

# Fifteen **initiatives** to **reduce** **housing vulnerability** to **natural risks**

## What lessons learned?



LEARNING FROM PRACTICAL CASES

**major natural risks**

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# Fifteen **initiatives** to **reduce** **housing vulnerability** to **natural risks**

## *What lessons learned?*

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Despite the many tools and means of action available in the field of natural risk prevention, we note that few approaches and operations to mitigate the vulnerability of housing to natural risks have been implemented. The Etablissement Public Loire and MEEDDAT (the Ministry for Ecology, Energy, Sustainable Development and Territorial Development) wanted to obtain feedback from a dozen case studies that have been identified in France and also from similar approaches underway in Europe (Germany, the Netherlands and the United Kingdom). This feedback has been compiled into a two-volume document.

→ In this first volume, **the French operations presented** (in the first part), most of which are currently underway although some have not always proved viable, reflect the specific type of context in which they originated. Most of the time, in fact, they are based on a sectorial approach: the schemes were either initiated because of a concern with preventing natural risks (PPR, PAPI, etc.), or a concern with housing rehabilitation (OPAH, ANRU, urban planning projects, etc.). They subsequently evolved towards a convergence of the two problems, with the goal of reducing the vulnerability of housing to natural hazards.

**The analysis of these approaches** (in the second part) makes it possible to reveal the strong points and obstacles, and to illustrate these through concrete situations. The resulting recommendations aim to simplify future approaches. They identify the

success factors affecting several areas: the territorial approach (stakes and vulnerability), the players (project initiators/leaders, teams, communication strategies, etc.) and the tools (regulatory, financial and technical).

**The descriptions and analyses of the European case studies** (in the third part) shed new light on ways of approaching the reduction of vulnerability to flood risks in Germany, the Netherlands and the United Kingdom. The approaches are based on the complementary nature of measures to ensure the resilience and resistance of buildings, public space development measures, along with a highly varied proportion of public intervention (communication, promotion of a collective dynamic) and private sector intervention (measures implemented in buildings or housing developments), with a continual concern for ensuring the profitable use of public funding (cost-benefit approach, partnerships with insurers).

The fourth part of this feedback from the French and foreign initiatives provides **general recommendations**. These largely concern project development assistance and accompaniment, the positioning of players and possible development of the tools available.

→ A second volume of feedback from these initiatives provides **further details and illustrations** about each of the 15 French and foreign operations under study.

In order to make reading easier, the acronyms are not always spelled out in the document. Below is a complete list:

- ANAH** : Agence nationale de l'habitat (*National housing agency*)  
**ANRU** : Agence nationale de rénovation urbaine (*National urban renewal agency*)  
**APL** : aide personnalisée au logement (*personalised housing benefit*)  
**CAT-NAT** : catastrophe naturelle (*natural catastrophe*)  
**CEPRI** : Centre européen de prévention du risque d'inondation (*European flood risk prevention centre*)  
**CERTU** : Centre d'études sur les réseaux, les transports, l'urbanisme et les constructions publiques (*Research centre for networks, transport, urban planning and public constructions*)  
**CETE** : Centre d'études techniques de l'équipement (*Public facilities engineering research centre*)  
**CGPC** : Conseil général des ponts et chaussées (*General council of civil engineering*)  
**CSTB** : Centre scientifique et technique du bâtiment (*Scientific and technical centre for building*)  
**DDE** : Direction départementale de l'équipement (*Departmental public facilities service*)  
**DEFRA** : Department for Environment, Food and Rural Affairs (United Kingdom)  
**DGPR** : Direction générale de la prévention des risques (*Department for risk prevention*)  
**DGUHC** : Direction générale de l'urbanisme, de l'habitat et de la construction (*Department for urban planning, housing and construction*)  
**DIREN** : Direction régionale de l'environnement (*Regional environmental department*)  
**DRE** : Direction régionale de l'équipement (*Department for public facilities*)  
**EPCI** : établissement public de coopération intercommunale (*public institution for intercommunal cooperation*)  
**EP Loire** : Établissement public Loire  
**EPTB** : établissement public territorial de bassin (*public territorial establishment for basin affairs*)  
**ERP** : établissement recevant du public (*establishment receiving the public*)  
**FPRNM** : fonds de prévention des risques naturels majeurs, dit « fonds Barnier » (*major natural risk prevention fund, known as the «Barnier fund»*)  
**HLM** : habitation à loyer modéré (*rent-regulated public housing*)  
**INSEE** : Institut national de la statistique et des études économiques (*Institute of national statistics and economic research*)  
**LAWA** : Länder-Arbeitsgemeinschaft Wasser (*Länder water association*)  
**MEEDDAT** : Ministère de l'écologie, de l'énergie, du développement durable et de l'aménagement du territoire (*ministry for ecology, energy, sustainable development and territorial development – previously MEDAD and formerly MEDD*)  
**MOUS** : maîtrise d'ouvrage urbaine et sociale (*urban and social project leadership*)  
**MRN** : Mission risques naturels (*Natural risks mission*)  
**MTETM** : ministère des transports, de l'équipement, du tourisme et de la mer [cf. MEEDDAT] (*ministry for transport, public facilities, tourism and the sea*)  
**OPAC** : office public d'aménagement et de construction (*public development and construction office*)  
**OPAH** : opération programmée d'amélioration de l'habitat (*planned housing improvement operation*)  
**ORU** : opération de renouvellement urbain (*urban renewal operation*)  
**PAPI** : programme d'actions de prévention des inondations (*flooding prevention action program*)  
**PHEC** : plus hautes eaux connues (*highest recorded water levels*)  
**PIG** : programme d'intérêt général (*general interest program*)  
**PLH** : programme local de l'habitat (*local housing program*)  
**PLU** : plan local d'urbanisme (*local urban planning program*)  
**PPR** : plan de prévention des risques (*risk prevention plan*)  
**PPRI** : plan de prévention des risques d'inondation (*flood risk prevention plan*)  
**PPRIF** : plan de prévention des risques d'incendies de forêt (*forest fire risk prevention plan*)  
**PPRN** : plan de prévention des risques naturels (*natural risk prevention plan*)  
**PPRT** : plan de prévention des risques technologiques (*technological risk prevention plan*)  
**PS69** : 1969 earthquake resistance regulation, replaced in 1995 by **PS92** regulations  
**PSMV** : plan de sauvegarde et de mise en valeur (*safeguard and improvement plan*)  
**SAGE** : schéma d'aménagement et de gestion de l'eau (*water management and development scheme*)  
**SCOT** : schéma de cohérence territoriale (*territorial consistency scheme*)  
**SDAGE** : schéma directeur d'aménagement et de gestion de l'eau (*comprehensive water management and development scheme*)  
**SEM** : société d'économie mixte (*mixed-economy company*)  
**SIG** : système d'information géographique (*geographic information system*)  
**TVA** : taxe sur la valeur ajoutée (*value-added tax*)  
**ZAC** : zone d'aménagement concerté (*designated development zone*)  
**ZUS** : zone urbaine sensible (*sensitive urban area*)

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# 1 - Presentation of the approach

## 1.1 The context and object of the study

This study came about because of the determination of the Etablissement Public Loire and of the DGPR (Direction Générale de la Prévention des Risques – department for risk prevention), which is part of the MEEDDAT, to collate and disseminate in-depth experience feedback about the operations underway to reduce the vulnerability of housing in France to floods and to broaden this analysis to include a few other European countries.

The approach of the Etablissement Public Loire comes under the framework of the European “Freude am Fluss” project in which it participates. The Etablissement Public Loire offered to supervise this feedback effort in order to make the French and European initiatives to reduce the vulnerability to flooding of existing housing better known. This is an opportunity to provide a clearer picture of the initiatives currently underway to promote their development in the Loire River basin and to share these interesting results with this European project’s German and Dutch partners.

The approach of the Ministère du Développement Durable (ministry for sustainable development) is part of the closer cooperation now underway between the DGPR and the ANAH (national housing agency) to introduce the vulnerability reduction component in programmed housing improvement operations (OPAH). This dynamic was initially translated into action with the signature of the MEDD-MTETM-ANAH tripartite agreement concerning processing funding applications for undertaking work to reduce vulnerability, financed by the FPRNM (Major Natural Risk Prevention Fund) (September 2006).

The Ministry for Sustainable Development also wants to expand on existing approaches and facilitate their transposition to other territories by making the most of the results of initiatives identified in France that involve all natural risks.

The Etablissement Public Loire and the DGPR therefore quite naturally decided to pool their efforts in order to jointly steer this feedback compilation project. The work has been entrusted to a team of specialists who were asked to develop and implement a joint methodological approach and timetable. The final analysis and the lessons drawn from these investigations were also conducted jointly.

## 1.2 Objectives

The work, compiled in a two volume document (“*What Lessons Learned?*” and “*Case Studies*”), is intended to disseminate the various methods that can be called on to induce property owners to implement initiatives that will reduce the vulnerability of their housing.

Its purpose is also to provide advice for project initiators in their efforts to launch and implement campaigns to inform, induce and support private individuals.

## 1.3 - Working method

The study was conducted in three phases:

- **Selection of the case studies** and establishment of a joint **descriptive grid** and **assessment grid**, to be applied to each of the cases under study.
- **Investigation and drafting of case studies.** The diversity of the operations under study was such that it was impossible to restore the information in an entirely consistent fashion: although the descriptive and assessment grids are common to everyone, certain components were studied in greater depth than others, depending on the situations (particularly as to progress underway, whether the operation was successfully concluded or if it did not lead to operational implementation, special foreign circumstances and/or the availability of data, etc.).
- **Cross-sectional analysis** of the operations under study as a whole and joint proposal of a series of recommendations aimed at future project initiators.

## 2 - Executive summary of the French initiatives

The study encompassed housing vulnerability mitigation initiatives, regardless of the context in which they were implemented. The search for examples, initially focused on OPAHs integrating reduction of vulnerability to natural hazards, gradually broadened to include other types of operations integrating reducing housing vulnerability to natural hazards, based on innovative tools or approaches.

**Examining the interrelation between the two problematics of “housing” and “risks” enabled identifying a dozen operations or approaches, which are presented below.**

The typology of this sampling, evident after the fact, reflects a “sectorial” approach that has always been fundamental in launching these operations. Their objective and initial concerns focused:

- either on housing, dwellings, urban planning and development projects;
- or on natural hazards, the vulnerability of assets at risk, the need to find solutions to protect highly exposed populations, districts and property.

Of necessity, each of these approaches was based on an ad hoc regulatory tool, a framework program that was designed to deal specifically (if not exclusively) with one or another of these two problematics. Generally speaking, developments in demand led to adapting this operational framework in order to take the other problematic into account.

This part provides a brief overview of the emergence context and the strong points in the French case studies based on these two components: “housing” and “risks”<sup>1</sup>. **These short descriptions already emphasize the importance of broaching all the territorial issues as a whole, in a cross-disciplinary and complementary manner, and in particular, the challenges of “housing” and “risks” from the very outset of operations.**

<sup>1</sup> Please refer to the second volume “Case Studies” for more details about these operations.



### 2.1 “Housing” orientation approaches

The examples presented below originated as projects under the ORU program (urban renewal operations). The Orientation and Programming Law for town planning and urban renewal, enacted on 1st August 2003, defines a national urban renewal program whose purpose is to regenerate rundown high-density housing districts, classified as being ZUS (sensitive urban areas), while heeding sustainable development and social/racial integration objectives.

The ANRU (national agency for urban renewal) helps implement this program by providing financial assistance. It will enable local officials and public housing landlords to launch global urban renewal projects that include all operations linked to social housing (building, rehabilitation, re-residentialisation or demolition) and aspects linked to redevelopment of road networks and urban spaces.

