effects.

Key Words: *defense; égalité devant les charges publiques; equity; flood risk management; legitimacy; loss; no-fault liability; pre-flood compensation; prevention; protection of property rights; solidarity; spatial planning*

INTRODUCTION

The distributional effects of climate change adaptation and flood risk management have been the subject of many papers. Most of these address the issue from an economic perspective (Flores and Thacher 2002) or a geographical perspective (Adger et al. 2005, Solecki et al. 2011). Social scientists have also addressed this issue (Mazmanian et al. 2013). Loss can be seen as a distributional effect (Fullerton 2009). The distributional effects of floods (ex post) are discussed in the literature (Tapsell et al. 2002, Penning-Rowsell et al. 2005). Our aim is to stimulate the discussion on the financial loss caused by measures to prevent floods (pre-flood). This issue is of interest not only to economists and social scientists, but also to legal scholars. Flood risk management is an important agent in causing distributional effects. Most literature addresses flood risk management as an element of adaptation to climate change (Bodansky 1999, Tol and Verheyen 2004, Mace 2006, Driessen and van Rijswijk 2011, Keessen et al. 2013, Tennekes et al. 2014) or the damage resulting from floods (ex post), but the distributional effects of preventive flood risk management (pre-flood) have hardly been discussed yet (Tapsell et al. 2002, Penning-Rowsell et al. 2005, Merz et al. 2010, Wilby and Keenan 2012, van Doorn-Hoekveld 2014, van den Broek 2015). To acquire insights into this aspect, we address the compensation mechanisms used in several EU member states for one specific distributional effect of flood risk management: the lawfully caused harm resulting from measures taken to prevent floods (pre-flood compensation). The compensation of lawfully caused loss is also called “no-fault liability.” This may be available even though in the case of wrongful conduct of a public authority it may also give rise to compensation (Engelhard et al. 2014). This specific topic, however, is outside the scope of this paper.

Adger et al. (2005) have defined criteria for successful climate change adaptation: equity and legitimacy being two of them. Specifically relevant to the criterion of equity is a fair distribution of adverse effects. We examine the ways in which distributional effects of preventive flood risk management measures are dealt with in England, France, the Flemish Region in Belgium, the Netherlands, Poland, and Sweden. The question that needs to be answered is, How can the legal similarities and differences of the no-fault liability compensation regimes regarding flood prevention be explained? By prevention, we mean all measures needed to prevent a flood from occurring. It encompasses, among others, spatial measures, flood defense or flood protection measures, and mitigation measures. Understanding these differences is necessary to gain insight into best practices that might be implemented in the different countries, which are all encountering similar challenges that go with the distributional effects stemming from the prevention, defense, and mitigation strategies. It also enriches the already existing literature that addresses distributional effects of flood risk management. The results can be used as a starting point for comparative research on government liability for harm caused by preventive measures in general, such as animal diseases or climate change mitigation measures.

We first describe the underlying principles of the legal framework in the six countries regarding the relevant compensation regimes for lawfully caused harm. Then we analyze the compensation regimes themselves by elaborating on three concrete measures, namely (1) a dike strengthening, (2) the creation of a retention or water storage area, and (3) a spatial planning measure. These three measures have a preventative character, which can cause harm to a limited group of people and simultaneously protect a large

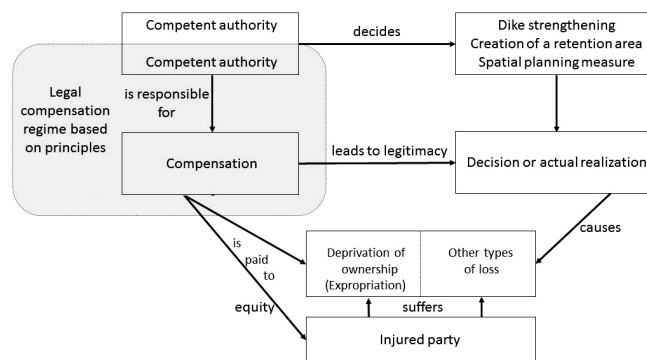
¹Utrecht Centre for Water, Oceans and Sustainability Law, Utrecht University School of Law, The Netherlands, ²Luleå University of Technology, Sweden, ³KU Leuven, Belgium, ⁴Flood Hazard Research Centre, Middlesex University London, England, ⁵Public Law, University François-Rabelais of Tours (France), ⁶Laboratory LERAP EA 2108, ⁷Institute for Agricultural and Forest Environment, Polish Academy of Sciences, Poland, ⁸Institute of Sociology, Adam Mickiewicz University

group of—sometimes different—people. The distributional effects are unequally spread. In order to achieve equity and increase the legitimacy of the measures proposed, some countries compensate the loss caused by the realization of these measures, while other countries oblige the injured parties to bear the costs themselves. In the third part of this paper, we explain these differences between the countries.

CONCEPTUAL FRAMEWORK

The main concepts used are represented in Fig. 1.

Fig. 1. Envisaged relationship between main concepts used.



Just as a flood can cause harm, the actions taken to prevent a flood can cause harm. In most cases, public authorities can realize measures, such as those previously mentioned, in order to protect a part of the country or a specific area—e.g., a densely populated urban area—from flooding, so that a larger group of people will benefit from this action. At the same time, a limited group of people may face adverse effects from these measures, such as devaluation of property as a result of restrictions on the use of their land, the restriction of their view, a loss of income because of the restrictions on the use of land or the loss of harvest, or even the loss of property in the case of expropriation. These adverse effects constitute the “loss” or “harm.”

Loss can be caused by a lawful action. Decisions and actions taken by the authorities for the common good, such as the designation and creation of a retention area, can be considered to be lawfully undertaken; all substantive and procedural rules have been applied correctly, there has been a balance of interests, and the decision is properly motivated. In many cases, all interested parties consider the decision or action the right thing to do, even those who suffer the loss. Since there is no wrongful conduct, in most cases civil or criminal law does not contain compensation clauses. However, most of the studied countries do have some provisions to compensate the persons in the case of lawfully caused harm. These provisions are based on general principles of law.

A legal compensation regime is the specific regime that is used for the compensation of loss. This differs per country and depends on the underlying general legal principles. The solidarity principle, the principle of the protection of property rights, and the principle of *égalité devant les charges publiques* [equality before public burdens] are relevant in the studied cases. The legal compensation regime differs per country, such as the way the compensation is designed and which authority is competent to award damages.

A competent authority is the administrative authority at the national, regional, or local level that has the power to make decisions regarding flood risk management or to realize measures, and that is responsible for these decisions or the realization thereof. It is possible that the authority that is competent for the realization of the loss-causing measure is not the same as the authority that is responsible for paying for the compensation of loss. The competences of authorities are laid down in legislation, and the precise division of powers may differ per country.

A dike, also called an embankment, is a hard flood defense structure that offers protection to its hinterland from flooding by a river, a lake, or the sea. The structure can be strengthened through broadening and/or heightening. When a dike is relocated, it is replaced—or rebuilt—at a different location. Although realization and relocation are not the same as strengthening, it is also discussed here because the harm is similar. These measures entail the need for more space for or around the structure, which may oblige landowners and other rights holders nearby to face disturbances from the surroundings, loss of free view. This can lead to devaluation of property. In other cases, more space is needed to realize the measure, which may determine that the authority must deprive individuals of their land (expropriation). For expropriation and regulation of property, different regimes are applied (Mountfield 2002). Deprivation of possessions leads to compensation based on the market value of the property in all studied countries. The difference between expropriation and the regulation of property is that in the latter case, the ownership is not shifted.

In times of high water discharges, a retention area—often established on private property—is used to temporarily store water to avoid flooding elsewhere. Harm that might arise consists of loss of ownership of property, devaluation of property, and loss of income because of the reduction of accessibility or possibilities to use the land for economic purposes.

We also focus on a specific spatial planning measure that can prevent flooding: the prohibition to build in, or develop, a flood-prone area. The harm may consist of a restriction on the owner’s use of the land in that area; i.e., they may not build or develop the land as they might wish, which may lead to devaluation of the property. A prerequisite for the existence of loss is that there was no prohibition in the area concerned before its designation as a flood-prone area.

The cause of harm is the factual deed, measure, or governmental action, or the written decision in which the action or decision is announced, depending on the legal regime in a specific country. The cause of loss is of crucial importance for compensation. It is necessary to establish the direct connection—causality—between the loss and the cause of loss (*conditio sine qua non*). If this connection cannot be established, no compensation is granted. The injured party can be an individual or a company who suffers loss as result of the measure.

The basic assumption of the *égalité* principle is that compensation is granted to those who have endured a disproportionately large burden or loss caused by activities pursued by the administration for the common good (Fairgrieve 2003:144). The *égalité* principle has some aspects in common with the jurisprudence of the European Court of Human Rights regarding, in particular, the

First Protocol Article 1 of the European Convention of Human Rights (ECHR), but differs on others. The *égalité* principle offers more protection of property rights than the regime of the ECHR (Barkhuysen and Tjepkema 2006, Tjepkema 2013).

The principle of equity is important in many fields of law. “Equity is often referred to as fairness, or a fair judgment or reasonableness” (Lindhout 2015:21). Equity is multifaceted, one of the facets being distributive justice, which refers to the allocation of benefits and costs in a society (Fraser 2009, Di Gregorio et al. 2013). This also relates to fair burden sharing, which is connected to compensation, because when the damages of injured parties are awarded, the burdens are considered to be more equally spread (Thomas and Twyman 2005, Driessen and van Rijswijk 2011). Compensation may thus lead to more equitable flood risk management.

