Chapter 4

Funding increased resilience against flooding of the Seine in Île-de-France

Funding the prevention measures required to increase resilience levels is a major challenge. This chapter focuses on risk prevention funding mechanisms and sources in France and their application to the specific risk of flooding of the Seine in Île-de-France. While this risk has been identified as a national priority, there is clearly scope for progress in funding prevention policies adapted to the challenges. The analysis and recommendations proposed seek to favour approaches to funding which ensure effectiveness and justice.

Introduction

France has been heavily involved in flood risk prevention over the past 30 years. A series of public policy instruments has been introduced, with associated funding mechanisms. In addition to national and local authority budget resources, an original collective insurance mechanism has been established, the CATNAT compensation scheme, based on a public-private partnership between insurers and the state and on the principle of solidarity against natural disaster risks. This mechanism also makes it possible to contribute substantially to risk prevention funding without imposing a direct burden on public finances, particularly for the risk of flooding, which is both the most frequent risk and the one that causes the most serious damage in France.

Many factors are likely to increase the funding needs necessary to improve the resilience of the Île-de-France region to the risk of flooding of the Seine: the increase in the exposure of human, social, environmental and economic assets to the risk of major flooding in the context of expanding urbanisation and the standards demanded by public and economic stakeholders in a modern society, plus the need for catch-up investment in prevention. While a co-ordinated strategy to manage the risk of flooding in Île-de-France has now been put in place with the implementation of the European Floods Directive, this chapter addresses the issue of how to fund increased resilience in Île-de-France, and according to what financial strategy for mobilising and prioritising resources.

In a context in which budget options are tending to narrow under the pressure to balance public finances, resources must be mobilised in response to this major risk on the basis of a range of stakeholders by means of more direct incentives to enhance flood resilience. The various mechanisms for funding flood prevention in France are thus explained with a view to developing a funding strategy based on action principles, in combination with good practices from OECD countries.

Delay in funding flood risk prevention in relation to the Seine in Île-de-France

The risk of flooding of the Seine compared to the risk of flooding in France

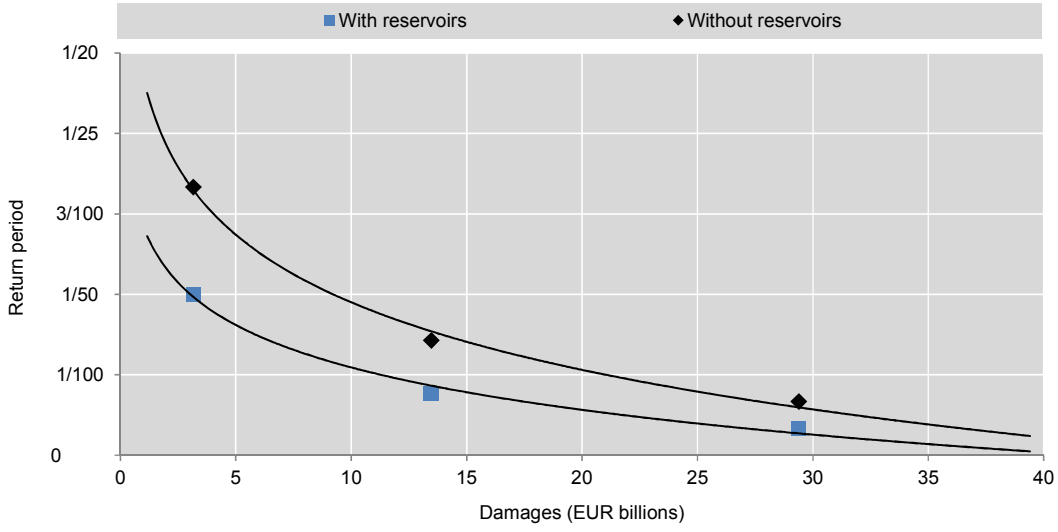
The average annual losses caused by floods in France are estimated at EUR 1-1.4 billion (Ministry of Ecology, Sustainable Development and Energy, 2012a). To make this calculation, the national preliminary flood risk assessment (PFRA) for France in the context of implementing the European Floods Directive incorporated the average cost of insured losses of EUR 400 million calculated by insurance companies on the basis of events of the past 20 years (in relation to current and updated assets). In the absence of a major national incident during that period, such as flooding of the Seine or Loire, an additional charge of EUR 200-300 million was estimated. An estimate of damage covered by insurance of 50-60% of the real damage gives this figure of EUR 1-1.4 billion.

The modelling of the different Seine flood risk scenarios developed in Chapter 1 produces an estimate of the average annual damage caused by flooding of the Seine in Île-de-France of EUR 250-500 million, taking only direct damages into account (Figure 4.1). This represents a quarter to a third of the total damage caused by flooding in France. Prevention efforts must therefore be adequate for this level of risk.

Flood prevention resources in France and in Île-de-France

Few OECD countries have made precise and exhaustive estimates of their risk prevention expenditure (World Bank and United Nations, 2010). It is generally difficult to estimate such expenditure, which in France and elsewhere is often included in a variety of sectoral programmes and makes demands on funding at several levels of government (Chapter 2). As the French Court of Auditors stated, "the administration is not in a position to present a complete and detailed overview of either public or state expenditure" (Cour des comptes, 2009). However, the General Commission for Sustainable Development (*Commissariat Général au Développement Durable*, CGDD), part of the Ministry of Ecology, Sustainable Development and Energy, has published a study in which it estimates the funding generated to prevent natural hazards as a whole in France for the 2009 budget year at EUR 600 million, shared between the state (55%), local authorities (40%) and the European Union (4%) (Ministry of Ecology, Sustainable Development and Energy, 2013c). Most of this funding is devoted to the risk of flooding, which is the most serious risk in France in terms of its frequency, widespread geographic distribution and impact.

Figure 4.1. **Seine flood damage frequency curve**



Source: Elaborated by OECD.

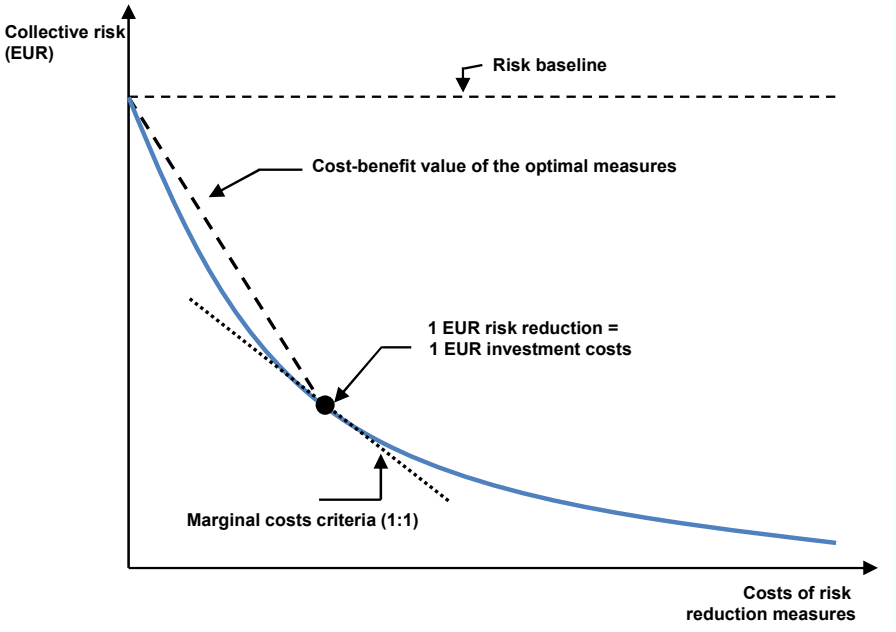
Flood prevention expenditure in France has been assessed at EUR 300-450 million (Ministry of Ecology, Sustainable Development and Energy, 2012b; 2013b; 2013c), corresponding to around a third of the estimated damage. Such a level of investment in prevention can be regarded as satisfactory in terms of the effectiveness of public expenditure (Box 4.1), provided that the most beneficial prevention measures are given priority in allocating these funds.