The urban renewal projects in town centres classified as ZUS are intended to benefit from ANRU funding. The intervention of the ANRU works, more often than not, hand in hand with the ANAH, which acts within the framework of urban renewal OPAH projects. The two public establishments act in a complementary way, with the ANRU able to intervene as part of social housing building operations through in-depth restructuring of urban blocks of buildings.

#### ■ Urban renewal

##### → The ANRU urban renewal operation in Pointe-à-Pitre (Guadeloupe)

At the heart of an area with a population of 125,000, the town of Pointe-à-Pitre has 21,000 inhabitants, including 10,000 in the town centre in a narrow and high-density zone. Pointe-à-Pitre, which is in a high seismic activity zone, grew rapidly between 1950 and 1970 under an initial urban renewal program that led to the building of 6,000 new homes near the town centre and on former marshlands. Since



then, the deterioration of the urban space and the social environment, as well as the loss of attractiveness in the town centre and in these districts, has led decision-makers to launch an "ANRU" urban renewal operation (OPAH-RU in the town centre, and in three districts referred to as urban renewal districts) that concerns half the town's population.

Although these high-density housing complexes enabled social progress and improved living conditions at the time, the first buildings to have been constructed are now very run down and do not meet the technical standards in force, particularly as concerns earthquake risks.

#### → ANRU urban renewal operation in Cannes-Salines in Ajaccio (Corsica)

The Cannes-Salines district represents a strategic space for the town of Ajaccio: it covers about one hundred hectares and is located directly adjacent to the historical centre, along the sea front, and at the edge of the built-up areas in the only plain that permits the town's spatial expansion. However, it is composed of high-density housing complexes with a great deal of social housing, and it has serious shortages of attractive public and collective spaces. With its 8,000 inhabitants, it concentrates many economic and social problems that justify its classification as a ZUS.

The ORU approaches, initiated in 2002, were "recycled" in 2003 as part of an ANRU approach calling on the demolition – reconstruction of a large number of housing units. At the same time, the first flood risks assessment became known: the perimeter in question is in a high to very-high hazard zone. A PPRI (to be drawn up) foresees a freeze on urbanisation projects there.

Discussions among the teams analysing these two problematics, initially along parallel lines but later together, resulted in completely refocusing the project by bringing the flooding constraints to the fore, with new stakes in mind:

- reducing the vulnerability to flooding (retention basin, rainwater networks, reducing the vulnerability of public facilities);
- planning and developing public spaces, organising urban transit, accompanying business development, defining an ocean-town relationship;
- And only demolishing very few housing units (20 units), making the operation more "efficient" in terms property asset issues, and a lot less expensive.

#### → Urban renewal project in Sapiac and Villebourbon in Montauban

The town of Montauban, crossed by three rivers (the Tarn, the Aveyron and the Tescou), has a history of flood events. Two of its central districts, Villebourbon and Sapiac, are particularly exposed to the overflowing of the Tarn. Following "Cévennes events", in other words torrential rains in the Cévennes, Gard or Hérault regions, water levels can rise violently and rapidly.



Two contradictory problematics compete in these districts:

- a significant flood risk, which is incentive to ban new building through the PPRI prevention plan;
- a need for urban requalification of districts dating back to medieval times that are gradually becoming pauperised; they serve as home to 6% of the Montauban population and present a growing vulnerability to flood hazards.

The objective pursued is to define the conditions that will enable building in the red zone of the PPRI so as to ensure the continuity of day-to-day living and of services, while reducing the global vulnerability of these districts.

The solution chosen by mutual agreement with the town of Montauban in order to efficiently combine the urban planning approach and flood risk prevention consisted of establishing a ZAC development zone. Once the urban renewal perimeter is determined and the ZAC project for the perimeter is planned by the public sector and validated by central government departments, the existing PPRI will be revised to take the anticipated developments into account and to allow the actual implementation of the ZAC project.

#### ■ Housing rehabilitation

##### → OPAH in Laon (Aisne): an operation with a dual objective

The town of Laon enjoys a very rich cultural heritage but it is also subject to considerable subsidence risks due to the fact that the subsoil has provided building materials and served as a sewer for many years.



The housing problems noted at the end of the 1980s and the need to revitalise the town centre are at the origin of the operation. The PPR approved in 2001 pres-



cries connecting homes to the sewerage system and, prior to undertaking this work, consulting with the quarry department established by the town of Laon.

An OPAH was thus initiated to finance housing improvements and to consolidate the subsoil with assistance from the Barnier Fund. The individualized inventory of the subsoil that was conducted under the supervision of the quarry department makes it possible to clearly understand the risks and to define consolidation operations thanks to special know-how and appropriate work. The OPAH has thus made it possible to improve real estate assets, largely to the benefit of the landlords.

**→ ANAH project in Indre-et-Loire: a new approach to process files in flood risk areas**

One quarter of the Indre-et-Loire Department's population is settled in floodplains. Four PPRs (risk prevention plans) concerning the Loire (145,000 people exposed) were approved in 2001. They include measures recommended to reduce the vulnerability of existing environments and structures. For its part, the Indre river PPR imposes such measures. Other PPRs are currently being drawn up.



Having become aware of the considerable flood risk in its territory, the ANAH Department of Indre-et-Loire has henceforward decided to process subsidy request files by checking to ensure that the risk has actually been taken into account. In order to obtain the necessary assessment skills, it conducted a study in 2007 that, on one hand, ensures it has the full set of maps showing existing flood risk areas on hand and, on the other, that it has a method enabling it to judge the pertinence of suggested work as regards housing vulnerability; its agreement (or refusal) to grant an ANAH subsidy is therefore based on a full understanding of circumstances.

The year 2008 will be devoted to training mentor/instructors as well as raising the awareness of contractors and owners or project leaders/contracting authorities prevailed upon to undertake work to reduce housing vulnerability. Encouragement to implement flood risk PIG programs is also foreseen.

**→ "Housing Scheme" in the Gard Department**

On 8-9 September 2002, very violent rainfall caused exceptionally high water levels in the Vidourle, the Gardons and



the Céze. The consequences of the ensuing floods were enormous: 80% of the department was affected, 1,400 families were deprived of accommodation and 88,300 dwellings damaged (95% of which were private residences and 5% public housing).

From September 2002 to March 2005, "Housing Schemes" were established and implemented in order to resolve three major problems:

- emergency situations: assessment of damages ("emergency MOUS"), defining the guidelines for attributing assistance to disaster victims and their families (PIG) and preparation of provisions for the various operations;
- rehousing: financing of temporary accommodations, installation of mobile-homes and promotion of permanent homes;
- rehabilitation: adapting urban planning regulations (limiting rehabilitations in floodplains, inspecting building permits in flooded areas), coordinating the local actions of the "rehabilitation MOUS" of the three players responsible for helping private individuals complete their rehabilitation formalities (filling out ANAH applications) and destruction-reconstruction (Barnier Fund).

These schemes have been successful thanks to the close collaboration between Government departments, territorial authorities, the ANAH, private engineering offices and associations.



## 2.2 - "Risk" oriented schemes

### ■ Risk prevention plans

**→ Planned operations to reduce vulnerability to flooding in the Pays Haut Anjou Segréen (Maine-et-Loire)**

The Pays Haut Anjou Segréen territory is crossed by the Mayenne, the Oudon and the Sarthe, and its municipalities exposed to flood hazards are endowed with recent PPRs that impose a number of measures to reduce the vulnerability of existing environments and buildings, largely aimed at ensuring the safety of local inhabitants. Approximately 400 homes are concerned.



Since 2004, the Maine-et-Loire DDE facilities management service has been studying, jointly with territorial authorities and Government services, the possibility of

implementing planned operations to reduce vulnerability to flooding. In 2007, in order to protect the territory of the Haut Anjou Segréen, it launched a study with the approval of its president intended:

- on one hand, to establish a precise housing vulnerability diagnostic adapted to the local context;
- and on the other, to propose an institutional and financial package to be able to undertake systematic assessments and provide subsidies for the work imposed by PPRs and, possibly, also for the work recommended.

The Pays Haut Anjou Segréen has been approached to be the project leader and it should soon be recruiting a service provider to supervise the information conveyed to property owners, conduct the diagnostics and assist in compiling subsidy applications. The definitive financial partnership is currently under discussion.

→ **From regional to local level: in *Ille-et-Vilaine*, the *Moyenne Vilaine - Semnon* operation**

The flooding of the Semnon and of the Vilaine affects urban areas that are largely located in Pléchéâtel, Guipry and Messac. Unprecedented flooding over a large portion of the Brittany territory has mobilised the public authorities at both national and regional levels. They wish to implement a preventive risk reduction approach.

Negotiations between the regional prefecture and the ANAH have enabled finding a budget package, subject to having recourse to the departmental OPAH and eliminating the maximum revenue limit of owner-occupants.

In view of the refusal of departmental authorities to accept the OPAH's becoming the project leader/contracting authorities, Government services (the DRE and DDE) and the ANAH intervened in order to integrate a "flooding" component in the standard OPAHs underway and to prompt initiatives among the municipality communities in the most affected sectors. The objective was to provide property owners with the technical and financial elements to undertake vulnerability mitigation operations.

Two booklets, one for the use of professionals and a second one for property owners were produced by the CETE de l'Ouest, which also drew up a project to perform diagnostics.

A joint supervision group made up of the ANAH and Municipalities was suggested for the purpose of ensu-

ring individual diagnostics. Recommended work would have been entitled to subsidies within the framework of the "flood" amendment for OPAHs underway. These proposals have not yet been followed up.

→ **A flooding component to the OPAH in *Quimper-Communauté (Finistère)***

The overflowing of the Odet and its tributaries causes frequent overflowing that affects downtown Quimper. In 2000, a great many homes, shops and businesses suffered damages, thereby prompting changes to be made in the initial PPR approved in 1997 as its estimates were exceeded. Nevertheless, the PPR that was revised in 2004 does not impose any obligatory measures regarding existing housing.

Central Government Services, along with those of the Conurbation Community of Quimper and the City of Quimper have a highly developed risk culture and awareness. Powerful communication campaigns were organised when the PPR risk prevention plan was implemented. Since then, a SAGE water management and PAPI flood prevention programme have been launched.

The city has implemented a population warning system and established a dedicated Website. In addition, work to reduce vulnerability is currently underway in the catchment basin.

The Conurbation Community wished to integrate a flood component from the very initial launching of an OPAH in 2007, whose general objectives are linked in particular to the development of a market offering of controlled rent housing units in the historic town centre. Individualised diagnostics were foreseen, with priority given to the highest hazard areas identified by calling on an analysis grid that was determined collectively.

■ **Basin approaches**

→ **Pre-operational survey of *Châteaulin-Porzay (Finistère)***

The Aulne is a channelized river whose banks frequently overflow, with flooding exacerbated by the influence of tides and of locks. Many homes, business and public facilities were affected by the exceptionally high water levels in 2000-2001. An initial PPR, approved in 1997, was revised following these events and approved at the start of 2005.

Because of the lack of any special structure specifically dedicated to water management of the EPTB type (public territorial basin establishment) and in the absence of a SAGE scheme, it was decided to establish an intercommunal agreement so as to launch an initial pre-operational survey.

The survey of the property owners potentially concerned will associate homes, businesses and public facilities. Lists of the work necessary and its possible corresponding financing will be proposed based on the types of buildings involved.

The operation concerns the Aulne's rural catchment basin, which includes the urban areas of Châteaulin, Port-Launay and Châteauneuf-du-Faou, or seven municipalities altogether, divided into three communities of municipalities.

This proactive approach, initiated by Government services and relayed by local officials, should ensure solidarity in the basin area and appropriate risk management. It should become a reality via the launching of an OPAH that will take over from the one ending in 2008.