The principle of legitimacy is another relevant legal principle. Buijze (2013:42–43) defines legitimacy as the extent to which “people have a fair chance to exert influence over decision-making, and people agree that an authority should exist because they are convinced that it brings them a net benefit.” van Buuren et al. (2014:1023) put it as follows: “It is government’s duty to use powers only for the reasons for which they are granted, to avoid the abuse of power, and to create a fair, reasonable, and proportionate balance of public and private interests.” These (participation and acceptability) are two of different facets of this principle. Also accountability, transparency, access to information, and procedural justice are part of this principle (Ek et al. 2016b). By taking into account the harm to some parties, not only are the first three facets of this principle addressed, but it also helps to further transparency and accountability, and thus the loss-causing decision might be considered to be more legitimate than it would be if damages are not awarded.

The principle of solidarity is also important because it underpins the compensation regimes of different countries. De Beer and Koster (2009) have introduced the so called one-sided and two-sided solidarity. They define one-sided solidarity as “assisting someone else without expecting anything in return” and two-sided as “[when someone] expects, on balance, to benefit just as much from others as they themselves are contributing” (see also Steinvoorth 1999). They also differentiate between voluntary and compulsory solidarity. Voluntary solidarity is the case when people help others on their own initiative. Compulsory solidarity is organized through the state (De Beer and Koster 2009:12). In flood risk management, one can find a mix of the different types of solidarity (Keessen et al., *unpublished manuscript*).

METHODS

We take a legal approach. In legal studies, a well-known method is legal comparison (Ancel 1971, Gorré et al. 1991, Bussani and Mattei 2012). It is used to elaborate on the differences and similarities of legal systems in various countries. The aim of a legal comparison is not only to gain insight into different legal systems but also to understand how legal systems function. This may enable the understanding of, for example, a specific policy instrument in the legal context in which it is used. Moreover, this may help to improve or reform the legal system and to achieve an optimization and harmonization of law, which may facilitate the implementation of European directives, such as the Floods

Directive, in a comparable way. Finally, this may also improve the implementation of flood risk management strategies in transboundary river basins. In order to get a comprehensive overview of specific legal regimes, an indepth analysis of primary and secondary sources—domestic legislation, jurisprudence, doctrine, and policy documents—must be conducted. This method is characterized as a desk-study approach. By studying not only the legislation of the central government but also decentralized legislation, guidance documents, policy, and case law, this method gives a broad impression of a specific aspect of a country’s legal system.

The legal systems of five countries and one region within a federal country are studied. The countries Belgium, England, France, the Netherlands, Sweden, and Poland are part of the consortium of the STAR-FLOOD-project. For the purpose of this paper, these areas were chosen because their preflood compensation regimes show interesting similarities and differences. The countries differ institutionally, from highly centralized (England) to decentralized (Sweden) to a federal state (Belgium), and differ from common law (England) to civil law (the other countries), and have some underlying principles in common. Also, the geographical aspects of the countries selected differ highly from densely populated (Flanders and the Netherlands) to sparsely populated (Sweden). Poland differs from a historical point of view, as it is the only country with a Communist background, and the current legal system is still developing. These reasons add to the representative character of the lessons learned in the broader context. The Belgian situation differs from the other countries. In Belgium, competences with regard to environmental issues, water management, and flood risk management pertain to the three regions: the Flemish Region, the Walloon Region, and the Brussels Capital Region. These three regions have thus developed their own sets of legislation and policies in this regard. For the sake of comparison, the Flemish Region will constitute the territorial unit of analysis.

In order to explain the differences and similarities, not only must the legal compensation regimes be studied but also the way in which the general regime is applied in concrete situations. We consider three typical preventive measures: a dike strengthening, a creation of a retention area, and a spatial planning measure. These three measures have been chosen because they represent different preventive flood risk management strategies that are carried out by administrative authorities with responsibilities in the field of flood risk management. To answer the research question, it would not be logical to consider mitigation measures that have to be realized by private parties because in that case the harm would not be caused by the administration and therefore will not be compensated by them. Another reason for these three measures is that in principle they lawfully cause loss to private parties because in most cases they affect private property. The final reason is that other similar measures—e.g., the construction of a dam—could be included under one of these three measures.

The scrutiny of the three measures is necessary to achieve an insight into the explanation of the general compensation regimes regarding flood risk management. Only when we know how the legal compensation regime is applied in a concrete situation can we explain properly how a system works in practice.

RESULTS

Principles

General legal principles underlie specific legal regimes or rules (Dainow 1966, Merryman and Pérez-Perdomo 2007). It is relevant to address the dominant principles because they can constitute the explanation of how a specific regime is established and how rules are applied. In this section, the dominant principles of compensation regimes are described.

Property rights are protected by law in all the examined countries. In Belgium, France, the Netherlands, and Poland, the protection is codified in the Constitution and in the Civil Code. In Sweden, it is codified in the Instrument of Government, one of the four constitutional instruments. In England, it is a long-standing principle of Common Law that no one should be deprived of their property by a public authority against their will unless Parliament has expressly provided for such action, which is in the public interest, and compensation should normally be available from the state (Blackstone Commentaries 1778, and confirmed most recently in the UK Supreme Court case of *R [Sainsburys Supermarkets] v Wolverhampton CC*, [2010] UKSC 20). The countries are all party to the European Convention on Human Rights, which also aims to protect property rights; the provisions of the ECHR Articles 6, 8, and especially Protocol 1 Article 1 are consequently applicable.

The protection of this right commonly entails that if the right is breached, proper—and in most cases, full—compensation must be granted. Where expropriation is necessary—i.e., land is needed to realize a measure—all countries provide compensation. Compensation for expropriation has a reparative function: the person affected should not be left in a worse position than those who can avoid it (Ljungman and Stjernquist 1968, Howarth 2002, Waline 2007, Leonski 2009, Ignatowicz and Stefaniuk 2012, Pauliat 2012, Radwański and Olejniczak 2012, Hostiou 2013, Bengtsson 2015, Garlicki 2015).

In England, the Common Law principle is that the state must be authorized by a specific piece of law, such as the water or planning legislation, which then allows the public authority, with the Minister's approval, and in the public interest, to take control of the use of the land or property, provided it normally compensates the owner or occupiers. The Human Rights Act 1998 also makes it clear that all public authorities must respect articles of the ECHR. These are, consequently, a part of the law. The calculation of the amount of compensation is based on the equivalence principle; i.e., that the person suffering damages must be no worse or better off financially than before the Authority's action (DCLG 2011). Generally, the amount of compensation awarded is for the loss arising from the difference between the market value before and after the work is done (Howarth 2002).

In Flanders, there is no comprehensive no-fault liability compensation scheme with clear-cut criteria and thresholds applicable. Flanders has developed a whole array of flood risk management instruments, ensuing mainly from the 2003 Decree Integrated Water Policy—for example, the water test, signal areas, and expropriation. All of these policy instruments have, be it directly or not, an effect on how citizens enjoy their properties and how the landscape is categorized in terms of planning destinations. Most of these provide for some sort of

compensation. The application of the *égalité* principle to environmental and spatial planning law and practice was not considered until recent judgments by the Court of Cassation and the Constitutional Court. In its 2010 judgment, the Court of Cassation stated that a citizen might be granted compensation for burdens that are greater than those justified by the public interest, even when there is no explicit legal basis for this compensation (Court of Cassation of 24 June 2010, C.06.0415. N). In 2012, the Constitutional Court found that the equality of burden sharing generally applies to easements of public interests (Constitutional Court, 19 April 2102, 55/2012). This judgment by the Court broadened the scope of the *égalité* principle to restrictions of property in the public interest in general (Van Hoorick 2012). It is expected that the principle might be applied for pre-flood harm as well, but currently no cases have been brought up for court.

In France, property rights are guaranteed by the Declaration of Human and Civil Rights of 26 August 1789 (art. 17), which is part of the constitutional block. Yet, this right is directly counterbalanced by another principle: the public interest, whereby the administration can infringe property rights (Truchet 1999). This principle is defined by the administration, under the control of the administrative judge, in order to leave a margin of maneuver. If the infringement is excessive (i.e., expropriation), a just and prior indemnity has to be paid to the landowner. Yet, in case of a low infringement, the administration does not have to compensate through an easement restraining the land use. This is a specific application of the *égalité* principle, according to which citizens have to bear all the loss caused by the administration through, for instance, a non *aedificandi* easement contained in a Plan de Prévention du Risques Inondation (PPRI) (Council of State, 29 December 2004, *Sté d'aménagement des coteaux de Saint-Blaine*, n° 257804). However, the administrative judge considers that compensation is required if the loss is abnormal and special (for public utility easements based on the Environmental Code; see Council of State, 3 July 1998, Bitouzet). The Parliament has also created a restrictive compensation regime for urban easements in planning documents (Urban Code, art. L. 105-1). Thus, compensation of loss caused by pre-flood measures is exceptional. Only in the case of expropriation, (full) compensation is granted.