Against this background, flood risk prevention with respect to the Seine in Île-de-France does not appear to have benefited from a level of investment commensurate with the level of risk over the past ten years. The instruments for funding prevention have, in fact, played a relatively little part in reducing the vulnerability of Île-de-France to this risk compared to other regions or catchment areas. When the principal flood-related contract programmes between the state and the various local authority levels are examined – flood prevention

action programmes (*programmes d'action et de prévention des inondations*, PAPI) and major river plans (Chapter 2) – the Seine basin and the specific risk to Île-de-France within that basin do not appear to be budget allocation priorities (Tables 4.1 and 4.2). Less than 10% of the financial resources of the major river plans are allocated to this risk, either by the state or local authorities. Like the PAPI projects, when the two major calls for proposals were issued by the state in 2004 and 2011, 114 projects were selected and awarded national funding over and above local authority contributions. Only 11 projects concerned the Seine-Normandy basin, 5 of which contribute to mitigating the risk of flooding in Île-de-France, since they are situated upstream of the basin. This corresponds to less than 2% of the resources generated in the past ten years for this major flood prevention contract programme between the state and local authorities. A total of EUR 1.5 billion was subject to contract under the PAPI projects, 35% of which the state was responsible for.

Box 4.1. **How effective is prevention?**

In risk management theory, optimum prevention measures are taken by maximising their benefit for a given cost. Thus, on the basis of an existing risk level, a utility curve can be defined which represents the optimum prevention measures on the basis of collective preference. Since zero risk does not exist, prevention measures become increasingly costly for a benefit that tends to diminish as the risk level falls. The marginal cost of prevention measures thus tends to increase up to a certain level at which the cost-benefit relationship is reversed. Investment in prevention becomes increasingly less profitable until it is no longer profitable after that level. A classic estimate places the latter at between one-third and one-half of the level of the initial risk.



Source: OECD (2014a), "Governing effective prevention and mitigation of disruptive shocks", OECD, Paris.

Table 4.1. **Flood prevention action programmes in the Seine-Normandy basin, 2002-13**

PAPI	Risk mitigation in Île-de-France	Department(s)	Date of labelling	Total amount (EUR)	Part funded by the FPRNM[1] (EUR)
Yerres	Yes	91, 77, 94	2012	1 053 508	395 897
Essonne	Yes	91, 45, 77	2004	6 000 000	..
Austreberthe	No	76	2012	2 710 000	741 900
Armançon	Yes[2]	21, 89	2004	3 998 500	..
Orne-Seulles	No	14, 61	2012	12 382 707	3 476 846
Marne	Yes	94, 93, 77, 02, 51, 52	2009	10 000 000	..
Mauldre	No	78	2003	..	..
Lézarde	No	76	2004	..	..
La Bassée	Yes	77	2004	..	..
Verse	No	60	2013	13 091 760	2 154 210
Bresle-Authie	No	80, 62, 76	2012	2 378 400	848 900
TOTAL Seine-Normandy basin *including flooding in Île-de-France*				51 614 875[3] *21 052 008*	12 387 570[4]

Notes: ..: data not available. 1. Fund for the Prevention of Major Natural Hazards, or "Barnier Fund". 2. The impact of this project on reducing the level of risk in Île-de-France is uncertain. 3. It was not possible to include PAPI contributions for the Mauldre, Lézarde and La Bassée. 4. Taking an average of 24% for the various PAPI in the basin.

Sources: Ministry of Ecology, Energy, Sustainable Development and Town and Country Planning (2009), "Premiers enseignements tirés de la mise en œuvre des programmes d'action de prévention des inondations (PAPI)", rapport du Commissariat général au Développement durable, No. 006319-01, La Documentation française, Paris, www.ladocumentationfrancaise.fr/rapports-publics/094000253; Ministry of Ecology, Energy, Sustainable Development and the Sea (2010), "Des PAPI d'aujourd'hui aux enjeux de la directive européenne inondations", synthèse du séminaire national PAPI du 18 novembre 2009, Ministry of Ecology, Energy, Sustainable Development and the Sea, Paris, www.cepri.net/tl_files/pdf/syntheseseminairepapi.pdf; Ministry of Ecology, Sustainable Development, Transport and Housing (2011a), "Programmes d'action de prévention des inondations, de la stratégie aux programmes d'action, cahier des charges", Ministry of Ecology, Sustainable Development, Transport and Housing, Paris, www.developpement-durable.gouv.fr/IMG/pdf/110215_PAPI_vdef.pdf; Ministry of Ecology, Sustainable Development and Energy (2013a), "Bilan de l'activité de la CMI et des instances locales", Ministry of Ecology, Sustainable Development and Energy, Paris, www.developpement-durable.gouv.fr/IMG/pdf/bilan-cmi-2013-1.pdf.

Table 4.2. **The major river plans, 2007-13**

Major river plans	Flood prevention funding (EUR million)	Financial contribution (EUR million)		
		State	Regions	Others
Garonne Plan	42	33	9	–
Rhône Plan	310	108	83	38 (including ERDF 34)
Loire Plan	127	72	45	8
Seine Plan	70	42	24	3
including flooding in ÎdF	*41*	*27*	*11*	*3*
TOTAL	549	255	161	49

Sources: Rhône Plan inter-regional planning contract, 2007-13; inter-regional planning contract between the state and Haute-Normandie, Basse-Normandie, Île-de-France, Champagne-Ardenne, Picardie and Bourgogne Regions, 2007-13; Loire inter-regional planning contract, 2007-13; Garonne Plan inter-regional convention on the state-region planning contract, 2007-13.

Defining the priorities of prevention policy

Other strategic priorities have mobilised the public authorities and flood risk prevention funding. As in other OECD countries, these priorities often correlate with the most recent events (OECD, 2014a). Significant efforts followed the major floods of the Rhône between 2002 and 2003, for example. With material damage and a significant human toll, these floods, caused mainly by breaches in dykes, confirmed that poor flood defence maintenance posed a serious threat. Significant investment under the Rhône Plan was intended to reinforce dykes in the lower Rhône valley. Similarly, the dramatic floods in 2010 – cyclone Xynthia accounted for 47 victims and over EUR 1 billion in damage because of coastal flooding by sea-water inundation, while the torrential floods of the Var caused 25 victims and EUR 1 billion in damage (Ministry of Ecology, Sustainable Development and Energy, 2012a) – led the public authorities to introduce the rapid flooding plan (*plan submersions rapides*, PSR). The PSR focuses on preventing flooding caused by sea-water inundation, flash floods by water run-off and floods caused by breaches of dykes (Ministry of Ecology, Sustainable Development and Energy, 2011b). It has a budget of EUR 500 million over 5 years (2011-16).

The above examples illustrate the priority attached by the public authorities to protecting human lives. It is difficult to compare choices for prioritising resources, since economic assets and public and human health assets must be assessed according to the same criteria. If this is to be put in monetary terms, a value must be placed on human life. This is possible in the context of multi-criteria environmental analyses (see below) according to hedonic methods, but raises both ethical and practical questions. The risk of flooding of the Seine in Île-de-France, however, is the most significant risk at national level in terms of economic impact, with indirect effects that would affect the national economy as a whole. It is classified as a major risk in the preliminary flood risk assessment.