**→ Val de Saône PAPI and reduction of flooding vulnerability**

Since the beginning of the 2000s, the Saône & Doubs EPTB has been considering possible approaches to reduce housing vulnerability in the 234 municipalities of the Val de Saône. Due to the failure to establish a partnership with the ANAH departments (because the resource limits for the attribution of funding did not enable foreseeing a programme likely to help many property owners), these deliberations were not initially conclusive. However, the project was back on track with the signature of a PAPI action programme in 2004 and thanks to prospective financing from the FPRNM (major natural risk prevention fund).



To date, however, very few PPRs in this vast territory (6 departments) impose measures on existing housing. The instruction/mentoring departments are nonetheless considering revising or establishing PPRs to introduce such measures. At same time, the Saône & Doubs EPTB has just launched an experimental flood vulnerability reduction study not only for housing but also for businesses and farms. This study is intended, thanks to about one hundred diagnostics, to finalise the vulnerability diagnostics guidelines. The discussions during the study with the Government, with the ANAH departments and with

the various territorial authorities that are members of the EPTB, should lead to a partnership arrangement to finance the work advocated by the diagnostics and/or imposed by the PPRs.

**→ PIG program to adapt homes to flood risks in Orléans (Loiret)**



The Conurbation Community of Orléans Val de Loire (22 municipalities, 14 of which are affected by flooding) is covered by old PPRs that do not impose any vulnerability reduction measures on the existing environment and structures. The Conurbation Community has jurisdiction over housing and it conducted an OPAH from 2002 to 2005. Increasingly aware of the flood risk issue, the Urban Area Council officials decided in 2005 to extend this local housing programme by a general interest PIG programme focused on the subject of reducing the vulnerability of homes.

An agreement was reached with the ANAH and a service provider was recruited; he launched an information campaign aimed at homeowners and, with the assistance of the DIREN and of the Multi-disciplinary Team of the Plan Loire, drew up an analysis grid for diagnostic purposes.

Over 500 diagnostics have been conducted to date. In mid-2007, the approach was extended to managing agents of multiple-owner buildings. Only 14 owners (3 landlords and 11 occupants) solicited aid for the rehabilitation of 19 residential units; this help was subject to ANAH resource limits, which were slightly higher for the subsidy share provided by other financing entities.

Aside from the project leader (the Conurbation Community) and the ANAH, other partners finance the operation: the Centre Region (engineering and structural work), the Loire-Bretagne Water Agency (monitoring & coordination), and the Ministry of Sustainable Development (engineering assistance). The PIG is to be completed by mid-2008, but it should be extended by a further year.



## 3 - What lessons learned?

The enormous diversity of the operations studied has made it possible to uncover the key characteristics of these projects, as well the conditions and mechanisms under which they were originated or, in some cases, implemented. In other cases, the reasons for their “logjams” or their failure became clearer.

The implementation of the recommendations below, inspired directly from the analysis of case studies, is largely under the initiative, responsibility and/or competencies of local players.

These recommendations are illustrated by the most significant circumstances.

### 3.1 - A key factor: the cross-disciplinary approach

A global analysis of the operations makes it possible to note, virtually systematically, their tremendous complexity, which is of course due to their specific geographic and political environment, but it is also due to the difficulty of establishing ad hoc “project leadership” and a joint working party that allies both “housing” and “risk” expertise.

This, in part, explains why each approach either favoured either an “urban planning” input or a “risk – vulnerability reduction” input, particularly when a PPR is underway or pre-existent.

The most “complete” operations were those where the players were rapidly able to overlay the two input components and to work together on developing a project where vulnerability reduction is at the core of the priorities.

To facilitate and generate this cross-disciplinary approach, it seems indispensable, in view of the case studies, to fill the following prior conditions:

- **acquisition of very clear knowledge about the territory** (geographical, political, operational, etc.), particularly regarding the stakes at issue and vulnerability;
- **development of working partnerships:** determining “key” players, constituting “project teams” with multiple, cutting edge skills, accompanying approaches

as a whole through a great deal of concertation and communication;

- **developing, combining and making the best use of existing regulatory tools and financing** by rapidly determining a methodology, particularly for carrying out diagnostics.

Conversely, the major obstacles noted in these approaches were found in those projects that failed to call on the above prerequisites and, above all, those whose working partnerships, particularly between central Government and municipalities, were difficult to constitute, imbalanced or deficient.

At the same time, it was noted in all cases examined that there are a certain number of impediments or difficulties in using the existing regulatory and financial tools, which were often too demanding (formalities, deadlines, etc.), above all in the case of complex operations requiring the benefit of flexibility and responsiveness.



### 3.2 - Analysis and knowledge of the territory: stakes and vulnerability

#### ■■■ Making a global diagnostic<sup>2</sup>

A detailed knowledge of the territory must be pre-existent to launching any operation: the functioning of the territory, inventory of overall stakes at issue (housing, public facilities and miscellaneous, etc.), knowledge of the hazard (existing studies or past events), understanding of the “political” context (players, potential contracting authorities, existing structures, etc.), regulatory documents or other existing elements, etc.

2 - See “Cadre méthodologique pour la conduite d’un diagnostic de quartier” (Methodological framework for conducting district diagnostics). The purpose of this document drawn up by the MEEDDAT is to provide guidelines for making territorial diagnostics within a global approach that synthesises the «risk» aspects with the social, economic, political and environmental issues that characterise this territory.



It is recommended that this inventory be drawn up in the form of a diagnostic that is shared by all of the future project partners. This joint approach must facilitate the agreement of the partners.

**→ The example of the Maine-et-Loire DDE: knowledge of the stakes**

Prior to launching a survey to undertake a programmed operation to reduce vulnerability to flooding in Haut Anjou Segréen, the Maine-et-Loire DDE conducted a complete internal inventory of the residential units established in floodplains within the territory in question. A descriptive data sheet was drawn up for each unit. The set of data sheets provides an initial understanding not only of the magnitude of the investigations required (400 vulnerability diagnostics) but also the nature of the affected buildings. In this way, the service provider was quickly able to classify the type of housing found and to evaluate the respective importance of each type.



Municipalities exposed to floods in Maine-et-Loire.

**→ The example of the Indre-et-Loire ANAH: knowledge of the hazard**

In order to process the subsidy applications so that henceforth the flood risk is indeed taken into account in the remedial work projects, the ANAH of Indre-et-Loire had a uniform compilation made of all the maps available of the flood-hazard areas.

The ANAH instructors now have a full set of maps (scale: 1/25,000) available showing the various hazard levels in a uniform way. This compilation makes it possible to understand the risk exposure of dwellings that must be rehabilitated and the timeliness of the work foreseen.

**→ The example of Montauban: sustainable development survey of the Sapiac and Villebourbon districts**

In order to appreciate the adaptation potential of the PPRN regulations to meet the specific development needs of the Sapiac and Villebourbon districts, the Government commissioned the Sols et Cités consultancy to provide a sustainable development survey of these districts, as this was a prerequisite to implementing a public intervention strategy. The study served the purpose of evaluating the urban renewal potential of these two districts, to finalise a renewal project compatible with the flood risk level in the different sectors and to delineate the regulatory development of the PPRI to enable this modification in complying with the major flood risk prevention principles.

The survey is based on:

- a careful analysis of the hazard in both districts;
- a detailed analysis of the urban and functional typology in the two districts;
- the renewal proposals for each area thus identified by overlaying the risk with the urban analysis.

The subdivision of the urban typology into several categories is based both on a notion of city shape and of building function. Through these two analyses orientations, it was possible to differentiate: the old densely-populated centres, sparsely populated housing areas, high-density housing complexes, public facilities, shops and businesses, etc.

Flood in Indre-et-Loire: the Vienne at Ile-Bouchard in 1913.



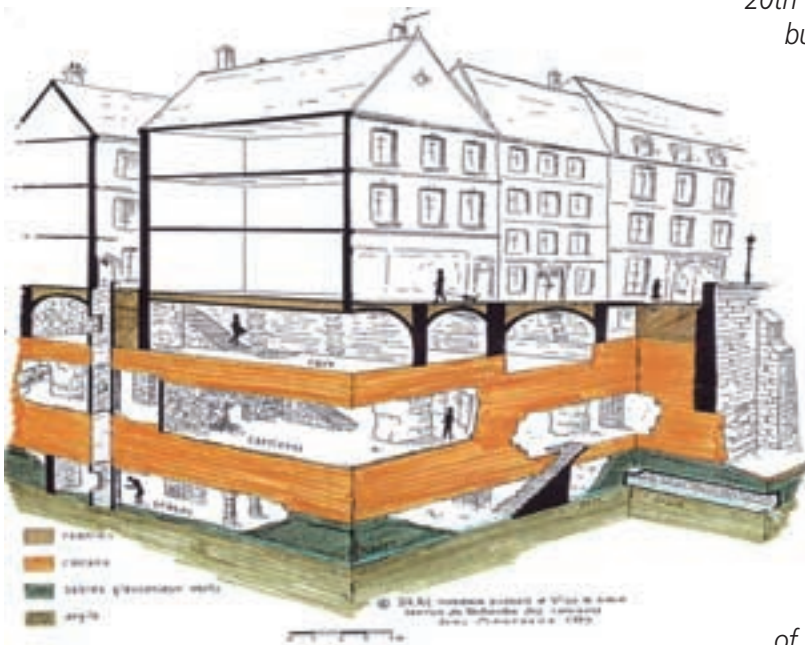
### → The example of the City of Laon

In 1987, the Regional Department of Cultural Affairs conducted an inventory of its rich heritage in the city of Laon's upper district: it involved miscellaneous buildings and edifices but also cellars and the underground quarry networks, since it had noted their fragility.

The city of Laon relayed the activities of the General Inventory Department by establishing a municipal quarry research department largely responsible for locating and monitoring underground cavities, along with identifying and inspecting any surface problems just as those below ground.

Historical research in the city archives enabled completing the experts' reports and mapping the hazards in the Risk Prevention Plan. This plan extends the initiative since it is mandatory to consult the municipal quarry department for any property developments or real estate sales in high-risk areas: this enables increasing the knowledge of the city's subsoil areas.

The importance of having a good prior grasp of the risks involved thus made the development of a genuine risk culture possible among the inhabitants.



Study in the Ville Haute of Laon [DRAC, Denis Montagne, 1995].

### ■■■ Extending the initial analysis of territorial stakes according to needs

It will be possible to orientate or to suggest more closely "targeted" vulnerability reduction diagnostics as regards specific housing or facilities in particular, thereby enabling the pertinent vulnerability reduction measures favoured to be stipulated. At this stage, it may be timely to draw up a classification of built-up areas (or of activities, etc.) that already reflects a certain appreciation of the existing vulnerability (e.g., whether the ground floor is elevated or not, inhabited or not, etc.). It is appropriate to associate partners right from this stage.

### → The example of the Maine-et-Loire DDE: classification by types of urban development

Prior to selecting the houses that will enable establishing a vulnerability diagnostic, the architect in charge of this assignment drew up a classification of the types of houses present in the flood-prone area that reflects a certain vulnerability either of the occupants or of the built-up area: houses dating from before 1900, many of which are farm buildings (rubble wall masonry or stone construction) or fine homes with freestone walls; old town houses (late 19th century or early 20th century) with shops at street level; suburban bungalows (from 1950 to the present) built of concrete blocks.

### → The example of the Val de Saône operation

In the Val de Saône area, within its methodological framework survey, the Saône and Doubs EPTB not only takes housing into account but businesses and farm holding offices.