Dutch flood risk management is characterized by the principle of solidarity (Keessen et al., *unpublished manuscript*). Landholders pay for the protection of the area of land in which they live or have their property, and which is managed by a regional water authority (van Rijswick and Havekes 2012, Nehmelman 2014, Wiering et al. 2015). The state also partly contributes financially to the construction and maintenance of primary flood defense structures (Explanatory Memorandum of the Water Act. The underlying rationale is that all Dutch citizens benefit from a safe country, so they should all contribute to keeping the Netherlands habitable. This approach can be explained by the fact that large parts of the Netherlands (about 66%) are extremely vulnerable to flooding and that a serious flood would cause harm to the society as a whole (Kaufmann et al. 2016). The thus provided solidarity regards not only financial contributions (taxes) to water management, because it ensures that all taxpayers contribute to flood risk management, but also has an equality aspect because all Dutch inhabitants are granted a certain level of safety. This

can be considered a compulsory two-sided solidarity (Keessen et al., *unpublished manuscript*). Closely connected to this rationale is the preflood compensation regime, which is developed mainly within the framework of water management. Loss resulting from measures taken in the field of flood protection is usually compensated. Mainly developed within the framework of water management, loss resulting from measures taken in the field of flood protection is usually compensated. The Dutch have adopted the *égalité* principle to create a generally quite well-balanced preflood compensation regime (OECD 2014, Wiering et al. 2015). The core of this principle is to compensate those who have endured a disproportionately large burden or loss caused by activities pursued by the administration for the common good (Fairgrieve 2003:144, Tjepkema 2010, van Doorn-Hoekveld 2014). The principle is codified in legislation, such as the Water Act (paragraph 7.3), the Spatial Planning Act (paragraph 6.1), and the General Administrative Law Act (title 4.5, not yet into force). Arguably, a consequence of this system is that the public-private divide is out of balance. Compensation is fully the responsibility of the government, and private parties have almost no responsibility of their own to prevent floods or to undertake recovery measures. This differs from countries with a more elaborated *ex post* compensation regime, such as Belgium, England, and France. In the case of private insurance systems, private parties are more likely to take preventive measures themselves (Suykens et al., 2016). This also has consequences for flood risk management in general, because at first glance, people assume that there is no need to gain awareness of flood risks in their vicinity.

Poland takes a different approach to the issue and places compensation within the proportionality principle. In Poland, the principle of subsidiarity is laid down in the Constitution, and the principle of proportionality is derived from Article 31 paragraph 3 of the Constitution. Restrictions on the exercise of constitutional freedom and rights with regard to flood prevention can be established but only by a form of an Act and only if it is necessary to prevent or reverse the consequences of a flood. With regard to ownership, this principle is further strengthened by Article 21 paragraph 2 of the Constitution, which states, “Expropriation may be allowed solely for public purposes and for just compensation,” and in Article 64 paragraph 3, which stipulates, “Property may only be limited by law and only to the extent that it does not violate the essence of property rights.”

In Sweden, compensation resulting from lawful actions is distinguished from the one resulting from unlawful actions (Bengtsson 1991, Hellner and Radetzki 2014). The protection of property rights is of most relevance for the topic at hand. In order to satisfy the public interest, the constitutional provision on the protection of property applies in the case of both expropriation and restriction of use of land and buildings. In relation to expropriation, the provision states that the individual must be guaranteed “full compensation for his or her loss” (Ch. 2, s. 15, par. 2 Instrument of Government). Compensation in the case of restrictions to the use of land is constitutionally ensured insofar as the restrictions entail that “the ongoing land use in the area in question is substantially impaired” or result in “considerable loss in relation to the value of the area in question”; the level of compensation in these cases is determined “in accordance with principles laid down in law” (Ch. 2, s. 15, par. 2 Instrument of

Government). There is, however, no constitutionally protected right to compensation in the case of restrictions that are grounded on the “protection of human health or the environment or on safety reasons” (Ch. 2, s. 15, par. 3 Instrument of Government). Here, the right to compensation is thus regulated entirely by law, and the principle is that no compensation is due (see Government Bill 2009/10:80). In summary, even when the property is not transferred but the freedom to the use of property is otherwise affected by a specific measure, compensation may be due in Sweden.

Compensation regimes

Dike strengthening (Table 1)

Under the so-called English Compensation Code, a large body of statutes, case law, delegated legislation, and government guidances, it is possible that the acquiring authority (AA), which includes local authorities, the Environment Agency, or, where they exist, Internal Drainage Boards, will be forced to compensate the owner or long lessee of the land (including buildings) for the compulsory purchase of the land or the loss of certain rights over the use of land, including buildings. Especially important here are the powers of the Environment Agency to organize the compulsory purchase of land or rights over the land, termed Flood Risk Management Works Orders, acquired for flood-related work (S 154 and 165 and Schedule 19 of the Water Resources Act 1991 [as amended]). Local authorities have similar powers (S266 Town and County Planning Act 1990). The Internal Drainage Boards again have powers similar to those of the local authorities in relation to flood prevention measures in nonmain rivers under the Land Drainage Act 1991.

These legislative provisions provide that, subject to a Minister’s approval and provided it is in the economic or environmental interest of the area, the AA has wide powers to order works or acquire land or interests over the land. The AA may also have to compensate for the loss of rights over the land rather than outright purchase under S7 and S10 of the Compulsory Purchase Act 1968, and where harm is caused by blight or disturbance, under the latter Act or S5 of the Land Compensation Act 1965. Under the Planning Act 2008, where there is a development of a Nationally Significant Infrastructure Project, such as a new airport or major road, the projects will be authorized under this Act, and so will the compensation.

France has a very complex system of ownership of dikes, as dikes may be owned by private owners, an association of private owners, a public authority (state, region, department, commune, public establishment of intercommunity cooperation), or an association of public bodies. Nowadays, for 45% of the dikes, the owner is unknown (CEPRI 2008:45). These are called “orphan dikes” (Larrue et al. 2016:160). In order to strengthen a dike, expropriation or a public easement is necessary. In this case, different types of actions are possible:

1. expropriation from private landlords in order to have no constructions behind dikes and to control the land;
2. implementation of urban planning’s easements (the norms contained in the urban planning documents [Local Urban Plan]) and public utility easements (are the norms contained in other legislations [Environmental Code]) in order to partly control the area and the dike; and

Table 1. Dike strengthening.

| | England | Flanders | France | The Netherlands | Poland | Sweden |
|---|---|---|---|---|--|--|
| Competent authority for realization of dike strengthening | Environment Agency or Lead Local Flood Authorities or Inland Drainage Boards | Regional water managers | Private owners, association of private owners Public authority (state, region, department, commune, public establishment of intercommunity cooperation association of public bodies) | Regional or national water manager | Director of Regional Water Management Board Provincial Authority of Drainage, Irrigation and Infrastructure | Revision of permit can be sought by Swedish Environmental Protection Agency, Swedish Agency for Marine and Water Management, Kammarkollegiet, Swedish Civil Contingencies Agency, County Administrative Board, municipality (in certain cases) |
| Competent authority for compensation | The authority that is also competent for the realization of the damage-causing decision | The authority that is also competent for the realization of the damage-causing decision | The authority that is also competent for the realization of the damage-causing decision | The authority that is also competent for the realization of the damage-causing decision | Regional Water Management Board | The permit holder may have to compensate third parties. Compensation is decided by the court. Revision of water operation permit |
| Cause of loss | The actual time of notice or entry on land or vesting declaration for the Compulsory Purchase Order or General Flood Risk Management Works | The project plan | Administrative police decision Public easement Administrative decision related to public works Declaration of public utility | Project plan | Project plan | |
| Loss | Loss of value of land acquired Loss of interests over the land Blight from the works Disturbance Costs of relocation or extinguishing Home loss—extra 10% of value | Devaluation of property Partial or full dispossession of ownership | Dispossession of ownership Restriction of ownership right: leads to a devaluation of property and a possible loss of income | Devaluation of property Loss of income Dispossession of ownership | Devaluation of property Loss of income Dispossession of ownership | Dispossession of ownership total or in part; damages to another's property caused by the modification of the structure |
| Injured party | Owners, leaseholders, some tenants | Property owners Businesses | Property owners, owners of real property rights and “personal” rights (e.g., tenant) Businesses | Property owners Businesses | Property owners Businesses | Landowners Holders of special rights |
| Compensation regime | Equivalence | Expropriation Égalité principle | Expropriation Compensation of public easement Compensation in case of public works damages | Égalité principle Expropriation | Expropriation | For dispossession: expropriation principles For damages: tort law principles |
| Relevant principle | Equivalence plus 10% for home loss and extra payments for businesses and agricultural owners in certain circumstances | Protection of property rights: Égalité principle | Protection of property rights Equality vis-à-vis government encumbrances | Égalité principle Protection of property rights Solidarity principle | Protection of property rights Proportionality principle Subsidiarity principle | Protection of property rights Compensation |
| Who benefits from the damaging-causing measures | Private parties living and working in the protected area | Inhabitants of area protected by dike | Private parties living and working in the protected area | Private parties living and working in the protected area | Private parties living and working in the protected area Municipalities in protected areas | Persons in the area protected by the structure |

3. adoption of administrative police measures in order to force the owner to do the necessary maintenance works.

In the first case, expropriated parties will be fully compensated. However, devaluation of property and a possible loss of income will not be automatically compensated. When an urban planning's easement is acquired, no compensation is provided, except if the very restrictive conditions contained in the article L. 105-1 Urban Code are met. The justification is that compensating all urban planning's easements would be an important constraint on land use planning (Ministerial Reply, Official Journal of the French Assemblée Nationale, 16 July 1977, p. 4741). In the case of a public utility easement, compensation is possible.

The Flemish and Dutch cases are quite similar. The Dutch regional water authorities and Flemish water managers are responsible for strengthening flood defense structures and are the competent authority to compensate the resulting loss. In the Netherlands, injured parties can ask for compensation based on the codified *égalité* principle (Water Act). Recent Flemish case law has applied the *égalité* principle to restriction of property rights ensuing from a lawful governmental Act, but this has not yet been consolidated in the legal regime regarding dike strengthening. The Dike Decree states that regional water managers should compensate for loss of value of the property, and can be obligated to buy or expropriate it (Dike Decree 1996). In the Flemish Region, expropriation is governed by legislation and gives right to compensation, just as in the Netherlands.

In Poland, compensation for flood protection expropriation is granted mainly by the Special Rules for the Implementation of Investments Act. It regulates acquisition of land required for flood protection constructions and it facilitates the construction process. It is a *lex specialis* to the Real Estate Management Act. Besides expropriation, authorities could also compensate loss according to the contract responsibility, although it is unlikely that authorities would sign a contract with a particular individual or company with such provisions.