The significant economic assets involved have caused a delay in funding prevention measures for the risk of flooding of the Seine in Île-de-France. A specific funding strategy must therefore be introduced. In a context in which the public authorities' budget options are limited, such a strategy must be able to rely on all of the available resources, including those in the private sector. Furthermore, the strategy cannot be simply financial: it must be accompanied by a better understanding of governance (Chapter 2) and a rebalancing which enables ambitious prevention measures to be implemented (Chapter 3).

Flood prevention funding instruments

This section provides an overview of the flood prevention funding instruments that contribute or could contribute to increasing the resilience of Île-de-France against flooding of the Seine. Flood prevention funding in France is based mainly on solidarity mechanisms. Much of this funding derives from solidarity among all insured parties through the CATNAT compensation scheme and its Fund for the Prevention of Major Natural Risks (*Fonds de Prévention des Risques Naturels Majeurs*, FPRNM), or "Barnier Fund". A substantial proportion also comes directly from the state budget and therefore from taxation via the Ministry of Ecology, Sustainable Development and Energy's budgetary appropriations. Additional resources provided by the local authorities are more difficult to estimate and are usually generated under the major river plans and PAPI contractual instruments. The local authorities also fund the EPTBs, notably the EPTB Seine Grands Lacs, which manages the dams upstream of Île-de-France.

Instruments at national level

The CATNAT compensation scheme and its disincentive effects in terms of prevention

The CATNAT compensation scheme enables compensation for damage caused by natural disasters and risk prevention policy to be funded without drawing directly on the state budget. It was conceived in the 1980s to offset shortcomings of the insurance market by making it available to cover all individuals and businesses against disaster risks without excessive risk premium variation from place to place. The scheme functions according to the principle of an additional premium at a mandatory state-fixed rate which applies to any insurance contract for damage to or loss of property, irrespective of its exposure to natural disaster risks, the proceeds going to CATNAT reserves. The CATNAT scheme is an original public-private partnership which provides each party with access to the insurance market and coverage against natural disasters under the constitutional principle of solidarity. National solidarity in this respect is expressed in three ways: *i)* the legal obligation to include the additional CATNAT premium in any property damage insurance contract; *ii)* the uniform rate of the additional premium paid by any insured party and fixed by the state; and *iii)* the state guarantee given to the Central Reinsurance Fund (*Caisse Centrale de Réassurance*, CCR). This system has proven its effectiveness since its foundation by allowing broad coverage and compensation for losses in all cases of natural disasters covered by the system. Disputes and appeals are therefore not very common, and civil society stakeholders and insurers agree on the usefulness of the mechanism, which has developed little since its foundation in 1982. Initially established at 2.5%, the premium has now risen to 12% for all-risk home and business insurance and 6% for motor vehicles. These reserves can be mobilised provided a natural disaster is declared by ministerial decree in a restricted area for a specific risk (Grislain-Letrémy et al., 2012).

While the CATNAT and its use over the years has been effective in ensuring collective coverage against natural disaster risks, it has nevertheless had a number of well-identified shortcomings, particularly its disincentive effect with respect to certain prevention efforts (French Senate, 2012; OECD, 2006). The lack of insurance premium adjustment in line with risk levels, for example, does not encourage insured parties to reduce their exposure or vulnerability to natural hazards. This raises a question of a moral hazard, whereby persons most exposed to risks benefit indirectly from transfers from those who are least exposed. Similarly, prevention efforts by individuals are not rewarded by lower premiums. In addition, the too-frequent triggering of the mechanism, even for events with a low recurrence interval of up to a mere ten years, hinders prevention measures. This system, initially envisaged for extreme events, deludes the public and decision makers into assuming that they can take advantage of it irrespective of the circumstances. These consequences have brought about a number of minor modifications to the system and many recommendations over the years, plus an unsuccessful bill drafted to overcome its failings (Box 4.2).

This system also functions thanks to its associated reinsurance contract, proposed by the CCR. Wholly state-owned, the CCR proposes reinsurance underwritten by the state guarantee beyond a certain threshold. This could be put to the test by major flooding of the Seine, for example, which would trigger the state's role as guarantor of last resort (Box 4.3).

Box 4.2. A plan to reform the CATNAT compensation scheme

A plan to reform the CATNAT compensation scheme was submitted to the Senate in April 2012 to address certain gaps in the system, particularly its imprecise legal framework, its detrimental effect on the transparency and equity of the system and its inadequate prevention incentive mechanisms.

The bill amended the insurance code: on the one hand, it specifies the legal framework of the scheme, particularly its scope; on the other it enhances the functioning and transparency of the procedure for recognising the occurrence of a natural disaster (scientific definition of phenomena eligible for the compensation scheme, clear delimitation of the intervention of building insurance and collateral arrangements against natural disasters in terms of compensation for damage, updating of the conditions for benefiting from such arrangements, etc.). The bill also amends the building and housing code by reinforcing prevention incentive mechanisms in the compensation scheme (possibility of a targeted adjustment of premiums paid by insured parties, introduction of prevention rules for building on land exposed to risks, etc.).

Source: French Senate (2012), "Projet de loi portant réforme du régime d'indemnisation des catastrophes naturelles", présenté au nom du Premier Ministre par le ministre de l'Économie, des Finances et de l'Industrie, ordinary session of 2011-2012.

Box 4.3. The CATNAT compensation scheme affiliated to the state guarantee via the CCR

Despite its substantial reserves, the CATNAT compensation scheme would not be sufficient to compensate all the damage caused by a major flood of the Seine in Île-de-France. Its resources could also be heavily restricted by two other major risks in metropolitan France: a major flood of the Loire (OECD, 2010) or an earthquake on the Côte d'Azur. In that event, the call for the state guarantee could then come into play. The CCR proposes a reinsurance contract for the CATNAT scheme for private insurers who collect the CATNAT additional premium. The reinsurance proposed consists of two complementary and inseparable contracts:

- quota-share treaties: the insurer pays half the premium collected to the CCR, which will thus share 50% of the damage to be covered with the insurer
- loss limitation treaties: by paying an additional premium, the insurer ensures that the CCR will take responsibility for losses above a certain amount, generally established at twice the premium collected.

The CCR benefits from the state guarantee when the accumulated reserves cannot meet the contractual obligations to insurers. The multiple natural disaster orders issued in 1999 thus obliged it to bring this guarantee into play for EUR 263 million, following which the additional premium was raised from 9% to 12%. The level for triggering the guarantee in 2013 was around EUR 5 billion for compensation claims under the CATNAT, which would certainly be exceeded in the event of a major flood of the Seine (Chapter 1).

Source: Grislain-Letrémy, C., R. Lahidji and P. Mongin (2012), *Les risques majeurs et l'action publique*, rapport du Conseil d'analyse économique, La Documentation française, Paris.