### → The example of the Chateaulin and Porzay municipality community

As part of an experimental approach, a prospective survey was launched in order to identify the appropriate modification work needed to reduce the vulnerability of inhabitants and buildings: it is a question of estimating the initiatives required by buildings that are classified as residential units but also those used by tradesman and businesses. The work necessary to upgrade public sewerage networks is also evaluated.

### More concerted deliberations

It appears important to take the deliberations about the functioning and future of the territory (social, economic and urban planning dimensions) into account when considering risk specific procedures.

#### → The example of the City of Laon: the sewerage system

Although the adverse consequences associated with the underground cavities have been recognised for quite a long time in Laon, they have assumed a particular importance here because domestic sewage used to be discharged directly underground right below houses. The connection of dwellings to drinking water mains and the resultant increased consumption has thus accelerated phenomena linked to the undermining of quarry supports.

The installation of a collective sewerage system in the upper district of Laon has made it possible to control the water discharged into groundwater, to limit problems and to remedy the unsanitary conditions of subsoils. The municipality has established the necessary drainage systems and implemented incentive measures (also coercive) that provide aid to private individuals so that a significant portion of the work to hook up to the public sewerage system is thus financed by the community.

#### → The example of Ajaccio

The city had widely associated the population with the ORU projects. In 2002, with the graduation to the new ANRU procedures, on one hand, and with the new understanding of the hazards of this area, on the other, the urban renewal project seemed to be "blocked": the risk surveys prompted the implementation of a flood risk PPR that completely checked any possibility of demolition–reconstruction in this district.

It was only over the course of lengthy field work, surveys and discussions that the technicians and the politicians involved in the urban planning project and in establishing the PPR were able to arrive at a solution that thoroughly refocused the initial project, by taking



Ajaccio

into account constraints and objectives that had seemed contradictory at the outset. As a result, only 20 residential units will be demolished in order to provide an outflow for water amassed behind this building, and the PPR regulations will be adapted to the situation of two public facilities (school, community centre) in order to reduce vulnerability and to ensure the safety of its occupants. In addition, the urban planning project foresees major requalification of public spaces and hydraulic development projects.

#### → The example of Pointe-à-Pitre

Half the population of Pointe-à-Pitre (21,000 habitants) is affected by this ANRU project. This major strategic project, with its vast urban, social and economic impact, essentially entails a substantial requalification of the housing inventory.



High-density housing in Pointe-à-Pitre.

Within this difficult context, the earthquake risk was not in any way the initial preoccupation of the urban renewal project. As it happens, most of these buildings that date from 1950-1970 were built on former marshlands, prior to the application of the PS92 earthquake resistant building regulations, if not before the PS69 regulations. The PPR earthquake risk prevention plan approved in 1995 provides no recommendations for the existing buildings.

The SIG (Société Immobilière de Guadeloupe) real estate company, to which the city had entrusted the role of delegated contracting authority, which hence provided it with a global view of the objectives and of the resources, wanted to include earthquake risks as a basic input component in the urban renewal project definition. The building vulnerability survey did, in fact, enable identifying buildings in need of reinforcement, rehabilitation and/or destruction and to discover that 90% of the problems were concentrated on 10 residences.

This survey thus made it possible to orient demolition choices and analyse solutions based on their cost and possible impact at the social level in order to define the urban renewal project.

Ultimately, the housing or business inventories conducted should be broadened to include other assets (ERPs, networks, etc.) and should lead to more global deliberations about the vulnerability of the territory. With this prospect in mind, it might be timely to combine considerations concerning vulnerability when drawing up municipal safeguard plans.



### 3.3 - Players, communication / consultation and strategic policy

One of the key elements for the success of the operations depends on the commitment of the various players, whether elected officials or Government services, and their capacity to ensure project leadership during its various preparation phases and, above all, to generate resolute cross-disciplinary working partnerships.

#### ■■■ Establishing close collaboration between territorial authorities and Government services

A balance is necessary in the existing involvement levels to avoid any withdrawal from commitments. At the local level, projects must implicate the highest hierarchical and political echelons to associate key players in order to ensure their long-term existence, even if the people originally involved leave their job positions during the project.

For instance: strong mobilisation will be required in terms of time and personnel from the instruction/mentoring departments for PPRs that decide to impose remedial measures on existing situations.

#### → The example of the Gard

The major flooding in September 2002 affected over 2/3 of the Gard Department, causing urgent rehousing problems (1,400 families without accommodations) and rehabilitation problems (42,000 disaster victims).

The magnitude of the operations to be conducted under emergency circumstances and with appropriate continuity, led to drawing up "housing schemes", coordinated by the departmental Prefect within the framework of the PIG. These schemes called for contributions from many players in Government, from territorial authorities, as well as from associations and the private sector. In this way, project leadership responsibilities were divided according to the actions to be undertaken:

- emergency MOUS (urban and social project leadership) went to the General Council;
- rehousing MOUS went to the DDE, assisted by the associations,
- rehabilitation MOUS went to two communities of municipalities, already in charge of OPAHs, with the support of engineering offices and the ANAH.

#### ■■■ Constituting "project teams"

The association of multiple skills, including those related to "risks", "housing and urban planning" and architecture in particular, enable decompartmentalising usual work habits thanks to assistance from technical departments that have been granted a general delegation of authority. This closer cooperation between risks/housing-urban planning skills must take place within Government services but also among local and regional authorities. In addition, it would be appropriate to systematically associate municipal and architectural professionals in deliberations about vulnerability reduction (dealing with the ground floors of existing buildings in the city centre is one example of this essential closer cooperation).



From left to right: emergency MOUS, Oct. 2002 ; rehousing MOUS, Sept. 2002 - March 2004 ; rehabilitation MOUS, Jan. 2003 - Dec. 2004.



→ **The example of the PIG to adapt housing to flood risks in the Orléans Conurbation Community**

*This operation is led by the Orléans Conurbation Community: its technical and administrative implementation was entrusted to two people with very complementary skills and responsibilities: the “risk” task officer for the General Manager and the “Housing” task officer for the Social Cohesion Department. The operation could not have been efficiently overseen and successfully completed if its management had been entrusted to only one of these departments.*

→ **The example of Ajaccio**

*Flood risk was not an urban planning preoccupation in the Ajaccio municipality. As of 2002, following an initial hydro-geomorphological study commissioned by the DDE, the Prefect decided to suspend urbanisation in the high-risk and very high-risk areas, arguing that the precaution principle must be heeded. This decision modified Ajaccio’s urbanisation picture, particularly as concerns the ANRU project.*

*The parallel work conducted by the DDE to draw up the PPRi and that of the City of Ajaccio to establish the ANRU project could not have been successfully concluded if:*

- *the technical teams of the Government: technicians in charge of risks and those entrusted with monitoring the ANRU,*
- *the municipal teams: Urban Renewal Department and technical services,*

*...had not spent lengthy sessions to pool and compare their objectives, methods and arguments in order to reach “acceptable” solutions within the framework of the two approaches, whose objectives seemed contradictory at first glance.*

*At the heart of the process are both awareness raising and acculturation, not only during the ANRU project but also as part of drawing up other PPRs (PPRIFs, PPRTs and ground movement PPRs) as well as the local PLU of the City of Ajaccio, which systematically integrates the risk problematic in its urban planning deliberations.*

■■■ **Calling on complementary skills**

Skilled tradesmen, sundry operators, sociologists, etc., are all likely to provide added value and, additionally, it is appropriate to raise awareness and to train work teams and contractors. The identification of competencies and the need to enlarge work teams can be done during the operations themselves. It is therefore important to be able to adapt the operation in the course of the project.

→ **The example of the PIG to adapt housing to flood risks in the Orléans Conurbation Community**

*Experience in the Orléans region has revealed that when private individuals who had benefited from a diagnostic approached contractors, their reaction was not consistent with the discourse of the Conurbation and the project service provider. The contractors tended to deny or minimise the risk and therefore deemed the recommended measures unnecessary. A similar attitude was noted among architects. They are essential to the process, yet they fail to relay the operation’s findings to private individuals. Landlords are most particularly concerned since their rehabilitation projects require substantial and technically complex surveys to find solutions to reduce the vulnerability of their buildings.*

*Based on this observation, the Orléans Conurbation decided it is imperative to launch awareness raising campaigns and even to organise training sessions for tradesmen and contractors to ensure that diagnostic recommendations are indeed recognised as pertinent and actually implemented by building trade professionals.*

■■■ **Ensuring the emergence of the entity capable of leading projects**

Such project leadership is both political and territorial (selecting the appropriate intervention scale), when several structures (syndicates and other bodies) are superimposed in the territory.

→ **The example of the Chateaulin and Porzay municipality community**

*While it has not been possible to complete the SAGE scheme launched in 2003 because of a lack of solidarity in the basin, and while the establishment of an EPTB is also on hold, the OPAH project integrating flooding vulnerability reduction has made it possible to resume discussions on more concrete foundations.*

*The Subprefect of Châteaulin and the DDE have become highly involved, particularly in terms of organising information meetings aimed at mayors on the possibilities of financing specific actions and in the implementation of a pre-operational survey.*

*Three municipality communities have agreed to have this survey conducted in order to establish a preliminary diagnostic and to identify vulnerability reduction measures. The municipality communities take care of its pro rata financing based on the number of inhabitants in the flood-hazard areas: project leadership is shouldered by the inter-community body most affected by the flooding.*

*This rallying around a concrete objective might promote the resumption of negotiations recognising the utility of a future EPTB and its establishment, thus allowing the completion of risk prevention work that has currently been suspended due to lack of project leadership.*

### ■■■ Ensuring the long-term durability of these approaches

It is important to take the time to raise the awareness of the different players and to explain the operations. We must remain aware that project leadership may take some time to emerge. It is necessary to elicit support and accompany partners without being excessively forceful or rushing matters. Foresee various phases and, in particular, test stages prior to generalising actions. Maintain flexibility to be able to adapt the actions underway.

#### → *The example of the DDE of Maine-et-Loire and Pays Haut Anjou Segréen*

*After having introduced mandatory vulnerability reduction measures (that target ensuring the safety of populations) for existing circumstances in the most recent PPRs and as part of the PAPI Maine approach, the DDE of Maine-et-Loire considered it essential to implement a “planned operation to reduce vulnerability to flooding”. The latter is the necessary condition for private individuals to adopt the measures: it is not only appropriate to inform them about the regulatory framework but also to offer them diagnostic visits adapted to their situation and to appreciate the timeliness and the feasibility of the mandatory measures, along with those which are recommended. It is also necessary to accompany them in preparing subsidy applications and to foresee, if need be, recourse to com-*

*plementary financing from the FPRNM (major natural risk prevention fund).*

*The DDE is thus encouraging project leadership to emerge – the Pays Haut-Anjou Segréen area was selected because this territorial district is considered to be the rightful project leader. But it must ensure broad consultation of many local players. Indeed, the commitment of the area requires that a precise, formal technical and financial package be adopted beforehand. If the area already has the power to impose local housing policy, the introduction of the vulnerability component represents a substantial novelty, even a quite unknown factor. It is hence essential that other partners reassure the project leader that they will provide their technical and/or financial support.*

*Such a package requires a long explanatory and concertation phase in order to mobilise the partners and lead to a satisfactory definitive plan. However, there is then a risk of seeing a reduced deadline within which the FPRNM fund can be exploited (5 years following approval of the PPR).*

#### → *The example of Châteaulin*

*Three municipality communities, seven municipalities some of which are very little prone to flooding, are involved in establishing a vulnerability reduction operation package encompassing a portion of a catchment basin. This requires a certain tenacity on the part of Government services and those of territorial authorities in order to overcome the obstacles: the option selected here was to progress step by step to convince, find solutions and gain the support of the municipalities as a whole.*

*The issues at stake for each municipality community were inventoried as a starting point: residential units, businesses, sales outlets, public facilities/networks.*

*The financing of the surveys on a pro-rata basis of the number of inhabitants subject to flood risks enabled removing certain reticencies.*

*It was nonetheless still a matter of ensuring the consistency of a tri-partite agreement among the municipality communities having different competencies.*



*Flooding at Châteaulin in 2001.*

As one of the three municipality communities had no housing competencies, negotiations led to the establishment of an inter-community agreement appointing one municipality community as the project leader for a survey intended to define the classification of buildings according to type, the recommended work to undertake and the possibility of corresponding financing being available.