In Sweden, the construction and alteration of structures in water areas, as well as measures taken to provide permanent protection against water, are considered "water operations," and thus require a permit (Ch. 11, s. 2, 3, and 9 Environmental Code [1998:808]). Water structures can be constructed and consequently owned by private or public persons. The structure is owned by either the owner of the land on which the structure stands or the holder of right (e.g., a special right of coercion) on the basis of which the structure has been constructed on land belonging to another. Landowners can even come together in joint property associations to share the benefits and costs associated with a defensive structure. The owner is obliged to maintain the structure and is not compensated for the connected costs; if someone other than the owner of the water structure has obtained a right to use the structure, both are in principle responsible for the maintenance (Ch. 11, s. 17 Environmental Code).

For example, if the owner of a structure wants to strengthen or broaden it, they will generally have to obtain a permit to do so. The supervisory authority (normally a County Administrative Board) may issue orders and prohibitions on safety-increasing measures, but only in relation to safety classified dams (Ch. 26, s. 9 Environmental Code). Moreover, certain public authorities

have the power to seek a revision of an existing permit, with the purpose of, for example, improving the safety of the structure (Ch. 24, ss. 5 and 7 Environmental Code). The revision of water operation permits by initiative of authorities is however rather unusual (see for example, SOU 2014:35).

If to carry out a strengthening measure, the permit holder takes possession, or otherwise damages another person's property, they will have to compensate that person (Ch. 31, ss. 16 and 17 Environmental Code). This is also applicable in case the measure is taken on the basis of a permit revision initiated by a public authority (Ch. 31, ss. 20 para. 2–3 and 21, para. 2 Environmental Code). The Expropriation Act (1972:791) is principally applicable in matters of compensation in connection with water operations permits and revisions (Ch. 31, s. 2 Environmental Code). Bengtsson et al. (2015) explain, however, that expropriation rules are applicable in case of compulsory purchase or comparable means of taking possession over another's land; compensation in case of other damages instead follows tort law rules (cf. Bengtsson 2010). Compensation is paid only for the loss that remains after the permit holder has taken preventive or remedial measures (Ch. 31, s. 16 Environmental Code).

In cases where a permit revision initiated by public authorities results in, for example, a loss of water or a restriction in the permit holder's right to regulate the water flow, the authority that has sought the revision may have to compensate the permit holder; however, "no compensation is due to the extent the loss or restriction can be deemed an improvement of the safety of the water structure" (Ch. 31, ss. 20 para. 1 and 21 para. 1 Environmental Code). Since this would be the case when the revision seeks only a strengthening of the structure, it is likely that no damages would be awarded to the permit holder. Even when compensation is due to the permit holder, the compensation is not full (see Ch. 31, s. 22 Environmental Code).

Creation of a retention area (Table 2)

In England, retention areas may be created by either the Environment Agency under water legislation or by Local Authorities under the planning regime; more usually they are created by negotiated agreements and compensation as under the legislation if a Compulsory Purchase Order (CPO) had been used. The compensation regime, which is applicable for loss as a result of a dike strengthening project, is also applied for harm caused by the creation of a retention area. There is no compensation for the designation of such areas in the Local Plan—only if it is actually used as a retention area and causes harm (R Lindley v East Riding CC [2016] UKUT 6).

In France, retention areas can be created through a water management plan, such as the Water Management Master Plan (*schéma directeur d'aménagement et de gestion des eaux [SDAGE]*) or Local Water Management Plan (*schéma d'aménagement et de gestion des eaux [SAGE]*), or through other public utility easements, such as a temporary water retention zone (ZRTECR). In the last case, compensation can be obtained by a private arrangement between the public body and the private owner, or if that is not possible, it can be fixed by the expropriation judge. The Environmental Code clearly states that compensation is possible only if the public utility easement creates a material, direct, and certain injury (art. L. 211-12 Environmental Code). Yet, if the retention area is not created on the basis of this legal

Table 2. Creation of a retention area.

| | England | Flanders | France | The Netherlands | Poland | Sweden |
|---|---|--|--|---|---|---|
| Competent authority for realization of retention area | Environment Agency Lead Local Flood Authorities Inland Drainage Boards | The water managers (regional, provincial, municipal) | State, local authorities, and intercommunality bodies | Regional water manager (national water manager) | Regional Director of Water Management Board | Municipality |
| Competent authority for compensation | The authority that is also competent for the realization of the damage-causing decision | The initiative taker (public authority) that is mentioned in the water management plan | The authority that is also competent for the realization of the loss-causing decision | The authority that is also competent for the realization of the loss-causing decision | Provincial governor | The authority that is also competent for taking of the loss-causing decision |
| Cause of loss | The actual time of notice or entry on land or vesting declaration for the Compulsory Purchase Order or General Flood Risk Management Works | Spatial zoning plan (designating the retention area) Project plan (activating the floodplain) Activation of the area (inundation) | Water management plan (Water Management Master Plan, Local Water Management Plan) Administrative decision of the state (e.g., public easements, Projet d'Intérêt Général, Déclaration d'Utilité Publique) | Ledger + spatial zoning plan (designating the retention area) Project plan (realization of area) Duty to tolerate (inundation of area) | Municipal spatial zoning plan (designating the retention area) Project plan (realization of area) Duty to tolerate | Water operation permit |
| Loss | Loss of value of land acquired Loss of interests over the land Blight from the works Disturbance Costs of relocation or extinguishing Home loss—extra 10% of value | Dispossession of property (expropriation) Loss of income for users of agricultural land and forest lands when floodplain is activated | Devaluation of property (restrictions of use through public easements) Dispossession of ownership Restriction of ownership right Real damage to property (loss of harvest) | Devaluation of property (restrictions of use) Dispossession of ownership Duty to tolerate a culvert or other hydraulic works Real damage to property (loss of harvest) | Devaluation of property (restrictions of use) Dispossession of ownership Duty to tolerate a culvert or other hydraulic works Real damage to property (e.g., loss of harvest) | Dispossession of ownership total or in part Harm to another's property |
| Damaged party | Property owners Leaseholders Tenants | Property owners Farmers Users of forestry land | Property owners Farmers Businesses | Property owners Farmers Businesses | Property owners Businesses | Landowners Holders of special rights |
| Relevant principle | Equivalence | Égalité principle Protection of property rights | Protection of property rights Equality vis-à-vis government encumbrances | Égalité principle Solidarity principle | Protection of property rights expropriation compensation | Protection of property rights Compensation |
| Legal compensation regime | Equivalence plus 10% for home loss and extra payments for businesses and agricultural owners in certain circumstances | Expropriation (for dispossession) Compensation for easement Égalité principle | Expropriation (for dispossession) Compensation of public easement (for limitation of use) Compensation in case of public works damages | Égalité principle Expropriation (for dispossession) Full compensation for loss caused by inundation | The right to property expropriation compensation Expropriation (for dispossession) Compensation for loss caused by inundation | For dispossession: expropriation principles For damages: tort law principles |
| Who benefits from the loss-causing measures | Private parties living and working in the protected area | People living and working in the surroundings of the retention area | Private parties living and working in the protected area. The damaged parties will probably have no direct benefits from this measure. | Private parties living and working in the protected area. The damaged parties will probably have no direct benefits from this measure. | Private parties living and working in the protected area | Persons in the protected area. Damaged parties will probably have no direct benefits from this measure. |

disposition, the loss is not compensated in the name of the public interest. This is why French public law is always presented as an unequal law (Cans et al. 2014).

In Flanders, two causes of loss can be identified: the designation of the area in a spatial zoning plan and the activation of the retention area by a project plan. However, devaluation because of the designation will not be compensated on the basis of the Decree Integrated Water Policy but may be compensated on the basis of the general spatial planning legislation (Flemish Code Spatial Planning) if the parcel was initially eligible for construction and this is no longer the case due to the spatial plan in question (Flemish Spatial Planning Code, art. 2.6.1) (De Smedt 2014). The explicit right of compensation ensuing from the Decree Integrated Water Policy (art. 17) applies only to farmers and users of forestry land in case of activation of the designated floodplain.

The Dutch consider not the factual deed, measure, or governmental action but the written decision in which the action or decision is announced as the cause of harm; e.g., in the case where a restriction of property leads to devaluation of that property, the spatial zoning plan in which the restriction is included is considered to be the cause of loss (van Doorn-Hoekveld 2014). The creation of the retention area is laid down in a ledger (map) of the regional water authority and a spatial zoning plan of the municipality. For the devaluation of property, the injured party may choose which route they want to take to get compensation: by the regime of the Spatial Planning Act or by the *égalité* principle of the Water Act. The project plan based on the Water Act, which includes the actual “construction” of the area, can also cause devaluation of property, for which the regional water authority is competent to compensate. The last is the real inundation of the area. Only in the last case will full compensation be granted by the regional water authority (van Doorn-Hoekveld and Groothuijse 2015). In the case of retention areas, expropriation is not common.

In Poland, the competent authority which creates the retention area (regional director of the Water Management Board) is not the same as the authority which has to fully compensate the loss (provincial governor). However, if the property is only partially occupied, or the owner cannot use the remaining part of the property for their purposes, the owner can oblige the Public Treasury to purchase the whole property. There is a wide approach on devaluation of property. It includes not only the physical damage to property but also opportunity costs—loss of potential benefits. The loss of potential benefits may be—in certain cases and to a certain extent—taken into account by the experts pricing the value of property.