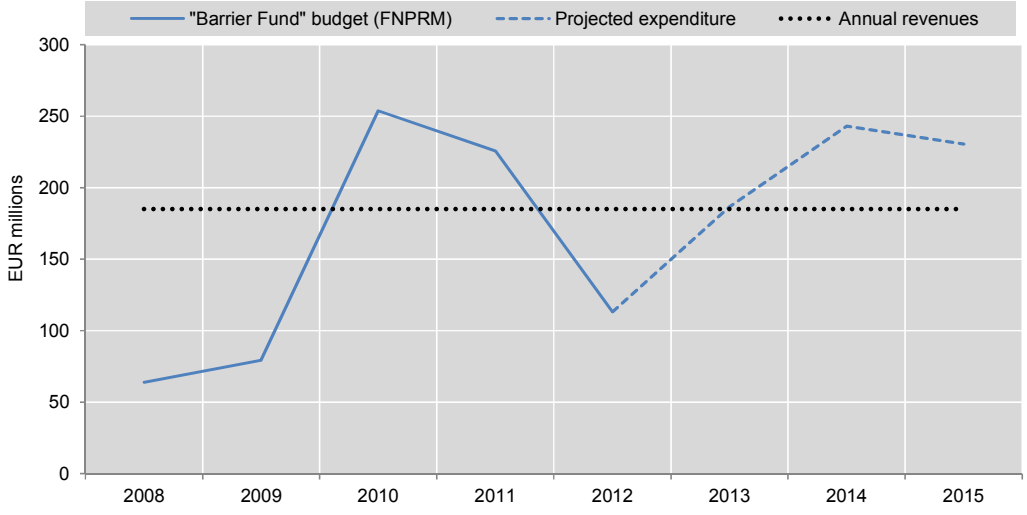
The Barnier Fund for financing prevention

Since the 1995 Barnier Law, the "Barnier" risk prevention fund has been affiliated to the CATNAT scheme by the retaining of a fixed percentage of sums collected. This fund, the FPRNM, thus has the advantage of being disconnected from direct state budget

resources, since it is increased on an annual basis by the insurance premiums of individuals and businesses. Initially established at 2.5% of the total additional premiums collected via CATNAT, the 2003 Bachelot Law allowed this rate to be adjusted by decree, thereby leading to its gradual increase to 4%, then 8% and now 12%. The remit of the Barnier Fund has been gradually expanded at the same time: initially set up to fund measures to purchase assets exposed or significantly damaged in the most at-risk areas, the Barnier Fund became the principal instrument for funding prevention and can now fund the drawing-up of PPRs as well as vulnerability reduction, run-off dampening and water protection measures. It generally involves co-funding with local authorities, with a fixed rate by type of activity ranging from 100% for preparing PPR-type regulatory instruments or departmental documents on major risks, and often 40-50% for other types of action. It is therefore the major financial instrument of the PAPI and PSR programmes referred to above.

The system's strength lies in the reliability of this funding, which is provided on an annual basis to the tune of around EUR 185 million, retained via the tax on the additional CATNAT insurance premium. Fund disbursements, meanwhile, are more variable. They are dependent both on recent disasters – particularly when they lead to asset purchases, such as after the cyclone Xynthia-related floods in 2010 – and on public prevention policy guidelines. Thus the development of flood prevention programmes for 2014 and 2015 is incorporated in Barnier Fund disbursement projections, which will be required to increase in years to come, according to the Ministry of the Economy and Finance's projections (Figure 4.2).

Figure 4.2. **Development of the FPRNM budget and forecast, 2008-15**



Source: Ministry of the Economy and Finance (2013a), "Rapport sur la gestion du fonds de prévention des risques naturels majeurs", Annexe au projet de loi de finances pour 2014, Ministry of the Economy and Finance, Paris, www.performance-publique.budget.gouv.fr/sites/performance_publique/files/farandole/ressources/2014/pap/pdf/jaunes/jaune2014_risques_naturels.pdf.

A substantial proportion of the funding also derives directly from the state budget and therefore from taxation via the Ministry of Ecology, Sustainable Development and Energy's budgetary appropriations adopted annually in the budget act. The budget action line for natural and water risk prevention can be followed specifically in risk prevention

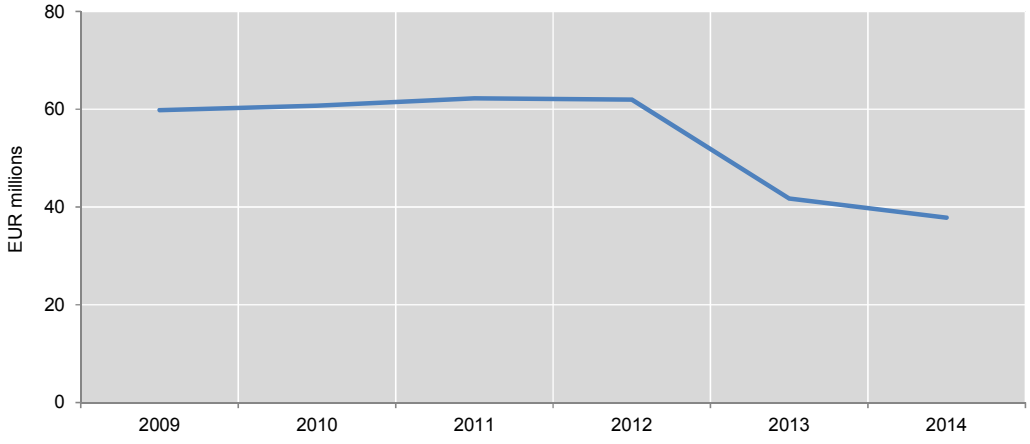
programme 181, on "the environment, sustainable development and energy" remit of the state budget. The monitoring over time of the payment appropriations adopted for this action indicates a significant reduction of almost 40% between 2012 and 2014, doubtless related to budget constraints. Even if the Ministry of Ecology, Sustainable Development and Energy's and other ministries' supplementary budgetary appropriations also come into play in funding prevention, the Barnier Fund and the 181 programme are the main sources of the national part of flood prevention funding. Via the Barnier Fund, therefore, France has a source of funding for virtually constant prevention which represents around three times the budget allocated for prevention under the budget act, a trend that is increasing.

Local authority funding of prevention

Co-funding of prevention by contractual approaches with the state

Contractual approaches between the state and local authorities enable local flood protection funding to be mobilised. Such approaches can be realised via the PAPI projects at risk basin level and via the major river plans at major catchment area level, particularly with the departments and regions and their different groupings. The success of calls for proposals under the PAPI (see Chapter 2) has brought local prevention-oriented project managers to the forefront and local authority funding to accompany them. This funding, however, has not yet enabled resources to be mobilised for the most at-risk areas. When the two calls for proposals were launched by the state, the first between 2002 and 2007 and the second since 2010, many applications for Barnier Fund co-financing were supported by local authorities. The audit conducted in 2009 following the first call – EUR 884 million, 60% of which was provided by local authorities – clearly showed that the increase in the number of projects was not always beneficial to their quality (Ministry of Ecology, Energy, Sustainable Development and Town and Country Planning, 2009).

Figure 4.3. **State budget expenditure on risk prevention, 2009-14**



Source: Ministry of the Economy and Finance (2013b), "Mission ministérielle – annexe à la loi de finance initiale pour 2013 – Écologie, développement et aménagement durable", Ministry of the Economy and Finance, Paris.

The lessons of this first call thus led the Ministry of Ecology, Sustainable Development and Energy to issue a second call with more rigorous selection criteria, particularly with regard to the economic analysis. Under the second call, a cost-benefit

analysis must now be carried out for all projects valued in excess of EUR 2 million (Box 4.4). The audit conducted in 2013 by the Joint Flood Commission (*Commission Mixte Inondation*, CMI) after two years of activity shows that most of the PAPI projects proposed were adopted. Projects were heavily concentrated in south-east France, as they were in the first call, and in the Loire-Brittany basin, particularly on the coast following cyclone Xynthia-related flooding. Currently, out of the 122 high flood-risk areas (HRAs) identified by the Preliminary Flood Risk Assessment provided for in the Floods Directive, 87 were not PAPI projects, while over half the envelope initially envisaged over the five years of the programme was committed (Ministry of Ecology, Sustainable Development and Energy, 2013a). The choice of a clearer resource allocation strategy should emerge from consultations under the National Flood Risk Management Strategy (*Stratégie Nationale de Gestion des Risques d'Inondation*, SNGRI), which may give greater consideration to the asset criterion, in addition to the economic efficiency of cost-benefit studies or multi-criteria analyses, and could add conditionality criteria in order to adjust incentives to ensure more prevention. The United Kingdom's approach, which models funding according to resource prioritisation criteria, is relevant in this respect: all projects submitted are funded, but the state proportion of funding is more substantial for projects located in priority areas (Ministry of Ecology, Sustainable Development and Energy, 2013b). It should be noted finally that virtually all this programme funding contributes to measures seeking to manage the hazard rather than reduce vulnerability.