The implementation of the operation is therefore quite a lengthy process, depending upon the functioning of the inter-community structures, but the agreement constitutes the foundation for placing elected officials at the heart of the project.

### ■■■ Initiating and accompanying communication campaigns

Communication campaigns must be targeted and properly adapted throughout the operation.

It is essential to communicate about reducing vulnerability at every occasion and not simply during the establishment of a PPR or the implementation of an OPAH. It is possible, for instance, to broach the subject of the value of implementing vulnerability reduction measures and financing arrangements when the municipal safeguard plans are being drawn up or the subject of flood warning systems to implement in order to prepare the population for crisis management.

The quality of the operation's communication component also rests on its capacity to adapt to targets and to the needs identified along the way, as well as the possibility of undertaking the proposed measures. The communication initiatives inevitably give rise to expectations; it is therefore appropriate to consider the timing when the communication is to be made, based on the solution alternatives that may be examined and acceptable.

#### → The example of Laon

The Laon Quarry Municipal Department was thoroughly committed to an initial communication campaign aimed at the upper city inhabitants. It was a question of developing a better risk culture. This was undoubtedly easier in an environment where the inhabitants may well be at the origin of their problems, but harder as regards the high cost of undertaking subsoil reinforcement work.

The PPR risk prevention plan allowed further awareness raising of the population, its mandatory measures being both intended to remedy the unsanitary conditions (by connecting homes to the collective sewerage system) and to reduce vulnerability to ground movements.

The communication was centred on the inhabitants appropriating the community's underground heritage, which also served as the playground (forbidden?) of Laon's long-time residents: opening of underground tunnels to the public as part of heritage-day events and group visits, for instance.

#### → The example of the PIG to adapt housing to flood risks in the Orléans Conurbation Community

In order to guarantee the success of its operation, the Orléans Conurbation Community foresaw right from the start a substantial budget allocated to the communication component. It represents 19% of the "engineering aid" budget (communication, diagnostics, monitoring coordination), thus quite apart from work. Raising awareness to flood risks is actually one of the operation's two objectives (with the implementation of vulnerability reduction work).

The feedback from the service provider shows to what an extent this component is essential. If the initial purpose of communication is to inform the inhabitants about the operation and the possibility of benefiting from a free diagnostic, it is subsequently adapted to other targets. Indeed, it also appeared timely to also target managing agents of multiple-owner buildings. Above all, however, it was observed that it is essential to raise the awareness of contractors/tradesmen and contracting authorities who, when the work was being undertaken, showed considerable reticence and even total incredulity with respect to the measures foreseen.



«Because the Loire is better in its bed than in yours...  
Ask for a free diagnostic of your house to reduce flood risks»

## ■■■ Favouring urban improvement approaches

These will enable “pulling projects up towards the high end” and to consider an urbanisation project as one that makes “positive use of risk”.

### → The example of Ajaccio: “risk was our opportunity”

The “flooding” constraint was unavoidable and insurmountable within the perimeters of the ANRU project, affected by high and very high flood-hazard areas. The precaution principle and Government policy concerning risk tended towards freezing the district “as is”, if not authorising its demolition, but not reconstruction. In point of fact, demolition-reconstruction is the standard scenario and a fundamental criterion in ANRU projects.

The project was thus reviewed with the following factors in mind:

- all the constraints as a whole: flood risks, and lack of available land in Ajaccio;
- the needs linked to these constraints: hydraulic development, an outlet towards the sea, reduction of public facility vulnerability, economising land;
- and the needs expressed by the inhabitants, who were fairly satisfied with their homes, but who noted that the public spaces were neglected.

As a result, the new project made positive use of the constraints by focusing on the requalification of public spaces, providing quality development plans and facilities, taking into account reducing flooding vulnerability by programming the creation of retention basins, along with work on the rainwater drainage systems, and by avoiding unnecessary demolitions.

The players are unanimous in saying that the flooding constraint ultimately served as an opportunity for the project, not only by being less costly but also by being more satisfactory for the inhabitants.

Montauban: the historic flood of 4th March 1930.



### → The example of Montauban with the redevelopment of the banks of the Tarn

In addition to the prospective surveys launched in the Sapiac and Villebourbon districts, in 2004 the City of Montauban – relayed by the Conurbation Community of Montauban Trois Rivières – drew up a global flooding protection programme that aims, among other things, to protect the two districts (5,000 people) from high water levels that may reach +9.5m and +10m respectively.

This programme includes various actions, including the redevelopment of the banks of the Tarn and of the Tescou. In total, 6 km of banks will be redeveloped and 27,000 trees and shrubs will be planted. This vast work site will allow, beyond providing flood protection, improving the banks and creating a new park area of 20 hectares at the heart of Montauban.

A pedestrian trail and 5 km of cycling tracks will be established from the city centre to the ring road so that the population can once again enjoy the banks of the river and make them their own. Family gardens will also be re-established along the banks.



## 3.4 - Regulatory, financial and technical tools

### ■■■ Seizing the opportunity offered by the emergence of an urban renewal plan

When a PPR is being established, the opportunity should be seized to integrate vulnerability mitigation or, as the case may be, to consider the possibility of revising the pre-existing PPR.

#### → The example of Ajaccio

The need to keep, if not develop, the public facilities in the Cannes-Salines district, in proximity to the Ajaccio centre, was taken into account in the PPRI project, although most of the ZUS is located in a high or very high hazard area.

A very specific sector was thus delineated in the PPRI project (ZU sector) in which certain land occupation possibilities were allowed subject to reducing the vulnerability to flooding, whether at district level or with respect to the buildings themselves. This sector in particular includes areas of old buildings affected by urban renewal operations, identified as zones with stakes at issue (ZU1). In



The only planned demolition in Ajaccio: a penetration of the Mancini block to allow rapid evacuation of floodwater into the sea.



this sector are allowed, subject to the general applicable policies in ZU sectors, the two only public facilities of the project concerned by the risk:

- the reconstruction of the Salines district school, on condition that this be accompanied by a delocalisation of a major proportion of the current classes to other sites, outside the flood-prone area;
- the building of a “community centre”.

These two facilities will have to heed the evacuation and emergency relief measures applicable to the population in case of unusually heavy rainfall using, in particular, an access road that cannot be submerged.

#### → The example of Montauban

The question posed in Montauban was: “How can an urban renewal project be steered in a flood-hazard area so it complies with general prevention principles?”

The combination of the urban approach with the flood risk approach prompted considering the establishment of a ZAC by the mixed economy SEM of Montauban, in compliance with risk prevention principles, including:

- controlling the increase in the exposed population;
- reducing population and asset vulnerability by relocating them to less-exposed sectors and by imposing development and building principles compatible with flood risk.

The development potential of these two districts was determined based on this cross-sectional analysis.

#### ■■■ Preparing the procedures and actions to be implemented

There is no question of waiting for the exceptional event: in territories that have suffered adverse consequences, reconstruction will integrate the vulnerability reduction component all the more easily inasmuch as procedures and actions have been implemented beforehand.

#### → The example of the Gard

The rehabilitation phase for the housing that suffered damages in the Gard following the flooding in September 2002, was organised in three geographic zones and entrusted to three coordination teams to accompany private individuals in their rehabilitation formalities (preparing ANAH applications).

We quite naturally note that the two areas where project leaders already existed (the Conurbation Community of Grand Alès and the Community of Pont du Gard) were very rapidly operational: these territorial authorities were already involved in planned housing improvement operations and the field was already familiar to the engineering offices that intervened. Nonetheless, their work would have progressed even more efficiently had the PIG rules (ANAH subsidy criteria related to vulnerability reduction requirements) been anticipated and harmonised prior to the advent of the catastrophe. This might have been done within the framework of deliberations about the causes and consequences of flooding, for instance, as part of drawing up a PPRI or PLUs (local urban planning programs).

#### ■■■ Associating the reduction of housing vulnerability with other prevention measures



Whether to reduce hazards, prepare for crisis management, or implement collective measures, etc., it is quite obvious that working in a collegiate manner, and calling on all existing risk prevention tools, is of considerable interest.

It is therefore appropriate to carefully situate vulnerability reduction actions within the framework of global management of flood risk (all the more unavoidable insofar as one is part of a PAPI programme). Reducing the vulnerability of the exposed stakes is, in fact, just one tool among others to reduce risk.

This necessity implies:

- thoroughly arguing the value of vulnerability reduction;
- clearly showing objectives, listing them by importance and pinpointing their targets: ensuring the safety of individuals? facilitating a return to normality? reducing the cost of damages for businesses? for homes?

#### → The example of the Gard

Although exceptional schemes and considerable resources have been implemented in the Gard since the exceptional flooding in September 2002, the rehabilitation actions revealed the limits of measures focused on reducing the vulnerability of the homes affected.

In fact, aside from determining the regulatory criteria for the subsidies to be granted (different criteria for the ANAH and the PIG concerning the creation of floors to serve as habitable refuges), the feasibility of creating habitable refuges was impossible in certain building configurations (under small roof trusses, for instance). In certain housing estates, communal refuge premises would have been more appropriate; elsewhere, the least costly and most obvious solution would have been to install upstream hydraulic systems.

The resources made available to meet post-catastrophe and emergency needs would have truly been well spent had they been applied more appropriately to given situations and in a complementary fashion in different areas such as urban planning or hazard reduction.



#### ■ ■ ■ Performing a diagnostic of buildings

The first stage in vulnerability reduction operations lies in conducting individual diagnostics for each building. These diagnostics enable defining the appropriate measures to be implemented and to evaluate their cost in relation, and particularly within the PPR framework, to the limit set at 10% of the market value of the asset.

#### ■ Finalising the diagnostic methods adapted to the local context and the hazard

To date, no truly standard diagnostic exists that has been tried and tested within a great number of surveys and that is applicable to the country as a whole. Nonetheless, many documents exist that already offer useful elements giving a methodological and recommendation<sup>1</sup> framework. However, it is

still necessary to adapt these documents to the local environment of the operations foreseen. Gradually, over the course of an increasing number of such operations and the dissemination of such experiments, this pre-existing methodological framework should become increasingly simplified.

#### → The example of the Val de Saône operation

Prior to launching its experimental survey on reducing flooding vulnerability, the Saône & Doubs EPTB assembled all the methodological documents available and outlined the initial summary and improvement factors. The service provider who will be selected to head this survey will have to finalise the definitive guidelines, based on the expert assessment of 100 diagnostics, in order to conduct diagnostics of housing, businesses and farms.

#### ■ Training the “diagnosticians”

In view of the small number of operations underway to date, the market for conducting such assessments is extremely limited. As a result, the competent engineering offices are rare. It is likely that this market will tend to develop, but it is nonetheless still necessary to anticipate preliminary training, either of service provider representatives who are on survey assignment or, in certain cases, of the task officers recruited directly by the project leader.

#### → The example of the PIG to adapt housing to flood risks in the Orléans Conurbation Community

The Orléans operation began in 2005. The service provider selected was specialised in housing improvement operations (OPAH type) but had never worked on the issue of reducing the flood vulnerability of housing. This being the case, the Orléans Conurbation undertook to train the survey representative, with the precious help of the DIREN

3 - CETE Méditerranée: Vulnérabilité aux séismes des écoles primaires de Guadeloupe (2007) (Vulnerability of Guadeloupe primary schools to earthquakes).