The creation of retention areas is uncommon in Sweden. It should however be considered that most major rivers in Sweden are regulated except for the purpose of hydropower production; this reduces high flows in the spring but may also intensify risks in the summer and fall (see Thorsteinsson et al. 2007). Johannessen (2015) has studied flood risk management practices in a highly flood vulnerable Swedish municipality, and concluded that they are focused on flood control in the urban area, and thus neglect opportunities for flood abatement in the river basin through, for example, the creation of wetlands in upstream forest and farming areas. The author indicates that while there are compensation schemes for farmers that manage wet grasslands or create

wetlands, they would not be applicable for flood buffering services. The creation of a retention area by a public authority (most likely a municipality) would require a water operations permit. This would activate the compensation rules that have been explained in the previous section.

Spatial planning measures (Table 3)

In England, under the planning legislation, there is no right to compensation in general for the granting or refusal of planning permission. Equally, no compensation is incurred by the drawing up of a local plan. There are slightly different rules in relation to claiming any compensation depending on the type of land or the rights over the land being acquired, such as residential, agricultural, or business land, or whether the claimant is an owner, leaseholder, or mere occupier. Certain categories of owners and long lessees may claim compensation, even if their actual land or rights are not being compulsorily purchased. Residential owner-occupiers of private property or business premises may claim if the value of their land is reduced because of the planning development by serving Blight Notices under Schedule 13 of the Town and Country Planning Act 1990 on the AA. This requires the AA to purchase the property at its so-called “Untainted Value” or the previous value. Others who have their land devalued due to partial CPOs or due to the use of public works may also claim for the reduction in value of their land. If the AA decides against such compensation or the amount, or refuses to acquire the property, there are the possibilities of challenges to the Upper Tribunal, lands chamber. Compensation may include loss of profits or for goodwill of the business, but each case will depend on the claimant proving loss (Moore and Purdue 2015).

In France, the restriction of the right to build or change a building imposed by a general planning document (Plan Local d'urbanisme) or a sectorial planning document (Plan de Prévention des Risques) is a major cause of pre-flood harm. In most cases, these restrictions can cause harm because the property right is partly limited. The French Parliament has chosen not to compensate loss caused by an urban planning's easement (art. L. 105-1 Planning Code). However, the administrative jurisdiction created an exception in order to allow compensation in very limited cases (Council of State, 3 July 1998, *Bitouzet*, n°158592): when the easement violates an existing situation or acquired rights, or when it leads to disproportionate loss to the general interest justifications. In this case, these exceptions have been translated into the Urban Code, but they are very limited, and compensation is extremely rare.

In the Flemish Spatial Implementation Plans (SIPs), the municipality, province, or region can include prohibitions to build in specific areas. To compensate this loss in value, planning blight (loss caused by the alteration of spatial plans) is awarded. Planning blight is granted when, on the basis of an operational SIP, a lot is no longer eligible for a permit to build or to parcel, whereas the day prior to the coming into force of the SIP it was eligible for a permit to build or to parcel. The plan damage compensation is due from the authority that made up the SIP that causes the plan damage. The sum amounts to 80% of the loss in value. However, this compensation is subject to strict conditions, and compensation is not always due; e.g., in case of a delimitation of a riparian zone or a flood area in a SIP, the owner or user of the property must then choose between the plan loss

Table 3. Spatial planning measures.

| | England | Flanders | France | The Netherlands | Poland | Sweden |
|--|---|---|---|---|---|--|
| Competent authority for spatial planning measure | Lead Local Flood Authorities local planning authority and Environment Agency, with minister's approval | Municipality, province, region | State Communes or intercommunality bodies | Municipality | Municipality | Municipal planning and building committee Municipal assemblies |
| Competent authority for compensation | Acquiring Authority | The authority that has drawn up and issued the spatial implementation plans | No compensation, except in the case of the illegality of the spatial planning measure | Municipality (probably the water manager that forced the municipality to take this measure will pay eventually) | Provincial governor | Municipality |
| Cause of loss | No compensation for the actual plan, only for the flood works, if relevant | Spatial implementation plan | Local plan Flood risk prevention plan | Spatial zoning plan | Local spatial zoning plan | Change or revocation of a detail plan during its implementation period (5–15 years) |
| Loss | Devaluation of property | Devaluation of property: planning blight is granted when, on the basis of a spatial implementation plan, a parcel is no longer eligible to be built upon, while the day prior to the entry into force of the final spatial implementation plan, the parcel was indeed eligible for a building permit (however, eight exception regimes apply) | Devaluation of property (loss of possibilities to develop land) Restriction of ownership right | Devaluation of property (loss of possibilities to develop land) | Devaluation of property (loss of possibilities to develop land) | Devaluation of property and other harm caused by the measure; If the decision causes the use of the property to be significantly hindered, the municipality must redeem the land. |
| Damaged party | Residential owner occupiers of private property or business premises | Private owners Businesses | Property owners | Property owners Businesses | Property owners Businesses | Landowners Holders of special rights |
| Legal compensation regime | Planning blight | Compensation for less value: property law and égalité (has to go through judicial proceedings) | No legal compensation regime because of the public interest | Égalité principle (based on the <i>Spatial Planning Act</i>) | The right to property expropriation compensation | Expropriation principles (exceptions applicable) |
| Relevant principle | Equivalence plus 10% for home loss and extra payments for businesses and agricultural owners in certain circumstances | Resent rise of "equality of citizens before public burdens," but not absolute | Public interest | Égalité principle Solidarity principle | The right to property expropriation compensation | Protection of property rights Compensation |
| Who benefits from the measures | Those protected by the future restrictions | Long-term benefits for the community as a whole | People are protected in the future because they will not be flooded, but at the moment they face the restrictions, they will not have any benefits. | People are protected in the future because they will not be flooded, but at the moment they face the restrictions, they will not have any benefits. | People are protected in the future because they will not be flooded, but at the moment they face the restrictions, they will not have any benefits. | People are protected in the future because they will not be flooded, but at the moment they face the restrictions, they will not have any benefits. |

compensation or the duty to buy/duty to compensate pursuant to Article 17, Decree Integrated Water Policy. The rise of the *égalité* principle in environmental and spatial planning law might provide more traction for compensation, but currently this is not consolidated in legislation. The ruling of the Constitutional Court (19 April 2102, 55/2012) is relevant in this respect. The Flemish government had argued that it is not obliged to compensate for restrictions to property rights, such as building prohibitions, when this is done in the public interest. However, the Court stated that a building permit constitutes a property right in the sense of the First Protocol to the ECHR. Thus, a building prohibition with respect to property in a buildable zone constitutes an interference with the right to the undisturbed enjoyment of the property. The Court deemed that a lack of compensation in this regard could not be reasonably justified and was thus in violation of Articles 10 and 11 of the Constitution. Planning blight is important with respect to the instrument of signal areas (areas in which a contradiction may occur between the spatial development perspectives and the interests of the water system). These areas are not developed and may, due to their natural characteristics, be beneficial in tackling flood risks but have a “hard destination” (e.g., building or industrial zones). The measures applicable to these areas should thus be thoroughly scrutinized and followed up. The Flemish government has recently reoriented the Rubicon Fund, which is a public fund created following the 2002 floods to fund investments in flood risk management, to partly alleviate the financial burden attached to these signal areas (art. 3 Subsidies Order of the Flemish Government 2014). Up to 60% of the amount of compensation in the context of signal areas paid by the provinces and municipalities can be reimbursed through this fund. Yet also here, there are strict procedural requirements (Order of the Flemish Government 2014).

In Dutch spatial zoning plans, zones in which it is prohibited to build can be included. In that case, owners of land that cannot be developed any more in the future can claim the compensation of planning blight by the competent municipality. This can cause tension between the municipality that is competent to make spatial zoning plans and water authorities who ask them to include these restrictions. If the restrictions were included in a water plan of the water authority, the latter would be responsible for the compensation of loss. However, the municipality could make an agreement with the water authority that requests the change in the spatial zoning plan, in which the water authority would pay the compensation of planning blight instead of the municipality.

In Poland, harm caused by restrictions based on a spatial zoning plan is compensated by an instrument provided by Articles 36 and 37 of the Spatial Planning Act. According to Article 36 paragraph 1 of the Spatial Zoning Plan Act, if, in connection with the adoption of the local spatial zoning plan or its modification, use of the property or part of it as usual or compatible with existing destination has become impossible or significantly limited, the owner or usufructuary of real estate may demand compensation from the municipality for actual damage or purchase of real estate or part thereof. In accordance with Article 36 paragraph 2, implementation of the demand referred to in paragraph 1 may also be done by offering the municipality to the owner or usufructuary a replacement property. Article 36 paragraph 3 states that if, in connection with the adoption of the local spatial zoning plan or its modification, property value has

decreased, and the owner or usufructuary disposes of the property and did not benefit from the rights referred to in paragraphs 1 and 2, they may require compensation from the municipality for the amount equal to a decrease in property values.

Swedish planning and building legislation—mainly the Planning and Building Act (2010:900)—builds on the principle that landowners must be compensated only in case of restrictions to the present land use; they are normally not entitled to compensation for the loss of values based on expectations of a change in land use (Bengtsson 2015). Consequently, when change in the present use of the land is not allowed, for example, when a person is not allowed to develop an area that is undeveloped, there is generally no right to compensation. Every municipality must have a comprehensive plan that establishes the overall land use for the whole municipality; this plan is not binding (Ch. 3, ss. 1–3 Planning and Building Act). A cohesive development, for example, a new urban area, necessitates a so-called “detail plan,” which is the primary form of legally binding planning in Sweden. A person who wants to develop an area can initiate the process for adopting a detail plan, but the municipality ultimately decides if the plan will be adopted. A detail plan can create a right (or sometimes even an obligation) for the municipality to redeem a certain piece of land; e.g., where a public area will be located, which in itself generates an obligation to compensate the landowner (Ch. 6, s. 13 and Ch. 14, s. 14 Planning and Building Act). The detail plan also gives the right to develop (i.e., a building right) under the plan’s implementation period. The landowner should apply for a building permit during this period. If the municipality were to change or revoke a detail plan during that time, in a way that the landowner can no longer build, the municipality will have to compensate the loss that this causes the owner (Ch. 4, s. 39 and Ch. 14, s. 9 Planning and Building Act). Compensation is determined following the principles in the Expropriation Act; however, in relation to loss that consists of a reduction in the market value of the property, values based on expectations of change in the land use are not to be taken into account (Ch. 14, ss. 23 and 24 Planning and Building Act). If the use of the land is substantially impaired, the landowner may even request that the land be redeemed (Ch. 14, s. 13 Planning and Building Act).