Box 4.4. **Cost-benefit and multi-criteria analysis**

The cost-benefit method described in PAPI project specifications provides for project promoters to follow a minimum range of criteria. The study must focus on the structural measures of projects if they exceed EUR 2 million or 25% of the project total. In terms of cost, it must consider both the initial costs as a whole from the time of the study until commissioning, and maintenance and operating costs over time. In terms of damage assessment, the method adopted involves assessing the average annual damage with or without planning in order to obtain the average annual damage avoided. To achieve this, the minimum direct tangible damage must be assessed for four types of asset (housing, economic activity, agriculture and public infrastructure) and three flood scenarios (frequent, average – ~100 years – and extreme). The cost-benefit ratio will then be obtained by dividing the total updated benefit by the total updated cost in the timeframe of the analysis, which must not exceed 50 years, and by using the discount rates established by the French planning authorities. This is referred to as the net present value (NPV). This calculation must be completed by a sensitivity analysis. This figure thus allows the economic efficiency of a project to be determined. It also enables several development options in the same basin to be compared. It is, however, more difficult to use to compare projects in different basins, since the methods involved are generally too dissimilar.

In order also to factor in the more intangible impacts highlighted by the Floods Directive in particular, the CGDD developed a multi-criteria analysis method to complete the cost-benefit analysis. This method considers impacts on human health, the environment or cultural heritage without having to monetise them. Some 20 indicators were thus defined, and a guide for project managers is currently being drawn up.

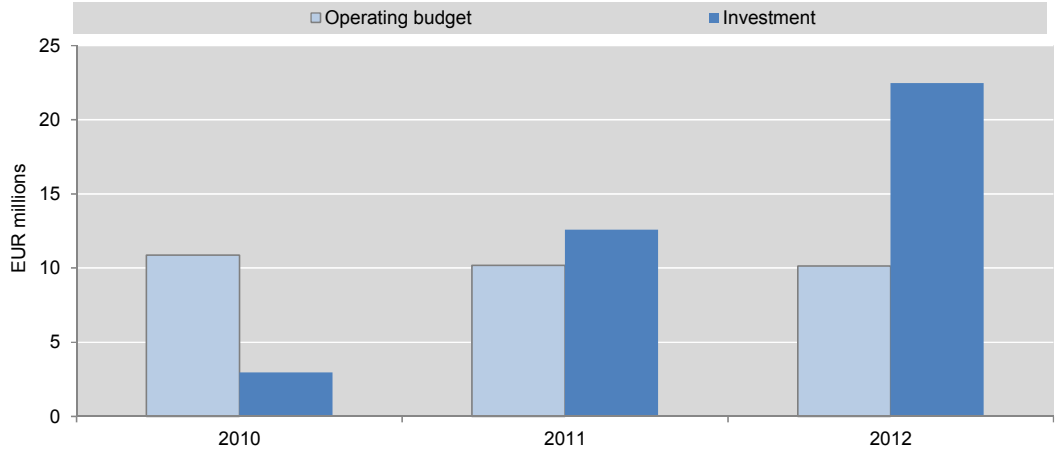
Sources: Ministry of Ecology, Sustainable Development, Transport and Housing (2011a), "Programmes d'action de prévention des inondations, de la stratégie aux programmes d'action, cahier des charges", Ministry of Ecology, Sustainable Development, Transport and Housing, Paris, www.developpement-durable.gouv.fr/IMG/pdf/110215_PAPI_vdef.pdf; Ministry of Ecology, Sustainable Development and Energy (2012b), "Analyse multicritères: Application aux mesures de prévention des inondations", Document de travail, No. 6.B, Commissariat général au Développement durable.

The regions generate flood prevention funding through the major river plans as planning and regional development stakeholders. These plans, which are tools agreed over a seven-year period between the state and the regions in a catchment area, allow the regions' and European funding via the European Regional Development Fund (ERDF) to work together on watercourse planning and flood prevention in particular. Out of the current programming period's EUR 550 million, EUR 160 million come from the regions and EUR 34 million from the ERDF. As flood risk management strategy currently stands at large basin level up to 2015 in terms of Floods Directive implementation, additional resources from EU risk prevention funding mechanisms could be mobilised via the different instruments available (see below).

Local public river basin authority funding: EPTB Seine Grands Lacs

Local authorities also contribute to flood prevention funding when they group together in a local public river basin authority (*établissement public territorial de basin*, EPTB), which is a flood defence management institution at sub-basin level. As a historic manager of dams upstream of the Seine basin, the EPTB Seine Grands Lacs is funded by its historic constituents in the former department of the Seine, i.e. the departments of the inner suburbs (Hauts-de-Seine; Seine-Saint-Denis; and Val-de-Marne) and the City of Paris. They provide its annual operating budget and a large proportion of its investment budget, the City of Paris contributing half and the three other departments sharing the remaining operating and investment costs equally. The tasks of the EPTB Seine Grands Lacs are evenly divided between flood prevention and low-water management. Half of these resources can be considered to be part of flood prevention funding, i.e. EUR 5 million per year for operations and an investment part varying from EUR 1 million to EUR 11 million over the past three years.

Figure 4.4. **EPTB Seine Grands Lacs budget, 2011-12**



Sources: EPTB Seine Grands Lacs (2013), *Rapport d'activité 2012*, EPTB Seine Grands Lacs, Paris, www.seinegrandslacs.fr/rapport-activite/SeineGrandLacs_web.pdf; EPTB Seine Grands Lacs (2012), *Rapport d'activité 2011*, EPTB Seine Grands Lacs, Paris, www.seinegrandslacs.fr/docs/EPTB%20Seine%20Grands%20Lacs/Rapport%20d%20Activit%C3%A9/2011-Rapport-activit%C3%A9-EPTB-Seine-Grands-Lacs.pdf; Les Grands Lacs de Seine (2011), *Rapport d'activité 2010*, Les Grands Lacs de Seine, Paris, http://pascalpopelin.fr/docs/grands-lacs-de-seine/rapport_activite_2010.

Mobilising local funding for resilience

In addition to contractual instruments and action within the EPTB, local authorities can mobilise budgetary appropriations to fund prevention on a complimentary and independent basis. The development of different regulatory tools at municipal level (risk prevention plan, major risks information document, flood markers) requires resources to accompany state co-funding. Similarly, when local authorities manage flood defences, they must have competent maintenance services and have to fund rehabilitation work where necessary. Finally, reducing the vulnerability of local authority-managed public infrastructure is also an area in which their own resources can be put to use. These budgets are difficult to estimate and are relatively variable according to the local authority, its resources and its responsibilities. In a context in which Act III of the decentralisation process could introduce a new flood and aquatic environment management responsibility for local authorities (Chapter 2), the respective resources should be brought into line with the risk level and balanced between the various local authorities facing the same risk.