GEOTER International: Etude de la vulnérabilité aux séismes du parc de logement HLM en Guadeloupe (2006) (Vulnerability of Guadeloupe public housing to earthquakes).

CETE de l'Ouest: Cahier des charges type OPAH pour le diagnostic et le suivi (2004) (OPAH-type specifications for diagnostics and monitoring).

DRE de Bretagne: Rendre son habitation moins vulnérable aux inondations (2 volumes, 2004) (Making your home less vulnerable to flooding).

DGUHC: Inondations, guide d'évaluation de la vulnérabilité des bâtiments vis-à-vis de l'inondation (2005) (Flooding: evaluation manual to assess the flooding vulnerability of buildings).

EPTB Saône & Doubs: Guides de diagnostic et d'auto-diagnostic de la vulnérabilité aux inondations pour les habitations du Val de Saône (2007) (Diagnostic and self-diagnosis manuals on flooding vulnerability for houses in the Val de Saône).

CEPRI: Guide pour le diagnostic de la vulnérabilité d'un bâtiment au risque d'inondation (à paraître, 2008) (Manual for diagnosing the vulnerability of a building to flooding risks) (still to be published).



Centre and the Multidisciplinary Team, on how to conduct the housing diagnostics and it also participated very actively in finalising the diagnostic method.

How to evaluate the time needed to conduct the "diagnostics"

The example of the PIG to adapt housing to flood risks in the Orléans Conurbation Community

The service provider of the Orléans Conurbation has between 600 and 1,000 diagnostics to conduct, at a per unit cost of 135. When he made his offer, this provider estimated the time needed for a diagnostic visit as being one hour. As it happens, the amount of time needed turns out to be considerably longer, and takes up to three hours. What had been underestimated is the amount of time that must be devoted to listening and to providing the explanations required by the owners.

Asking oneself about owner participation in financing the diagnostics

Prior to undertaking a project, it is appropriate to ask oneself whether such diagnostics should be free of charge or whether to ask owners to participate in their financing. We note from the examples studied that where these assessments have been conducted, they have been offered for free to property owners. This does not appear to be a position "set in stone" since it seems likely to evolve over time. In the Seille Basin, for instance, the debate's outcome is not yet entirely determined (self-financing by owners might amount to between 10 and 20%).

Extract from the document: «La réduction de la vulnérabilité aux inondations» (reducing vulnerability to floods) by the Saône et Doubs EPTB (December 2004).



**LA RÉDUCTION DE LA VULNÉRABILITÉ**

Les techniques de réduction de la vulnérabilité ont pour objectif commun de diminuer l'impact d'une inondation sur la vie et les biens des personnes. Ces techniques peuvent être réparties en plusieurs catégories, selon leur mode, leur lieu, ou leur période d'intervention. Vous trouverez ci-dessous quelques exemples de solutions techniques, sèches ou en eau, applicables aux bâtiments d'habitation.

**TECHNIQUES « SÈCHES »**

L'objectif de ces techniques est de maintenir temporairement l'eau à l'extérieur de l'habitation. En complément de ces techniques, l'installation d'un pompage est généralement nécessaire.

**Ouvertures:**  
Les ouvertures de portes ou fenêtres peuvent être closes par des dispositifs amovibles (bâches) en polyéthylène. Les serrures basses peuvent être fermées temporairement par des caches spécialement prévus. Il est très important de ré-ouvrir toutes les ouvertures après l'inondation pour permettre un séchage efficace.

**Murs:**  
L'étanchéité des murs extérieurs peut être améliorée en bouchant les fissures et en enduisant les joints. De manière temporaire, une bâche étanche peut être fixée, tendue et clouée au pan de la base des murs.

**Bâches temporaires:**  
Sacs de sable, pompes... Des techniques alternatives ou complémentaires existent sur le marché : murs de latardeaux (bâches amovibles), boudins gonflés d'air ou d'eau...

**Réseaux:**  
Un clapet anti-retour posé sur la canalisation de sortie des eaux usées (en amont du réseau ou du premier regard) permet d'éviter le retour de l'eau par l'intérieur. L'étanchéité autour des passages de réseaux (gaz, eau potable) à travers les murs peut également être améliorée grâce à un simple mastic.

**LES TECHNIQUES « EN EAU »**

Concomitant aux techniques précédentes, telles et cherchant à adapter de manière permanente l'habitat à la présence occasionnelle de l'eau.

**Ré-niveau - Étage:**  
La ré-niveau du plancher ou la création d'une pièce - refuge - hors d'eau à l'étage permet de réduire la vulnérabilité humaine et matérielle aux inondations.

**Mobilier:**  
Les meubles précieux seront placés et protégés hors d'atteinte de l'eau. Tous les pièces fragiles (peintures ou polychromes) doivent être protégées. Les portes, fenêtres, charnières et encadrements en PVC ou aluminium se sont montrés sensibles à la présence de l'eau.

**Murs:**  
Il s'agit d'utiliser des matériaux qui ne s'imbibent pas et d'éviter le jointage de l'eau entre deux couches imperméables. Seront privilégiés les murs pierre, des mortiers rigides (polyuréthane ou polyuréthane plâtre) que sera de verre et si nécessaire un drainage vertical déconnecté à l'extérieur. Pour le renforcement, des peintures et enduits à la chaux, carrelages (murs et joints au ciment et à la chaux - mastic de table de bain), joints auto-adhésifs, seront indiqués.

**Électricité:**  
Le relèvement des prises et interrupteurs à 90 cm du moins du sol est conseillé. Le réseau doit être en haut des murs plutôt qu'en son milieu et si le réseau est en haut des murs plutôt qu'en son milieu et si le réseau est en haut des murs plutôt qu'en son milieu. Dans les murs, les fils peuvent être placés dans des goulottes prévues pour faciliter leur évacuation de leur changement. La rénovation des courants (gaz - électrique) peut être effectuée avec l'aide de fours à eau.

**Chauffage:**  
Une des priorités est de bien isoler ou améliorer l'isolation de la chaudière et le circuit de chauffage. Des ventouses automatiques peuvent également être prévues pour évacuer automatiquement les gazes et évaporer en cas de choc, réduisant le risque de glissement et la souffrance des murs et meubles.

**Clôtures:**  
Les clôtures pleines maçonnées (en briques) sont privilégiées à de préférence. Si nécessaire, la préférence sera néanmoins pour l'hydrofuge, l'auto-nettoyant et si possible traité par une substance en métal inoxydable plutôt qu'en bois.

**Sols:**  
Les carrelages ou étages béton seront les sols les moins sensibles à la présence d'eau. Si un plancher en bois doit malgré tout être conservé, on pourra privilégier des ouvertures de son traitement isolantes pour le séchage (trap, etc.).

**Vie saine:**  
La réhabilitation du toit de chaudière peut être l'occasion de créer un vide sanitaire. Pour faciliter son drainage, celui-ci peut être aménagé avec un sol incliné vers une fosse ou une pompe (TAR), généralement hors d'eau, rigide en béton et d'un accès (escalier) pour l'entretien et l'entretien.

**LES NECESSITÉS CONNEXES**  
Il ne s'agit pas de déplacer son à l'extérieur plus rapide.  
Mobilier hydrofuge  
Enduit et peinture à la chaux  
Boudins hydrofuges, bâches joint  
Cimentage, mortier  
Sacs de sable, PVC  
Axe inondable  
Polyuréthane, polyuréthane

**... et d'éviter de**  
Plâtre  
Mortier  
Papiers joints  
Sacs de sable ou graviers  
Laine de verre laine de roche

**Il est important de noter que, pour les techniques « sèches » :**  
- dans le cas de murs lisses peints de revêtements de plâtre, ces aménagements peuvent se révéler inefficaces ;  
- la structure du bâtiment n'est jamais conçue pour soutenir les fortes pressions exercées par l'eau. En règle générale, on ne cherche pas à élever une différence de niveau de plus de 50 cm entre l'intérieur et l'extérieur ;  
- du fait de leur aspect temporaire, les techniques doivent être testées et vérifiées régulièrement (mais en particulier les boudins, démontage de la jointure, entretien du clapet, ventilation des fissures adhésives...).

Feuille d'information du Programme d'Actions de Prévention des Inondations du Val de Saône - Décembre 2004

Feuille d'information du Programme d'Actions de Prévention des Inondations du Val de Saône - Décembre 2004

## ■■■ Modifying selection criteria

The ANAH approaches, even when they take into account vulnerability mitigation, only affect populations with very low incomes. These are highly selective criteria while the tools and the approaches are very interesting, if not innovative.

### → *The example of the PIG to adapt housing to flood risks in the Orléans Conurbation Community*

Within the framework of the PIG of the Orléans Conurbation, the subsidies reserved for the three years of work operations amount to nearly 1.3 m (77% of which come from the ANAH and the rest from the Conurbation and the Centre Region). This aid from the ANAH is governed by the usual attribution rules of this organisation. As a result, for instance, owners must meet maximum resource conditions or must rent (for 9 years). In addition, the work can only be subsidized in dwellings that were built over 15 years ago. The subsidies provided by the Conurbation and by the region represent complementary aid to that provided by the ANAH. Where owner-occupiers are concerned, this aid is subject to resource conditions, with the basic ANAH upper limit being indexed at 150%. As the ANAH limit is very low, the removal of limits for aid from the Conurbation and the region does not permit significantly broadening the public that can potentially benefit from these subsidies. Hence, because the population in the flood-prone territory happens to be fairly well-off in this case, the maximum resource limits of the ANAH deprive most residents of this aid. Two and one half years after the operation's launch, only 36% of the work budget funds had been solicited (and mainly used by just three landlords).



## 4 - European initiatives

The objective of inventorying foreign cases is to provide examples of interesting approaches used in the field of development and building renovation in built-up areas, which are likely to diversify the solutions already being implemented in France.

Considerable documentation has been collected and meetings have been held to discuss local initiatives in three countries: Germany, the Netherlands and the United Kingdom.

### 4.1 - Protection and adaptation measures for existing buildings

Four categories of measures serve as guidelines in the various foreign policies examined:

- **“structural” protection measures at the level of watercourses**, which are the standard province of public authorities or of developers: permanent dikes, dams, border strips, etc.;
- **“resistance” measures that make it possible to delay the arrival of the water at the level of a given area** (district, parcel) and generally encompass the various mobile protection measures (sand bags, removable barriers), partitioning (compartments) or permanent installations (walls, water-channelling work);
- **“entry resistance” measures to keep water out at the level of a building**, including mobile installations (barriers on gates, cofferdams and watertight closure of cellars, for instance). The quality of the structure and of the foundation are among these resistance measures since they are often determinant in limiting the most serious damage;

- **“resilience” measures** aimed at reducing damage should the building be flooded and to facilitate a return to normalcy after the flood: refuges, ensuring networks/systems and dangerous products are up out of the way of water, that claddings/coverings are compatible with water, that ground floor occupation is limited, etc.

The general idea is that **these four complementary aspects must be consistent**. Delaying water does indeed enable applying water entry resistance measures, if not implementing a portion of resilience efforts (putting people and property out of harm’s way).



### 4.2 - A different approach to risk

The approaches in the three countries studied are very much oriented towards **prevention at the source**, therefore based on public intervention applied to water courses and the public space. This reflects the legal framework (main liability of the public authorities) and the more limited nature of insurance plans. The adoption of resistance or resilience measures in private spaces is considered to be useful, but remains of the order of “advice” given to private individuals (or it can to play a part in negotiating insurance contracts), while planning and hydraulic management are the prior duties of the entities in charge of safety.