Similarities and differences of the compensation regimes

Property rights are protected in all selected countries. However, every country also recognizes that property rights may be limited. This limitation must be made by law and serve the public interest, and a proper compensation must be provided. Therefore, all countries have an elaborate regime for compensation in case of expropriation. Only Sweden has a slightly different system, with the constitutional provision even including certain protection against restrictions to the use of land and buildings. In all countries, the compensation of expropriation has a reparative function: the affected person should be left in a financially similar position to that before the expropriation. In Sweden, however, since 2010, the Expropriation Act requires that a 25% supplement above the market value of the property (in case of total expropriation) or the reduction in the market value (in case of partial expropriation) is also granted to the owner. Householders, businesses, and agricultural owners in England can also obtain an additional premium. One can wonder whether this can still be seen as reparative (e.g., Bengtsson 2015).

In France, Flanders, and the Netherlands, the *égalité* principle can be considered to be one of the principles that form the basis for compensation of lawfully caused harm. Only in the Netherlands is this principle extensively elaborated and codified in legislation. In Flanders, the principle has been applied in case law, albeit not specifically with respect to pre-flood loss, and is still developing. In France, the principle exists but is not used to compensate pre-flood damage at all. Where restriction of the use of property is imposed, the legal instrument of easement must be used in France as well as in Flanders. In that case, compensation is provided by the competent authority.

England, the Flemish region, the Netherlands, and Poland also have some other regimes in common: the compensation of planning blight. In these countries, this regime is codified in the Spatial Planning Act, and in Flanders especially, it is rather complicated to get compensation for affected parties. In the Netherlands, this regime is now based on the general *égalité* regime. In Poland, a compensation claim needs to be in accordance with the actual damage of real property.

Explanation of the similarities and differences

The Dutch system of compensation of pre-flood harm is the most elaborate of the selected countries. This is likely because it has been developing over a long period, just as the prevention of flood risks. In the different regulations, criteria^[1] that have to be met are summed up in order to provide for legal certainty and to assure a smoother implementation of flood risk measures in a densely populated country. It should be remembered that flood risk measures will seldom be possible in sparsely populated and not intensively used areas, since more than 60% of the Netherlands is flood-prone and two-thirds of the population lives in these flood-prone areas (Kaufmann et al. 2016). For flood risk management, this means that people should be aware that they live in a flood-prone country that is only habitable thanks to ongoing investments and maintenance in flood safety. Another explanation is the strong feeling of (two-sided) solidarity in the Netherlands. The state provides for safety, and every inhabitant is paying taxes that aim at keeping the whole country safe, not only the area of the inhabitant in question. This is clearly visible in the *égalité* principle as well: every inhabitant benefits from actions taken by the state, so every citizen should also bear some adverse effects of it—also called the normal social risk, but in case these effects are disproportionately large, they should be compensated by general means. This fits in the general no-fault liability compensation regime that is quite generous and has led to a certain “compensation state of mind” in the Netherlands.

Despite the fact that Flanders neighbors the Netherlands and shares many physical similarities, the system is quite different. In comparison with the Netherlands, flood risk management in Belgium in general, and Flanders in particular, has not been such a high priority throughout the past decades. Floods have led to economic damage in the past but have resulted in a relatively low number of casualties (River Basin Management Plan Flemish Part of the Scheldt River 2016–2021). Similar principles and compensation regimes exist, but in Flanders, these have been developed only for pre-flood harm in recent times, through certain high-level judgment with precedence value. This is also connected to developments in the insurance system: compensation in Belgium entails ex post loss—so, after a flood has occurred. For

ex post damage, solidarity is one of the cornerstones of the compensation regime. Since the amendment to the Insurance Act through the Act of 17 September 2005,^[2] ex post compensation has been transferred from the public sphere to the private insurance market (Suykens et al., 2016). Coverage for floods is automatically and mandatorily included in the fire insurance. Although fire insurance, as such, is not obligatory in Flanders, 90–95% of the households have taken it up. All citizens thus contribute to the flood coverage, although buildings in high-risk zones built after 23 September 2008 might not benefit from caps set on insurance premiums by the Tariff Office. The governmentally administered Disaster Fund functions as a fallback mechanism in case, among other things, insurance thresholds have been exceeded.

The solidarity principle is also very important in France, but contrary to the Netherlands, it is connected to ex post compensation. This can be explained by the constitutional principle to compensate people for loss sustained by a disaster (paragraph 12 Preamble of the 1946 French Constitution). The following *égalité* and solidarity principle were thus connected to ex post loss instead of ex ante loss. Because the current form of flood risk management dates from the 1980s, the development of the compensation regime based on the French Constitution is disconnected from the idea of prevention but is linked to ex post compensation instead (Debates of the National Constituent Assembly of 1946, Pontier 1983, Borgetto 1993). The CAT-NAT regime (n°82–200, 1982), is a public–private partnership, as there is a hybrid insurance system associating insurance companies, which raise the additional insurance premium dedicated to natural disasters. The state ensures the solvency of the system. Insured people have to pay an additional premium, even if they are not facing any natural risk. Just as in Belgium, where there is a private insurance scheme with a public fallback mechanism, this public–private system is used only for ex post compensation. It is not connected to pre-flood compensation because obligations enforced by the French administration are traditionally considered as a public utility easement that cannot be compensated.

England is a country in which historically the responsibility of citizens for themselves, with little interference by the state, is an important notion. This is also the reason that there is an elaborated insurance system available for flood risks. In contrast to Flanders and France, this is part of the private market (Wiering et al. 2015).

The physical characteristics of Sweden differ from those of the other countries. The country has been relatively spared from floods with catastrophic consequences (MSB 2012). Individuals are primarily responsible for the protection of their property; municipalities can take action where it is in the local public interest (Andersson 2009). It is only in recent decades that the issues of flood and flood risk management have begun moving up on the national political agenda, not in the least as a result of increasing awareness of climate change effects (Ek et al. 2016a). The legal framework corresponds to the historical and present flood risk situation in Sweden, but there is reason to suspect that it could be challenged by a future where increasing public action for preventive flood risk management is needed.

Poland historically differs from the other countries. This is a country in transition after being Communist for decades. One of the most crucial values of the Polish Constitution of 1997 (after four decades of unlawful expropriation without compensation during the People's Republic of Poland) is the protection of private property. Now, therefore, only drastic situations such as the State of Natural Disaster or the measures involved in protecting against such a state can justify not only compensation for unlawfully caused harm but also compensation for lawfully caused loss. The system of compensating lawfully caused loss is still developing.

CONCLUSION AND DISCUSSION

The explanation of the differences and similarities of the researched compensation regimes consists of multiple aspects.

Geographical differences are of great importance. The difference between Flanders, England, and the Netherlands, on the one hand, and Sweden, on the other, is significant. In densely populated areas, flood risk management measures are more likely to interfere with rights of private parties than in vast areas with a substantial degree of open space.

However, differences also appear in geographically quite similar countries; e.g., England, Flanders, and the Netherlands. These differences have a legal explanation; it can be found in the principles that underlie the whole legal system of a country, namely, (compulsory) one-sided solidarity versus private responsibility. Again, the Netherlands can be placed on one side of the spectrum, as solidarity plays a very important role in flood risk management as well as pre-flood loss. All Dutch inhabitants contribute to keeping the country habitable, and closely connected to this, to compensation for the loss of some. On the other side of the spectrum, one can find England, with a deep respect for private responsibility, and a historical and political attitude of encouragement of private responsibility and the restriction as much as possible of interference by the state. The differences between Flanders, France, and the Netherlands are of interest since these three also have the solidarity principle as well as the *égalité* principle in common, but these are applied differently. In France, solidarity is connected more to ex post compensation than to pre-flood compensation in which the protection of property rights plays a more important role because of the development of the constitutional principle of solidarity, which is connected to disasters instead of prevention. In Flanders, the general compensation regime, through recent case law, is developing toward a system that is more similar to Dutch pre-flood compensation, in which the *égalité* principle is leading. However, the protection of property rights still plays an important role in pre-flood compensation, and the solidarity principle plays an especially significant role in post-flood compensation. Flanders still has quite a long way to go before the *égalité* principle becomes a fully fledged and across-the-board doctrine with respect to pre-flood compensation.

Property rights are protected in all the selected countries, but in England, Poland, and Sweden, they seem to carry comparatively more weight in pre-flood compensation. All countries pay full compensation in the case of a breach of property rights; e.g., dispossession. In England and Sweden, extra compensation can be offered in specific cases as well, which makes their "rigid"

pre-flood compensation regime more generous than that of the other countries, in which in more cases compensation might be awarded, even though "overcompensation" is exceptional. Of note is that this increased protection of property rights in the case of expropriation and similar measures is a recent development in Sweden.