In the Île-de-France inner suburbs, the departments are thus responsible for managing protection infrastructure (river banks, dykes and walls) and can carry out work to ensure their maintenance and repair, where necessary. The Hauts-de-Seine, for example, has an annual flood risk prevention budget of around EUR 1 million. The City of Paris has invested in a removable protection system. The Val-de-Marne is prepared to co-fund renovation work on the Joinville-Le-Pont sector gate, which was blocked for many years (EUR 3 million). Measures to reduce vulnerability and enhance resilience are also highly diversified according to the department. Like the differences in protection levels referred to in Chapter 3, these individualised local authority actions against the same risk raise the question of equality for citizens facing the risk and equity between areas in the same risk basin. The financial resources of the departments in the inner suburbs, however, are also highly variable, and are generally higher to the west and in Paris than in the east or north.

Other sources of prevention funding

Other sources of funding exist or can be mobilised to fund flood prevention in France and in Île-de-France in particular. This is the case, for example, of water policy financial resources in the broad sense. Network operators and private businesses can also contribute to flood risk prevention funding when they increase their own level of resilience, as can individuals. The European Union is also an additional source of funding in this respect.

Water policy funding

Water policy in France is funded according to the "polluter and consumer pays" principle at large basin level. While it is clear that flood prevention is not part of their remit, it remains the case that there are many synergies between flood prevention and water management, and that water agency funding programmes could contribute in that respect to prevention efforts, provided multiple-use projects are proposed: low-water level management/flood management, wetland restoration/flood retention, restoration of dykes and banks/environmental approaches. In addition, the water authorities have substantial budgets: the Seine-Normandy Water Agency's investment programme stands at EUR 4.7 billion over the six-year period from 2013 to 2018. Therefore, according to an integrated basin rationale which goes beyond the borders of Île-de-France in the strict sense but takes the real circumstances of the river and its tributaries into account, these

resources enabled the final two EPTB Seine Grands Lacs reservoirs built in the 1970s and 1980s to be 30% and 40% funded because of their contribution to low-water management. The protection of drinking water and sewage treatment networks and infrastructure, often situated in floodplains, is also an area in which water authority funding can play an important role. Finally, the funding of the preservation of wetlands, which are often flood retention areas, and the combating of erosion and water run-off both in rural areas (hedge planting, maintenance of grassland, etc.) and urban areas for reasons connected to the quality of water and aquatic environments, which fall within the remit of the Seine-Normandy Water Agency (*Agence de l'Eau Seine-Normandie*, AESN), also contribute to flood risk control.

Meanwhile, the state has recently charged the working capital of water agencies at a rate of 10% under the 2014 budget act. In addition to the allocation of these resources to the general budget, their potential use for flood prevention could be put forward in the context of Floods Directive implementation.

In addition to existing water policy resources, as leading stakeholders, water agencies can also contribute to prevention funding: water agencies have a basin-level financial engineering capacity which allows them to collect fees and charges through water bills and to reallocate these resources to projects with the local authorities. This financial instrument could be useful in implementing other instruments specific to flood management that could be based on the low-water level fee introduced by the EPTB Seine Grands Lacs for the major water users (Box 4.5).

Box 4.5. **EPTB Seine Grands Lacs low-water management charge**

In February 2012, the Prefect of Île-de-France and Seine-Normandy Basin Co-ordinator announced the signature with the concerned prefects of the inter-prefectural order declaring the development, upkeep and operation of the reservoirs managed by the EPTB Seine Grands Lacs as being in the general public interest. This order allows the EPTB Seine Grands Lacs to levy a low-water management charge to fund work on the Seine reservoirs owed by municipalities along the Marne, Aube, Seine and Yonne. The EPTB Seine Grands Lacs set the charge at EUR 0.175/m^3 of water per annum withdrawn from the Seine, Marne, Aube, Yonne and related water bodies. Collected on an annual basis by the Seine-Normandy Water Agency, it must be applied to the municipalities, public agencies for co-operation between local authorities, water agencies and certain manufacturers and farmers if they remove over 80 000 m^3 during the low-water period. The EPTB Seine Grands Lacs obtained EUR 6 million from this charge in 2013.

Source: EPTB Seine Grands Lacs (2013), *Rapport d'activité 2012*, EPTB Seine Grands Lacs, Paris, www.seinegrandslacs.fr/rapport-activite/SeineGrandLacs_web.pdf.

Funding network operator, business and individual resilience

The operators of critical networks (electricity, telecommunications, transport, water) play a fundamental role in the flood resilience of the capital. Since they are particularly vulnerable to potentially very costly damage to the infrastructure they operate, but also to knock-on effects that exacerbate crises, the operators are – or should be – doubly encouraged to invest in risk prevention. Despite the regulations which exist for vitally important sectors of activity (Chapter 3), investment generally appears to be weak compared to the challenges. For example, the electricity network operator ERDF spent EUR 2 million between 2006 and 2012 specifically to reduce the potential impact of

flooding on its network in Île-de-France, which has been assessed at between EUR 200 million and EUR 1 billion if the Seine were to flood. The RATP has invested EUR 6 million since it established its business continuity plan in 2003, with damage to its network estimated at EUR 1-5 billion. This seems all the more inadequate in that many public enterprises are their own insurer. Since, on that basis, they do not benefit from the CATNAT scheme, they must bear any losses themselves. Certain telecommunications and water operators have been able to undertake more significant investment, but in these potentially competitive fields involving several operators, investment levels vary according to the operator and do not necessarily ensure a consistent approach and an equivalent level of service for the various users and clients.

Private businesses, particularly the major groups, invest in flood risk prevention in line with their degree of awareness and the prevailing regulations, particularly those issued by sector regulators. Investment in business continuity is a rather recent trend among major French businesses. Insurers' incentives and the multi-risk approaches adopted generally force them to introduce continuity solutions based on system redundancy, safeguards and fall-back possibilities. Little specific investment in protection measures or vulnerability reduction have been identified in Île-de-France. The relocation of certain data centres or front offices outside floodplains has been envisaged by several businesses. The awareness of SMEs, however, is generally not very well developed (see Chapter 3).

Individuals, meanwhile, contribute to risk prevention funding in two ways: by complying with risk prevention plan measures – which are minimal in the case of the existing buildings that largely predominate in Île-de-France – and as insured parties under CATNAT funding. The latter is not connected to the level of risk (Box 4.2), though it is directly linked to the value of the property insured. In practice, since the introduction of the Barnier Fund, very few natural disaster orders have been issued in Île-de-France, and the region and its inhabitants have therefore been net contributors to the CATNAT scheme and consequently to the Barnier Fund.

European prevention funding

Risk prevention at EU level involves specific instruments, particularly financial instruments, which have been reinforced in recent years. The adoption of the European Commission communication on risk prevention in February 2009 laid particular stress on the need to improve the effectiveness of existing financial instruments. In addition to funding via the European Regional Development Fund already referred to, other European funds which are less well known to prevention stakeholders in France can fund their actions. The European Council's conclusions on innovative solutions for funding prevention also invited the European Commission to compile a list of financial instruments after realising that these resources were not sufficiently used in this area and that few member country projects involved applications for them. Table 4.3 shows the principal EU risk prevention financial instruments. The implementation of the Floods Directive will represent an opportunity to mobilise these resources to the fullest.

Scoping a funding strategy

The risk of flooding of the Seine in Île-de-France is now clearly identified, and a management strategy under the Floods Directive is currently under development for 2015-21. When governance mechanisms are put in place, their funding could benefit

from a number of principles enabling the fullest advantage to be taken of the sources of funding identified above in times of budgetary constraints.