<http://www.dijkteruglegging.nl>

Lent on the Waal, facing the town of Nimegue (Netherlands): official and alternative project to give the river more space (Ruimte Voor de Rivier program).

The question of the measures that need to be imposed on existing buildings is still in its infancy, aside from a few experiments, even if technical solutions are known. The conclusion reached about the limits of structural protection, due to costs and the difficulty of precisely delineating residual risk, is very recent. The approach tends more towards informing or raising awareness, since the adoption of vulnerability reduction measures is considered to be a private matter. Nevertheless, a number of initiatives seem to show that developments will occur in the near future: more often than not, this concerns regulations to be included in municipal codes, in the same capacity as safety regulations.

Reflecting the spirit underlying the European project, *Freude am Fluss*, born in the Netherlands, we note the resolve to bring inhabitants closer to the river, in order to elicit greater familiarity and prudence, which would tend to generate less demanding or less "passive" attitudes with respect to the constraints imposed by the competent authorities. A form of behaviourism is evidently the therapeutic approach being pursued.

Finally, micro-economic calculations play an essential role in the prevailing views in the Netherlands and the United Kingdom. In other words, the measures are always appreciated case by case, on a return-on-investment basis that may vary and it presupposes taking into account insurance rates, reductions for damages assumed by the public authorities, and losses avoided for business. Assessment tools are actually available for small enterprises in the United Kingdom (through the Department for Environment).

### 4.3 - Major orientations

Considerable attention is paid to the decision-making process of private individuals, whether they be residents, property owners or businesses. The English case is the most revealing because of initiatives made to encourage graduating to a policy less focused on structural defences.

The concern with informing and promoting a long-term collective dynamic is very strong: numerous documents, repeated public events, education and an emphasis on water's appeal for leisure activities, tourism and its landscape value. The capacity of a population to respond to risk is never a sure thing under this approach, hence continual mobilisation is necessary.

The weight of economic calculations in the Dutch and the British cases leads to having frequent recourse to the cost/benefit approach and also calling on the notion of public funding profitability. Moreover, this recourse is being called into question by players in the insurance business or in associations who feel that all efforts to limit adverse consequences are, in any case, positive in a very uncertain environment. Nonetheless, this focus does lead to stinting on renovation work for isolated low-value buildings.

A major theme emerges in each country that enables understanding the approach adopted. The way structural measures are broached, as well as resistance and resilience measures to deal with flood risks, depends upon the national context.



Pages from the online flood resilience modelling system  
on <http://www.floodresilienthome.com>



## ■ In Germany

**Information measures and the implementation of consistent plans** appear to be preponderant in the German case; this country recently launched (2005-2006) general risk management planning measures. As early as the end of the 1990s, however, municipal and regional departments that specialised in flood risk finalised some technical tools and communication/advice policies based on the continuity of prevention measures, which range from interior remedial work right through to the development of public spaces and early-warning organisation.

→ *The guides disseminated by the German Länders as of the end of the 1990s were preceded by deliberations among public engineers at inter-regional level within the framework of LAWA, an exchange structure for technical water services. They finalised a systematic global analysis of prevention measures designed to deal with flooding and this now enables disseminating very complete information at the local level. The municipal services or "Hochwasserschutz" subsequently serve to relay these guides, which are distributed in each city thanks to information campaigns, emergency warning drills, diagnostics and orientation of property owners to implement work programs. The result is very gradual, of course, but it became obvious during the 2002 floods that the buildings renovated according to recommendations suffered half as much damage as the others. The majority of this damage reduction can be attributed to the change in use made of the build-up areas so as to reserve sections most exposed to water for less vulnerable functions.*

## ■ In the Netherlands

**Actions in public spaces combined with the mobilisation of the inhabitants** appear to be the main orientation in the Dutch case: despite substantial protection, the residual risks appear increasingly difficult to mitigate (risk of dykes breaching, of rising groundwater or rainfall hazards). The first deliberations were initiated concerning emergency measures in extension areas or flood-risk areas, management of existing urbanisation into the beds of watercourses, and the issue of central districts or historical districts where structural protection would imply remedial work that might deteriorate the quality of the sites. The approach consists of compensatory measures that use unbuilt areas to store, infiltrate or circulate excess water in order to delay damages. The inhabitants play a very important role in raising awareness

and acting on a daily basis as regards monitoring, maintaining and suggesting improvements in these measures.

→ *A number of Dutch cities are committed to renovating existing districts to mitigate residual risks of flooding behind the dikes (overtopping or breaching). In the districts dating from the 1950s and 1960s, which have sizeable open spaces in the road networks or between high buildings, the effort to "leave room for the water" has led to a very ambitious programme, in particular in Rotterdam (Rotterdam2035 Plan) and in Delft (Tanthof and Delftzij districts). Ponds, reservoirs, canals and flood-control works make it possible to ensure that water "circulates", or even infiltrates directly on the spot rather than trying to evacuate it via saturated networks. The water, kept in situ, retains its cleanliness better and serves leisure and landscaping purposes.*

## ■ In the United Kingdom

**The work underway with professionals** (insurers in this case) in the United Kingdom is occurring within a context where the advantageous insurance coverage on offer had removed the responsibility of all the players confronting inundation hazards in floodplains and flood-risk areas. The fact of having reconsidered urban development projects in floodplains posed both the issue of existing districts and of the impossibility of handling the cost of complete structural protection. By combining diagnostic tools and experimental financing measures, the arrangements currently finalised are designed to encourage adaptation of built-up areas coupled with modulation of insurance rates.

→ *The British Department for Environment (DEFRA) and several insurance companies are undertaking an incentive operation at six experimental sites for the redevelopment of about one hundred dwellings, in order to improve their "resilience" in case of flooding. The objective is to cover a wide range of situations so that the results can subsequently be used as examples. Subsidies (£5,000 on average) are attributed case by case and based on expertise and advice provided by these operations and backed by insurers that can then modulate their rates according to the work done. The first cases of floods affecting certain renovated dwellings have shown that the damages have become very limited, although the average reduction is estimated to be about 30-40% for interior work, which seems to be the most*



efficient. The operation is still underway, but initial results conclude that it is essential to modulate the aid and arrangements to meet a very wide range of situations. A too-highly standardised national approach would thus be counterproductive.

#### 4.4 - What lessons learned?

The French efforts implemented to stimulate adapting existing buildings to flood risks would do well to be inspired by the approaches developed in Germany, the Netherlands, or in the United Kingdom.

##### ■ Developing operational partnerships

The three countries are applying themselves to implementing very close **operational partnerships** with insurers, in the British case, with water and protection technicians in the German case, and with inhabitants in the Dutch case. The perspective in the three countries is clearly that the involvement of these partners must not remain limited to consultations, but must result in a permanent association, as much for mobilisation, as for information and development purposes, based on continual feedback from the field.

##### ■ Diversifying measures (while ensuring their consistency)

Despite very different situations, the three countries appear to be strongly emphasizing **the complementarity of the resilience/resistance measures applied to**

**buildings** (a little-known distinction in France<sup>4</sup>) and of the options for redeveloping public spaces, of temporary protective initiatives and of water evacuation plans. The dominant notion is that a single measure is never enough to deal with a risk whose assessment is always temporary and whose variations can shift over time; moreover, the diversity of cases requires that incentives schemes not be standardised because there is no systematic reproducible answer to reduce flood damage. The set of measures as a whole must be organised in a consistent manner, as is shown in the guides edited by the German cities; these define a timetable that starts as of the flood warning and include the implementation of measures to existing structures within overall warning systems.

##### ■ Improving information systems

Information to raise awareness about **hazards and risks and about advice on building and development measures is very prevalent** in Germany and in the Netherlands (but also in Austria). A great deal of easily accessible information is in circulation, as much as concerns raising people's awareness of risks as in technical fields explaining building methods in flood-prone areas.

Generally speaking, initiatives are currently in full progress in the three countries, with a common tendency towards the implementation of more ambitious or standardisation policies to **adapt existing structures in terms of the risks associated with each situation**.



4 - The measures proposed in France are often limited to certain aspects of resistance to water entry. The building's resilience is rarely addressed in terms of making better use of a building's interior. Certain German municipal regulations stipulate that the ground floor may not be used permanently, for instance.

<http://www.ufz.de>

Flooding in Germany in 2002.

## 5 - Some recommendations

### 5.1 - Emergence of projects

All of the initiatives examined reveal **the importance of partnerships between Government and territorial authorities in ensuring a project's success**. The Government plays a key role in the emergence of the projects and/or their successful progress.

No matter what the context is, the best strategy must be found to implement vulnerability reduction operations. The PPR may either be the origin of this strategy, or it may exist to provide support, or it may be totally absent. Different options are possible:

The Government services can decide to initiate such operations starting with the PPRs. This "regulatory route" consists of introducing obligatory measures in new PPRs (or in older revised PPRs) that cover existing structures and concern vulnerability reduction. This obligation to comply is then imposed on property owners (but also, as the case may be, on company directors) and may prompt the territorial authorities in question to make arrangements (of the OPAH type for instance) aimed at helping owners implement these measures. Government services may then accompany these approaches, as both technical and financial partner, if not as instrumental in their origination (as is the case in Maine-et-Loire, for instance).

The second option consists in working upstream of the PPR regulations through collaboration between territorial authorities and Government. It is then a matter of **moderating joint deliberations about the risk, and then defining a strategy to reduce this risk based on a shared diagnostic**, one component of which will be vulnerability mitigation, in a similar way to the PAPI, for instance, or to natural risk prevention schemes or to the SCOT consistency schemes even. The prescription or the revision of PPRs is then only one option if we consider that the urban planning documents (PLU) will be able to take the risks into account efficiently and that vulnerability reduction will be presently included in the incentive approaches, quite apart from any regulations.

Alternatives to the regulatory route exist. In particular, territorial authorities may consider possible financing arrangements other than the FPRNM (Barnier Fund) and thus avoid "waiting" for the approval of PPRs prescribing mandatory measures covering existing structures. In this respect, the case of the Orléans Conurbation provides the most telling example. It encourages not conditioning the emergence of initiatives by territorial authorities on the existence of a PPR and its contents.

**The initiatives relating to housing policies and urban renewal** show that these operations should be more systematically seized as opportunities for in-depth reflections about vulnerability reduction along with concrete actions, not only at the level of existing buildings but also at territorial level. In Government and territorial authority departments, it would then be appropriate to ensure that those heading PPRs, PLUs and OPAHs work together more closely.

Urban renewal provides an alternative, alongside the regulatory approaches like the PPRs or the incentive approaches that are sometimes insufficient and partly anchored within the territory.



### 5.2 - Project accompaniment

For both the measures made mandatory by the PPR and those set out in other schemes, **information and inducements are paramount**.

The measures must be presented and defended, possibly during the public inquiry, as the case may be, and financing related arrangements should be known and presented on this occasion.

In particular, the information process must be pursued when a PPR has been approved. Feedback has shown that the affected inhabitants know relatively little about these documents. If no information is disseminated, the measures concerning existing

buildings will never be implemented (and certainly not within the 5-year lead time in which to benefit from the FPRNM).

Beyond information, experience also shows that it is imperative **to establish advice and accompaniment arrangements**, without which private individuals will not alone undertake the various formalities necessary (finding tradesmen, discussing the measures to be implemented with them, preparing financing applications, etc.).

An *ad hoc* arrangement is thus absolutely necessary to accompany the implementation of the vulnerability reduction measures.

The involvement of the territorial authorities is here again also primordial. However, the regulatory nature of the measures made mandatory by a PPR seems to prompt territorial authorities to fade into the background. It is therefore appropriate to work closely with the authorities well upstream on the actual drafting of these measures. One of the keys to mobilise all the players around these measures is to base them on a prior shared diagnostic of existing buildings; this guarantees that the measures are pertinent and adapted to each building.