In conclusion, the explanation of the differences and similarities is multifaceted. Geographical aspects as highly flood vulnerable and densely populated countries and the consequent substantial interference with private rights makes compensation regimes more elaborate. The principles that underlie the compensation regimes are also an important explanatory factor. The dominance of the solidarity principle versus the protection of property rights leads to different compensation regimes. Poland is different in many ways, mainly because of its Communist history and the development of a relatively new compensation regime based on the protection of property rights.

Compensating the loss of some leads to more equity, in the sense that the burdens of pre-flood measures are fairly spread in society. It also leads to an increase of legitimacy. By awarding damages, authorities show that the distributional effects and therefore the interests of the injured parties are thus weighed in the decision-making process. This is especially the case when the competent authority of the loss-causing decision is the same as the one that is competent to decide over the compensation.

We have made a start at filling the knowledge gap concerning the specific distributional effect of "harm caused by pre-flood risk management measures." By looking not only at the compensation regimes in general, but also at three concrete measures, we have painted the picture of how distributional effects are dealt with in the selected countries. The legal comparison method enables us to analyze the differences and similarities between the countries, and to explain them. After identifying the similarities and differences of these systems and their explanation, research can be further developed. An important next step in research on distributional effects can be to examine the connection between pre-flood and post-flood compensation and the explanation as to why one system is chosen in relation to dominant national flood risk management strategies in various countries.

We suggest that distributional effects do not appear only after floods have already occurred, but also in the preventive phase of flood risk management, especially in countries with a strong focus on the prevention of floods; e.g., the Netherlands, where no major flood has occurred in the last decades because of an effective preventive flood risk management system, in contrast with, for example, Poland. It can be expected that the legitimacy of pre-flood measures will be increased by, among other things, a well-developed compensation regime. This specific aspect of pre-flood compensation needs further multidisciplinary research. We also show that other disciplines—for example, economics—should take into account not only the costs of preventive measures but also the loss and the compensation thereof, in order to get a comprehensive overview of the costs and benefits of a specific flood risk management system. Because of its value to the equity, legitimacy, and effectiveness of flood risk management, the aspect of pre-flood compensation can be considered to be the backbone of good preventive flood risk management.

[1] General criteria of the égalité principle in the Netherlands are, among others, the normal social risk, special burden, and risk acceptability (Tjepkema 2010).

[2] Act of 17 September 2005 on the insurance of natural disasters modifying the Insurance Act of 25 June 1992 and the Act of 12 July 1976 on compensation of damages to goods as a result of natural disasters, Belgian Official Journal of 11 October 2005

Responses to this article can be read online at:
<http://www.ecologyandsociety.org/issues/responses.php/8648>

Acknowledgments:

This paper was supported by the European Union's Seventh Framework Programme through the grant to the budget of the Integrated Project STAR-FLOOD, Contract 308364. The authors would like to thank Magdalena Bar and two anonymous reviewers for contributing to the improvement of this manuscript.

LITERATURE CITED

Adger, W. N., N. W. Arnell, and E. L. Tompkins. 2005. Successful adaptation to climate change across scales. *Global Environmental Change* 15(2):77–86. <http://doi.org/10.1016/j.gloenvcha.2004.12.005>

Ancel, M. 1971. *Utilité et méthodes du droit comparé*. Editions Ides et Calends. Newcastle.

Andersson, T. 2009. Ansvar vid naturolycka. Myndigheten för samhällsskydd och beredskap, 476. Karlstad, Sweden. [online] URL: https://www.msb.se/Upload/Forebyggande/Naturolyckor_klimat/nationell_plattform/Rapport_ansvar_vid_naturolycka_webb.pdf

Barkhuysen, T., and M. K. G. Tjepkema. 2006. Aansprakelijkheid uit 'rechtmatige' overheidsdaad: het samenspel tussen de nationale égalité en het Europese eigendomsrecht. *Rechtsgeleerd Magazijn THEMIS*:179–201. <http://hdl.handle.net/1887/12935>

Bengtsson, B. 1991. *Ersättning vid offentliga ingrepp. 2, Allmänna ersättningsprinciper*. Norstedt, Stockholm, Sweden.

Bengtsson, B. 2010. *Nya ersättningsfrågor i fastighetsrätten*. Svensk Juristtidning 726–746.

Bengtsson, B. 2015. *Speciell fastighetsrätt - Miljöbalken*. 11, [omarb. och utök.] uppl. Iustus Förlag AB, Uppsala, Sweden.

Bengtsson, B., U. Bjällås, S. Rubenson, and R. Strömberg. 2015. *Miljöbalken. En kommentar*. Version 1, April 2015 (until supplement 15). Norstedts, Stockholm, Sweden.

Bodansky, D. 1999. The legitimacy of international governance: a coming challenge for international environmental law? *American Journal of International Law* 93(3):596–624. <http://www.jstor.org/stable/2555262>

Borgetto, M. 1993. *La notion de fraternité en droit public français. Le passé, le présent et l'avenir de la solidarité*. LGDJ, Paris, France.

Buijze, A. 2013. *The principle of transparency in EU law*. 's-Hertogenbosch: Uitgeverij BOXPress.

Bussani, M., and U. Mattei. 2012. *Comparative law*. M. Bussano and U. Mattei, editors. Cambridge University Press, New York, USA.

Cans, C., P. Billet, I. Diniz, T. Thouret, and J. Pontier. 2014. *Traité de droit des risques naturels*. Le Moniteur, Paris, France.

CEPRI. 2008. *Les digues de protection contre les inondations. La mise en œuvre de la réglementation issue du décret n°2007-1735 du 11/12/2007*. Paris, France.

Dainow, J. 1966. The civil law and the common law: some points of comparison. *American Journal of Comparative Law* 15:419–435. <http://dx.doi.org/10.2307/838275>

De Beer, P., and F. Koster. 2009. *Sticking together or falling apart?: solidarity in an age of individualization and globalization*. Amsterdam University Press, Amsterdam, The Netherlands. <http://dx.doi.org/10.5117/9789089641281>

Department of Communities and Local Government (DCLG). 2011. *Guidance on compensation for compulsory purchase*. London, UK. <https://www.gov.uk/DCLG>

De Smedt, P. 2014. Towards a new policy for climate adaptive water management in Flanders: the concept of signal areas. *Utrecht Law Review* 10(2):107–125. <http://doi.org/10.18352/ulr.272>

Department of Communities and Local Government. 2011. *Guidance on compensation for compulsory purchase*. London, UK. www.gov.uk/DCLG

Di Gregorio, M., M. Brockhaus, T. Cronin, E. Muharrom, L. Santoso, S. Mardiah, and M. Büdenbender. 2013. Equity and REDD+ in the media: a comparative analysis of policy discourses. *Ecology and Society* 18(2):39. <http://dx.doi.org/10.5751/ES-05694-180239>

Driessen, P. P. J., and H. F. M. W. van Rijswijk. 2011. Normative aspects of climate adaptation policy. *Climate Law* 2(4):559–581. <http://doi.org/10.3233/CL-2011-051>

Ek, K., S. Goytia, M. Pettersson, and E. Spegel. 2016a. *Analysing and evaluating flood risk governance in Sweden. Adaptation to Climate Change?*. STAR-FLOOD Consortium, Utrecht, The Netherlands.

Ek, K., M. Pettersson, M. Alexander, J.-C. Beyers, J. Pardoe, S. Priest, C. Suykens, and H. F. M. W. van Rijswijk. 2016b. *Design principles for resilient, efficient and legitimate flood risk governance – lessons from cross-country comparisons*. STAR-FLOOD Consortium, Utrecht, The Netherlands.

Engelhard, E., B. van den Broek, F. de Jong, A. Keirse, and E. de Kezel, 2014. Let's think twice before we revise! "Égalité" as the foundation of liability for lawful public sector Acts. *Utrecht Law Review* 10(3):55–76. <http://doi.org/10.18352/ulr.284>

Fairgrieve, D. 2003. *State liability in tort: a comparative law study*. Oxford University Press, Oxford, UK. <http://dx.doi.org/10.1093/acprof:oso/9780199258055.001.0001>

Flores, N. E., and J. Thacher. 2002. Money, who needs it? Natural resource damage assessment. *Contemporary Economic Policy* 20(2):171–178. <http://dx.doi.org/10.1093/cep/20.2.171>