Table 4.3. **European risk prevention funding**

Fund	Date	Objectives and applicable prevention measures
European Regional Development Fund (ERDF)	2006	To reinforce European economic and social cohesion by correcting regional imbalances: 1. To develop plans and measures to prevent and combat natural and technological risks 2. Flood prevention 3. Protection and management of catchment areas, coastal areas, services connected to water and wetlands
Civil Protection Financial Instrument (IFPC)	2007	To support protection of the population, the environment and property in the event of natural or man-made disasters 1. Modelling to reinforce prevention, facilitate the exchange of best practices and disseminate information and know-how on risks 2. Definition of scenarios to reinforce prevention, facilitate the exchange of best practices and disseminate information and know-how on risks 3. Study and research to reinforce disaster prevention, facilitate the exchange of best practices and disseminate information and know-how on disasters
European Agricultural Fund for Rural Development (EAFRD)	2005	To reinforce European rural development policy and simplify its implementation 1. Establishment and implementation of river basin management plans 2. Flood prevention
Structural funds regulation	2006	1. Risk prevention, including the drafting and implementation of plans and measures to prevent and manage natural risks 2. Other measures to preserve the environment and prevent risks
Seventh framework programme 2007-13 (FP7)	2006	To stimulate co-operation to consolidate the European Research Area 1. Research on the environment, risk management and sustainable development 2. Research on the improvement of prevention, mitigation and management strategies within a multi-risk approach 3. Research into methods for assessing risks and their impact 4. Research into prevention strategy indicators 5. Activities connected to public perception and risk communication 6. Research into vulnerabilities
European Financial Stability Facility (EFSF)	2010	To safeguard European financial stability 1. Measures to respond to threats to critical infrastructure 2. Development of effective preparation of citizens for environmental incidents 3. Development of emergency planning measures for potential environmental incidents

Source: European Commission (2012), Catalogue of Disaster Prevention Measures that May Benefit from EU Funding, DG ECHO, European Union, Brussels.

Risk level and resource mobilisation

Defining the funding needs to prevent the risk of flooding of the Seine in Île-de-France is directly linked to the long-term view and the objectives established by the strategy. The choice of an acceptable or optimum risk level (Box 4.1) will then determine the assessment of funding needs for prevention, emergency response capacities and insurance-based risk transfer mechanisms (OECD, 2014a). Governance mechanisms currently being established at risk basin level will be those that are the most likely to define such a level, if they come to represent a collective choice that is sufficiently shared by the various stakeholders, whether beneficiaries or sponsors of the planned prevention measures.

The procurement of funding to allow this acceptable risk level to be achieved must take two principal elements into account: the budget context and poor risk awareness among the leading sponsors. Risk prevention resources are diminishing in budgetary

terms at national level (see above), while CATNAT resources are and will continue to be increasingly sought after in the future under the effect of climate change. Local authorities are also experiencing budget restrictions with a reduction in the state's financial contribution in 2014. In this context, the allocation of resources to risk prevention is a challenge which must demonstrate that public funds will be used as efficiently as possible.

The lack of any significant flooding of the Seine in the past 60 years tends to dim the awareness of stakeholders and does not motivate them to establish a financial approach to prevention challenges. If funding for flood prevention measures in Île-de-France has not matched the risk in the recent past, this is due both to the fading of the collective memory and the range of weaknesses set out in this report. This concerns, in particular, the lack of governance capable of understanding the implications on the appropriate territorial scale, whether regional or basin-wide. Sponsors must be reassured that these obstacles have been overcome in order to obtain their financial support. On the basis of this observation, stakeholders must bear a number of principles in mind before taking decisions.

The beneficiary pays principle

The general principle of funding is based, above all, on identifying the beneficiaries of flood prevention measures and assessing their capacity to contribute funding in proportion to the level of risk the measures will protect them against (OECD, 2003).

The parties primarily affected by flood prevention are the inhabitants of floodplains and the businesses located on them. While they contribute generally to prevention funding through taxation and their contribution to the CATNAT scheme and therefore to the Barnier Fund, such contributions are no different from those of other citizens. Few specific incentives actually concern prevention under the CATNAT scheme and none apply to flooding of the Seine in Île-de-France. The few incentives for the public and businesses to carry out work to reduce vulnerability that can be included in the PPRs and financed under the Barnier Fund are also not applied to any great extent in Île-de-France. Greater progress could be achieved here on the basis of tax credit mechanisms for energy efficient buildings or the raising of elevator safety standards, for example. Such incentives or regulatory measures have attracted investment from individuals seeking to reduce greenhouse gas emissions or improve building safety. At business level, insurance companies could provide more direct incentives by developing policies geared specifically towards business continuity.

Over and above its primary mission of ensuring the safety of the public, the state is also on the front line in preventing the risk of flooding of the Seine in Île-de-France, since its functioning would be seriously disrupted and the economic impact could be national in scope (Chapter 1). Furthermore, as the ultimate guarantor of the CATNAT scheme, state budget resources would be mobilised to compensate individuals and businesses in the event of significant flooding of the Seine. The mobilisation of its own resources to fund prevention is therefore justified and could involve not only risk prevention resources but also civil security and state continuity resources. Similarly, local authorities would also benefit from additional prevention measures enabling them to continue to fulfil their public service remit and maintain the attractiveness of their areas.

Certain specific sectors could also benefit from greater resilience, such as network operators, who are especially vulnerable to flooding and would suffer significant damage in the event of a major flood, particularly since they are often their own insurer (see Chapter 1). It would therefore be justified for them to contribute to common efforts

towards greater resilience, either by reinforcing their own infrastructure or contributing to the funding of a broader metropolitan strategy.

Finally, the insurance sector could also benefit from additional prevention measures that reduce the exposure of their portfolio to the risk of flooding of the Seine in Île-de-France. Insurers, however, traditionally reflect risk levels by adjusting the calculation of their policy premiums. Since the fixed level of the CATNAT additional premium decided by the state does not allow for such adjustments, the sector's contribution to enhanced resilience should include a broader discussion on reforming the CATNAT (see above). It would not, in fact, be justified to increase the level of the CATNAT additional premium or the contribution to the Barnier Fund merely to finance a local flood risk management strategy.

Efficiency of prevention measures

According to OECD principles, the funding of flood risk prevention in Île-de-France should ensure the greatest efficiency through a coherent long-term economic approach, taking equity into account.

Coherence

Greater coherence between public risk prevention policies leads to lower costs and more effective measures. The diversity of approaches between different public policy fields, levels of government and stakeholders has been stressed. This could give rise to redundancy of action and additional expenditure and an overall lack of efficiency in the measures taken, since the level of resilience is often determined by the weakest link. The various local authorities thus invest to a different extent according to their resources, their risk level and their risk perception, which are all interlinked. Similarly, network operators do not work together to ensure the resilience of their common networks, potentially generating distortions in competition and service levels. Un-cooperative "free-riding" has been observed in telecommunications, for example, where certain operators invest in the resilience of multi-network passages which are, in fact, beneficial to all. An improvement in the coherence of measures taken may reduce such additional expenditure and bring about economies of scale by mutualising expenditure that could be allocated more directly to funding prevention measures.

Effectiveness

The search for greater effectiveness in the use of prevention resources cannot be limited to ensuring that approaches are more coherent, which is only one prerequisite. A resource allocation strategy prioritising those prevention measures that are the most effective in reducing the hazard and/or vulnerability must be developed.

To that end, the cost-benefit studies and multi-criteria analyses promoted by the Ministry of Ecology, Sustainable Development and Energy are a step in the right direction. In addition to their usefulness in determining the relevance of a project, they can also allow all the available options and their impact on mitigating risks within the same risk basin to be compared. This includes non-structural measures, the benefits of which must be measureable, particularly with respect to urbanisation. The new knowledge tools relating to the Seine basin in Île-de-France (Chapter 3) and the structure of governance envisaged for the Île-de-France HRA under an economic committee will allow cost-benefit studies to be carried out for each potential prevention measure by means of the same methodological approach, in order to compare and prioritise them.