### 5.3 - Involvement of the various players

#### ■ Territorial authorities

In view of the points mentioned above and the competencies of the territorial authorities, they have an essential role to play – whether the approach is regulatory or voluntary – in the development of operations to reduce housing vulnerability.

In order to progress along this path, it is necessary for such authorities to adopt the role of project leader to steer this type of operation. This requires becoming aware that risk prevention and urban improvement are complementary, and also that the “risk” component needs to be integrated in their global development project.

To this end, these projects require a dual approach that combines “risk” and “urban planning” (the integration of housing and other property).

These can be dealt with at different territorial levels. The more operational aspects can generally be implemented at the municipal or intercommunal level. In some cases, other components such as information, global diagnostics, diagnostic tools and financial aids can be dealt with more effectively at a higher echelon (departmental, regional, river basin district).

#### ■ Government services in charge of risks

It is necessary for the Government to provide special support as regards the following aspects:

- **assisting in the determination of project leadership**: strategy definition, considerations about the proper territorial level, identifying and ensuring the availability of technical and financial resources; ensuring that the initiatives continue in the long term;
- **helping to draw up arguments**, at local level, to justify the efforts to reduce vulnerability;
- in this same spirit, it might be pertinent to **mediate an economic discussion** about the timeliness of such an effort concerning vulnerability reduction with qualified people: in a given territory, how should an assessment be conducted? Where is the best place to start? How can the profitability of the anticipated actions and measures be assessed?

#### ■ The ANAH

**Closer cooperation between the ANAH delegations and the PPR mentor services might be very constructive.** Exchange clubs about risks exist in all the regions and bring together the deconcentrated department agents who are in charge of risk prevention. Today, these could serve as an information interchange hub for vulnerability reduction by also associating the ANAH mediators or mentors. This would enable eliciting local initiatives, harmonising and professionalising best practices, producing regional doctrines and ensuring the dissemination of methods in order to highlight the most interesting projects. It is through the capacity to generate both knowledge and strategy that the regional technical network contributes to implementing the Government’s national policy best.

#### ■ Professionals in the building trades

**A collaborative effort must also be conducted with prime contracting professionals and with building trade professionals** who are not currently very receptive or involved in these actions.



This is necessary, in particular, when drafting the PPR regulations. The association of professionals well upstream would enable clarifying the measures selected and mobilising professionals in time to efficiently implement such measures. Similarly, upstream cooperation with the prime contractors would permit being assured that the know-how sometimes required to deal with building vulnerability reduction is available locally.

Finally, this closer collaboration could be useful in convincing insurers to integrate vulnerability reduction measures in post-crisis reconstruction. Insurers are consequently players that must also be associated at the early stages.



## 5.4 - Tools to be developed

### ■ Procedures

Experience feedback has shown how difficult it is to mobilise regulatory procedures – and most particularly the convergence between risk and housing procedures – to deal with complex uncharted situations. **An innovation effort is therefore essential** with respect to these procedures.

In the absence of specific procedures, it is appropriate to try to make the different existing schemes (including the PPR) converge into a consistent vision.

A collaborative effort must be undertaken between the Government and the territorial authorities concerning public spaces and facilities as part of establishing SCOT, PLU, PPR, PAPI, SDAGE or SAGE (etc.) programs, for instance.

Special care must be devoted to project phasing because each scheme is currently associated with a specific timeline: ANRU (5 years), OPAH (3 years), and the FPRNM linked to mandatory PPR measures (5 years).

**The European “flood risks” directive** of 23 October 2007 should help encourage innovative new procedures to emerge. Its objective is to establish **a framework for the assessment and management of flood risks** in order to mitigate the adverse consequences on human health, the environment, cultural heritage and economic activities associated with floods in the Community.

It imposes a three-stage methodology to manage risk:

- the preliminary flood risk assessment, which includes, in particular, a description of flood hazards and adverse consequences on human health, the environment and economic activity in the river basin district in question;
- the flood hazard maps, showing the geographical areas that could be flooded, and the flood risk maps, showing potential adverse consequences caused by flood events. These maps must include three flood scenarios: floods with a frequent return period every 10 years, floods with a return period every 100 years and an extreme low-probability event. The adverse consequences will be expressed using three indicators: the number of inhabitants potentially affected, the potential economic consequences in the area and the potential consequences to the environment;
- the establishment of flood risk management plans at the river basin district level. These plans must provide a global strategy to reduce risks based on prevention, protection and preparedness for crisis situations.

Although the management plan emphasizes prevention, it could also serve as the component that presents the vulnerability mitigation measures.

### ■ Diagnostics

Several entities have drawn up methods to assess the vulnerability of housing or public facilities [see p. 20], with tremendous variations in production cost. In short, the fact of systematically advocating diagnostics makes it **necessary to validate a method** (or methods) to assess vulnerability. It would serve as a benchmark to determine a “standard” diagnostic method whose objectives, means, criteria and “know-how” would be clearly defined and it would serve, in particular, as a guideline for an emerging profession: that of diagnostician.

In addition, **a cost-benefit evaluation of implementing the advocated measures** stipulated in the vulnerability assessments would be necessary to target and recommend the most efficient prevention measures that are also economically viable and implementable by project leaders/contracting authorities and property owners.

Moreover, when project initiators ask their personnel to perform diagnostics or ask an outside organisation to do this, they must be attentive as to **the limits of the assignment entrusted to the diagnosticians**.

Their intervention ends with the proposal of a set of potential solutions to reduce vulnerability, but they must not issue a prescription. The study of the specific solution and its implementation is the province of the prime contractor/design engineer that the owner of the diagnosed building must call on. Two different competencies are involved here (and hence insurance coverage as well). Should the case arise that one and the same person is involved, the services in question will give rise to two individual contractor agreements.

In the case of building reinforcement/consolidation work (often very heavy structural work), continual monitoring during project execution is necessary. This is to be done by an entity that has the required qualifications as regards knowledge of building reinforcement techniques in the civil engineering field.

The entity that undertakes the technical investigations and draws up the safety enhancement project is different from the one handling prime contracting of the work project.

This makes it possible to define individual responsibilities, both for the execution of the diagnostics and for the execution of work to mitigate vulnerability.

### ■ Financial aid

The mobilisation of financial aid sometimes proves complex and hard to fathom in the eyes of beneficiaries, as well as fairly inflexible in view of the diversity of situations. Its implementation may require harmonising the timetables among the various procedures: ANRU (5 years), OPAH (3 years) and FPRNM linked to the mandatory PPR measures (5 years).

In view of the multiplicity of phases, projects, players and regulations that determine the attribution of funding, including the FPRNM, it is necessary **to invent financial packages specific to each operation** (within the framework of the PAPI, for instance, through a strong mobilisation of partner territorial authorities). This role as “complex project leader” must gain an increasingly important role within Government services.

There must be greater clarity concerning the aid available for property-related projects and the adaptation of ANAH limits to resources. It would also be appropriate to consider fiscal incentives that might be of assistance (tax credit, reduced VAT, etc.).

## 6 - Conclusion

Although the number of initiatives aiming to reduce housing vulnerability is still very limited, we note their tremendous diversity, which makes any attempts to generalize difficult. It is nonetheless possible to draw a few general, but significant, lessons.

The first observation is **that no single answer exists** to steer housing vulnerability reduction projects in an entirely satisfactory manner, whether they are approached by favouring “housing” considerations or, on the contrary, by focusing primarily on the “risk” dimension.

In order to oversee projects that adequately reflect the complex realities on the terrain, it even seems imperative **to ensure the convergence of the approaches and procedures** pertaining to the housing and natural risk management field.

This is the reason it was noted that no players exist who are likely to be able to initiate, coordinate and proceed with this approach in an autonomous and independent manner, just as **no single tool exists** to deal with all the problems brought to light, or any one single source of financing.

The European initiatives – in which we observe a genuine but quite recent mobilisation as regards these issues, and most particularly in the Netherlands and the United Kingdom – show how much the notions of **partnership among players, of complementarity** among the different components of risk management and of technical project accompaniment are essential, with the regulatory framework covering vulnerability mitigation being much more limited than in France.

Any new project will hence require **very substantial mobilisation** over a long period of time on the part of many players, as well as **considerable powers of persuasion and very creative ideas**. The initiatives studied demonstrate the importance of the commitment and organisation of these players, before any concrete action can be taken. They also show the need to have a global territorial diagnostic available at the earliest stages that includes, in particular, **a clear evaluation of the stakes involved** for each risk considered and, as far as possible, the nature of the housing settlements in the sector.

The initiatives studied also highlight **the importance and value of having a preliminary assessment of built-up areas**. This stage, in all the approaches to reduce housing vulnerability to natural hazards, is a crucial one. In addition to helping to identify the principles to be implemented in order to reduce the vulnerability of buildings, the diagnostics also participate in raising the awareness of inhabitants to the risks and showing them the essential role they play in mitigating this vulnerability.

The recentness of initiatives in France over the past few years makes it very difficult to judge whether they are a success or failure, due to the lack of perspective. This experience feedback nonetheless underlines the fact that the tight deadlines required by the various regulations make preliminary upstream work, whether technical or political, all the more essential for drawing up programs to reduce the vulnerability of housing to natural risks.



### List of case studies and authors

The fifteen projects analysed (twelve case studies in France and three in other European countries) are presented in greater detail in the second volume entitled: “Fifteen initiatives to reduce the vulnerability of housing to natural risks: case studies”.

Localisation	Operation name	Nature of the risk	Authors
<b>FRANCE</b>			
<i>Corsica</i>	ANRU urban renewal program in Cannes-Salines in Ajaccio	<b>Flood</b>	CETE Méditerranée
<i>Finistère</i>	Quimper-Communauté: a flood component of the OPAH	<b>Flood</b>	CETE de l'Ouest
<i>Finistère</i>	Pre-operational study in Pays de Châteaulin-Porzay	<b>Flood</b>	CETE de l'Ouest
<i>Gard</i>	Housing scheme in the Gard Department	<b>Flood</b>	CETE Méditerranée
<i>Ille-et-Vilaine</i>	From regional to local: Moyenne Vilaine-Semnon operation	<b>Flood</b>	CETE de l'Ouest
<i>Indre-et-Loire</i>	ANAH: a new approach to examining subsidy applications for flood rehabilitation work	<b>Flood</b>	Ledoux Consultants
<i>Loiret</i>	PIG of adaptation of homes to flood risks in the Orléans conurbation	<b>Flood</b>	Ledoux Consultants
<i>Maine-et-Loire</i>	Planned operation to reduce vulnerability to flooding in Pays Haut Anjou Segréen	<b>Flood</b>	Ledoux Consultants
<i>Saône</i>	Val de Saône PAPI: reduction of flooding vulnerability	<b>Flood</b>	Ledoux Consultants
<i>Tarn-et-Garonne</i>	Urban renewal project of Sapiac and Villebourbon Districts in Montauban	<b>Flood</b>	CERTU
<i>Aisne</i>	OPAH in Laon: an operation with a dual objective	<b>Ground movement</b>	CETE de l'Ouest
<i>Guadeloupe</i>	Urban renewal operation (ANRU) in Pointe-à-Pitre	<b>Earthquake</b>	CETE Méditerranée
<b>OUTSIDE FRANCE</b>			
<i>Germany</i>	Information and advice	<b>Flood</b>	Fondation des Villes
<i>United Kingdom</i>	Partnership with insurers	<b>Flood</b>	Fondation des Villes
<i>Netherlands</i>	Managing public space with the inhabitants	<b>Flood</b>	Fondation des Villes





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