- Fraser, N. 2009. *Scales of justice: reimagining political space in a globalizing world*. Columbia University Press, New York, USA.
- Fullerton, D. 2009. Introduction. Pages xi–xxvii in D. Fullerton, editor. *Distributional effects of environmental and energy policy*. International Library of Environmental Economics and Policy. Ashgate, Burlington.
- Garlicki, L. 2015. *Polskie prawo konstytucyjne. Zarys wykładu*. Wolters Kluwer, The Netherlands.
- Gorlé, F., G. Bourgeois, and F. Reyntjes. 1991. *Rechtsvergelijking*. E. Story-Scientia, Brussels, Belgium.
- Government Bill 2009/10:80. 2009. *En reformerad grundlag*. Stockholm, Sweden.
- Hellner, J., and M. Radetzki. 2014. *Skadeståndsrätt*. 8. [rev.] uppl. Norstedts juridik, Stockholm, Sweden.
- Hostiou, R. 2013. Le adroit de l'expropriation et la QPC: esquisse d'un premier bilan de trois années de mise en œuvre du contrôle de constitutionnalité par voie d'exception. In *Droit de l'aménagement, de l'urbanisme et de l'habitat*. Éditions du Moniteur, Paris, France.
- Howarth, D. 2002. *Flood defence law*. Shaw and Sons, Crayford, UK.
- Ignatowicz, J., and K. Stefaniuk. 2012. *Prawo rzeczowe*. LexisNexis, Warszawa.
- Johannessen, Å. 2015. *Integrating flood risk reduction, river basin and resilience management in planning: a case study of Kristianstad, Sweden*. Stockholm Environmental Institute, Stockholm, Sweden.
- Kaufmann, M., W. J. van Doorn-Hoekveld, H. K. Gilissen, and H. F. M. W. van Rijswijk. 2016. *Analysing and evaluating flood risk governance in the Netherlands. Drowning in safety*. STAR-FLOOD Consortium, Utrecht, The Netherlands.
- Keessen, A. M., J. M. Hamer, H. F. M. W. Van Rijswijk, and M. Wiering. 2013. The concept of resilience from a normative perspective: examples from Dutch adaptation strategies. *Ecology and Society* 18(2):45. <http://dx.doi.org/10.5751/ES-05526-180245>
- Larrue, C., S. Bruzzone, L. Lévy, M. Gralepois, T. Schellenberger, J. B. Trémorin, M. Fournier, C. Manson, and T. Thuilier. 2016. *Analysing and evaluating flood risk governance in France: from state policy to local strategies*. STAR-FLOOD Consortium, Utrecht, The Netherlands.
- Leonski, Z. 2009. *Materialne Prawo Administracyjne*. Wydawnictwo C. H. Beck, Warszawa.
- Lindhout, P. 2015. *Cost recovery as a policy instrument to achieve sustainable and equitable water use in Europe and the Netherlands*. 2VM, Bergambacht, The Netherlands.
- Ljungman, S., and P. Stjernquist. 1968. *Den rättsliga kontrollen över mark och vatten - Del II* 3 uppl. P.A. Norstedt & Söner Förlag, Stockholm, Sweden.
- Mace, M. J. 2006. Adaptation under the UN Framework Convention on Climate Change: the international legal framework. Pages 53–76 in W. N. Adger, J. Paavola, S. Huq, and M. J. Mace, editors. *Fairness in adaptation to climate change*. Massachusetts Institute of Technology, Cambridge, Massachusetts, USA.
- Mazmanian, D. A., J. Jurewitz, and H. T. Nelson. 2013. A governing framework for climate change adaptation in the built environment. *Ecology and Society* 18(4):56. <http://dx.doi.org/10.5751/ES-05976-180456>
- Merryman, J. H., and R. Pérez-Perdomo. 2007. *The civil law tradition: an introduction to the legal systems of Europe and Latin America*. Third edition. Stanford University Press, Stanford, California, USA.
- Merz, B., J. Hall, M. Disse, and A. Schumann. 2010. Fluvial flood risk management in a changing world. *Natural Hazards and Earth System Sciences* (10):509–527. <http://www.nat-hazards-earth-syst-sci.net/10/509/2010/>
- Moore, V., and M. Purdue. 2015. *A practical approach to planning law*. Thirteenth edition. Oxford University Press, Oxford, UK.
- Mountfield, H. 2002. *Regulatory expropriations in Europe: the approach of the European Court of Human Rights*. New York University Environmental Law Journal (11):136–147.
- Myndigheten för samhällsskydd och beredskap (MSB). 2012. *Översvämmingar i Sverige 1901–2010*. MSB, Karlstad, Sweden.
- Nehmelman, R. 2014. Institutional and governance aspects of water management: subsidiarity and decentralisation - the secret of the Dutch approach to water management. *Journal of Water Law* 24(3/4):134–140. <http://www.lawtext.com/pdfs/sampleArticles/WL24-3-4FINAL.pdf>
- Organisation for Economic Co-operation and Development (OECD). 2014. *Water governance in the Netherlands: fit for the future?* OECD Publishing, Paris, France.
- Pauliat, H. 2012. Question prioritaire de constitutionnalité et adroit de propriété, une jurisprudence insuffisamment protectrice? *Revue juridique de l'économie publique* 2(695):3–9.
- Penning-Rowsell, E., P. Floyd, D. Ramsbottom, and S. Surendran. 2005. Estimating injury and loss of life in floods: a deterministic framework. *Natural Hazards* 36(1):43–64. <http://doi.org/10.1007/s11069-004-4538-7>
- Pontier, J.-M. 1983. De la solidarité nationale. *Revue de droit public*:899–928.
- Radwański, Z., and A. Olejniczak. 2012. *Zobowiązania. Część ogólna*. Wydawnictwo C. H. Beck, Warszawa.
- Solecki, W., R. Leichenko, and K. O'Brien. 2011. Climate change adaptation strategies and disaster risk reduction in cities: connections, contentions, and synergies. *Current Opinion in Environmental Sustainability* 3(3):135–141. <http://dx.doi.org/10.1016/j.cosust.2011.03.001>
- SOU 2014:35. 2014. "I vått och torrt - förslag till ändrade vattenrättsliga regler". Slutbetänkande av Vattenverksamhetsutredningen. Stockholm, Sweden.
- Steinvorth, U. 1999. The concept and possibilities of solidarity. Pages 29–37 in K. Bayertz, editor. *Solidarity*. Kluwer, Dordrecht, The Netherlands. http://dx.doi.org/10.1007/978-94-015-9245-1_2

- Suykens, C., S. J. Priest, W. J. van Doorn-Hoekveld, T. Thuillier, and M. van Rijswick. 2016. Dealing with flood damages: will prevention, mitigation, and ex post compensation provide for a resilient triangle? *Ecology and Society* 21(4):1. <http://dx.doi.org/10.5751/ES-08592-210401>
- Tapsell, S. M., E. C. Penning-Rowsell, S. M. Tunstall, and T. L. Wilson. 2002. Vulnerability to flooding: health and social dimensions. *Philosophical Transactions of the Royal Society A* 360 (1796):1511–1525. <http://doi.org/10.1098/rsta.2002.1013>
- Tennekes, J., P. P. J. Driessen, H. F. M. W. van Rijswick, and L. van Bree. 2014. Out of the comfort zone: institutional context and the scope for legitimate climate adaptation policy. *Journal of Environmental Policy & Planning* 16(2):241–259. <http://doi.org/10.1080/1523908X.2013.836961>
- Thomas, D. S. G., and C. Twyman. 2005. Equity and justice in climate change adaptation amongst natural-resource-dependent societies. *Global Environmental Change* 15:115–124. <http://dx.doi.org/10.1016/j.gloenvcha.2004.10.001>
- Thorsteinsson, D., A. Semadeni-Davies, and R. Larsson. 2007. Planning for river induced floods in urban areas: experiences and key issues for Sweden. Pages 485–503 in S. Begum, M. J. F. Stive, and J. W. Hall, editors. *Flood risk management in Europe: innovation in policy and practice*. Springer, Dordrecht, The Netherlands. http://dx.doi.org/10.1007/978-1-4020-4200-3_25
- Tjepkema, M. K. G. 2010. *Nadeelcompensatie op basis van het égalitébeginsel: een onderzoek naar national, Frans en Europees recht*. Wolters Kluwer, The Netherlands. <http://hdl.handle.net/1887/15694>
- Tjepkema, M. K. G. 2013. Between equity and efficiency: the European Union's no-fault liability. *Review of European Administrative Law* 6(1):7–37. <http://hdl.handle.net/1887/21144>
- Tol, R. S. J., and R. Verheyen. 2004. State responsibility and compensation for climate change damages – a legal and economic assessment. *Energy Policy* 32(9):1109–1130. [http://dx.doi.org/10.1016/s0301-4215\(03\)00075-2](http://dx.doi.org/10.1016/s0301-4215(03)00075-2)
- Truchet, D. 1999. L'intérêt général dans la jurisprudence du Conseil d'Etat : retour aux sources et équilibre. Page 6 in *Conseil d'Etat, Rapport Public*. La Documentation Française, Paris, France.
- van den Broek, B. 2015. Compensation of damages within a systematic approach to large-scale water and infrastructure projects. *Journal of Water Law* 24(5/6):266–271.
- van Buuren, A., P. Driessen, G. Teisman, and M. van Rijswick. 2014. Toward legitimate governance strategies for climate adaptation in the Netherlands: combining insights from a legal, planning, and network perspective. *Regional Environmental Change* 14(3):1021–1033. <http://doi.org/10.1007/s10113-013-0448-0>
- van Doorn-Hoekveld, W. 2014. Compensation in flood risk management with a focus on shifts in compensation regimes regarding prevention, mitigation and disaster management. *Utrecht Law Review* 10(2):216–238. <http://dx.doi.org/10.18352/ulr.279>
- van Doorn-Hoekveld, W. J., and F. A. G. Groothuijse. 2015. Schadevergoeding ten gevolge van bergingsgebieden: een juridisch labyrint. *Tijdschrift voor Agrarisch Recht* 75(7/8):358–366.
- Van Hoorick, G. 2012. Over het bouwverbod en de schadevergoedingsregeling in het kader van het Duinendecreet, en het beginsel van de gelijkheid voor de openbare lasten. *Milieu- en Energierecht* (4):249–254. <https://biblio.ugent.be/publication/3230531/file/6790282>
- van Rijswick, H. F. M. W., and H. J. M. Havekes. 2012. *European and Dutch water law*. Europa Law Publishing, Groningen, The Netherlands.
- Waline, J. 2007. L'indemnisation des atteintes à la propriété privée. Pages 413–431 in *Pour un droit commun de l'environnement*. Dalloz, Paris, France.
- Wiering, M., C. Green, H. F. M. W. van Rijswick, S. Priest, and A. Keessen. 2015. The rationales of resilience in English and Dutch flood risk policies. *Journal of Water and Climate Change* 6(1):38–54. <http://dx.doi.org/10.2166/wcc.2014.017>
- Wilby, R. L., and R. Keenan. 2012. Adapting to flood risk under climate change. *Progress in Physical Geography* 36(3):348–378. <http://dx.doi.org/10.1177/0309133312438908>