Long term

The search for lasting financial solutions should enable long-term resilience to be improved. Long-term investment planning also makes it possible to ensure flexibility in making choices, to take into account and adapt to the development of knowledge and to reduce uncertainty. This also allows the level of resources required to be adjusted according to needs. An approach of this kind has been adopted against major risks and the associated uncertainties in OECD countries such as the Netherlands with the Delta Plan, and in the United Kingdom with the Thames Estuary 2100 project (Box 4.6).

Box 4.6. **Long-term flood prevention funding strategies in OECD countries**

In the United Kingdom, Thames Estuary 2100 is a long-term proactive flood risk management plan for London and the Thames estuary in the 21st century. The plan was drawn up in 2002 by the Environment Agency to develop a strategic flood risk management strategy that could be adjusted in the light of climate change uncertainties. The strategy defines local action to be taken in the short, medium and long term: action 0 to be taken in the first 25 years includes, *inter alia*, the joint definition of the funding required for the various measures by the Environment Agency and partners implementing the plan. The works will be funded primarily by the Thames, Anglian and Southern Region Flood Defence Committees under the responsibility of the Department for Environment, Food and Rural Affairs (Defra). Additional support has been obtained from the European Union Interreg 3B funding programme and the Office of the Deputy Prime Minister for two sub-projects.

In the Rhine basin, a ministerial conference on the Rhine in 2001 adopted the Rhine 2020 programme, based on co-operation between nine countries (Austria, France, Germany, Italy, Liechtenstein, Luxembourg, the Netherlands, the Belgian region of Wallonia and Switzerland). The principal objectives of this strategy are to restore the ecosystem, prevent flooding and provide flood defences, improve water quality and protect groundwater. This long-term strategy involves several successive stages. Close to EUR 10 billion has been invested to date in this framework for implementing the flood defence action plan. Many particularly financial regional and local partners are associated with the process of implementing measures, especially in sectors engaged in restoring the environment and preventing flooding.

In the Netherlands, the Delta Fund was established under the Delta Act to fund measures of national importance concerning flood and water resource management. EUR 16.6 billion have been programmed from 2014 to 2028, i.e. around EUR 1 billion per year. Flood risk prevention funding is currently estimated at EUR 1 billion, two-thirds funded by central government and one-third by regional water agencies which collect taxes and levies. The Delta Committee also recommends an increase in flood protection standards compared to current levels by 2050, which means that the respective infrastructure must be reinforced. The Delta programme envisages an outlay of EUR 1.2-1.6 billion per year from 2010-50 to achieve this objective, taking climate change into consideration. These costs do not encompass the water management maintenance and operating costs borne by central government, the regional water agencies and the provinces, estimated by the Delta Committee at EUR 1.2 billion per year.

Source: Commission internationale pour la protection du Rhin (2001), "Conférence ministérielle sur le Rhin 2001: Rhin 2020, Programme pour le développement durable du Rhin",www.iksr.org/fileadmin/user_upload/Dokumente_fr/rhein_2020_fr.pdf; Environment Agency (2012), "Thames Estuary 2100 Plan", TE2100, August, Crown Copyright, London, http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/LIT7540_43858f.pdf; Lavery, S. and B. Donovan (2005), "Flood risk management in the Thames estuary looking ahead 100 years", Royal Society Publishing, London, http://rsta.royalsocietypublishing.org/content/363/1831/1455.full; OECD (2014b), *Water Governance in the Netherlands: Fit for the Future?*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264102637-en.

Equity

Questions of equity in funding measures to prevent the risk of flooding of the Seine in Île-de-France arise in some dimensions: the allocation of national solidarity resources for this specific risk and differences in the level of risk and funding within the at-risk area in Île-de-France.

On the first point of national resource allocation, the level of average damage (see above), and above all the impact of major flooding on the functioning of the state and on the national economy (Chapter 1), justify in themselves a state budget contribution to prevention. Moreover, since the principal tool for funding prevention depends on the CATNAT scheme and is therefore indexed to the value of property, the citizens of Île-de-France have contributed heavily to funding the system and therefore to prevention in France since it was set up. With few declarations of natural disasters in Île-de-France and relatively little funding received via the Barnier Fund for floods compared to other French regions, the Île-de-France has, in fact, contributed both to prevention and to post-disaster compensation for other French regions through transfers from this system of solidarity. The question then arises as to whether some of these resources should be refocused on Île-de-France itself because of its vulnerability.

The difference in protection levels between areas within Île-de-France has already been stressed. This favours areas which benefit from existing defences, while areas that do not have them or have them to a lesser extent bear pressure on public finances. A common basin-wide approach would justify protecting the heavily urbanised regions of Île-de-France at the same level because of the assets now situated in the floodplain.

Existing and additional resources

Many existing funding mechanisms can be mobilised to prevent this major risk. A multi-hazard approach (flood, drought, pandemic, terrorism) may open up access to water policy or risk management funding in the broad sense. A long-term approach linked to the Greater Paris regional development process also creates opportunities, and many European mechanisms allow risk prevention to be funded and should be investigated.

Several potential sources of additional funding could also be mobilised. Interviews have shown that a number of private-sector stakeholders are prepared to contribute to the funding of prevention measures if it can be shown that the investment involved could significantly reduce their level of risk exposure, and more effectively than the individual measures they could take themselves. Existing capital gains taxes on immovable property in floodplains and local taxes on sealing or the tourist sector, for example, should be explored as sources of funding. Resources in the form of the EPTB Seine Grands Lacs' low-water management charges could also foster a similar mechanism for the flood protection service, particularly for network operators.

Conclusion and recommendations

The funding of the prevention measures required to raise the level of resilience against the risk of flooding of the Seine continues to be a major challenge in Île-de-France. In a context of underinvestment in recent years and the difficult economic climate, investment in prevention has been under pressure due to the need to balance budgets and prioritise public funding, both by the state and local authorities. In Île-de-France and often elsewhere, decisions to initiate and fund prevention are dependent upon the economic context and the impetus generated by recent events. The absence of

significant flooding for almost 60 years tends to dull the awareness and does not motivate stakeholders to establish a financial approach to prevention challenges. Differences in risk levels and the intensity of prevention efforts in geographical terms also contribute to the difficulty in funding infrastructure that might be of greater benefit to some than others, and to a failure to take action that would enable a collective resilience surplus to be funded.

There is therefore scope for redefining flood prevention funding policies so as better to adapt them to the likely challenges. When public finances are under strain, the issue of additional resources and the sharing of effort (state, local authorities, businesses, the public, EU funds) could be addressed by establishing a number of principles underlying a global funding strategy that could be based on the recommendations set out below:

- Support local strategies for managing the risk of flooding of the Seine in Île-de-France with a clear financial strategy that takes specific national characteristics into account. This could be based on continuity and long-term vision, accountability and proportionality between beneficiaries of measures and sponsors, greater effectiveness and equity in allocating resources and synergies with other sectoral strategies (drought, water, planning, crisis management).
- Mobilise all prevention measure beneficiaries in a multi-level approach involving local authorities and state funding, the various network operators, the private sector and citizens by means of targeted incentives. Additional funding could be generated by positive incentive mechanisms within existing systems of levies and taxes, in association with the insurance, property and water management sectors in particular.
- Continue efforts to clarify criteria for prioritising state investment in risk prevention. This could take into consideration European funding perspectives that could be mobilised to implement the EU Floods Directive in areas at serious risk of flooding, such as Île-de-France.
- Reappraise the CATNAT compensation scheme's impact on flood risk prevention. The bill seeking to reduce the system's disincentive effects could be revived, which would represent an opportunity for broader reflection on prevention funding.

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