FLOOD-serv

FLOOD Emergency and Awareness SERVice

The FLOOD-serv Project Experience in Genoa

Hydrogeological Risk, Citizens, Institutions, Technology

Co-funded by the Horizon 2020 programme of the European Union

Grant Agreement N. 693599

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Municipality of Genoa

Department of Architecture and Design (DAD)

Department of Political Science (DISPO)

This book is free of charge

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Foreword

Year 1970. Year 2011. Year 2014.

The city of Genoa cannot surely forget these dates, which, with their respective floods, have strongly marked the life of the city.

The morphology of our city is such that a high percentage of the city centre is affected by floods from the streams that traverse the Genoese valleys.

A city by now ready to cope with flood-related events but which, like many other cities, needs a constant exchange of information between Public Administration and citizens to better deal with dangerous situations.

The FLOOD-serv project, co-funded by the European Union within the scope of the Horizon 2020, Programme, aims to define a digital platform through which citizens and associations are actively called upon to gather territorial data and information serving to prevent the hydrogeological risk.

Through Genoa's pilot project, the choice was made to focus attention on the pre- and post-flood periods and share the results obtained in support of all those who intend embarking on a process of involvement of the population for the sake of territorial protection.

The project develops the idea of a proactive, personalised and citizen-centred public service; by using the modern technological networks of communication and information made up of persons, skills and sensors, the attempt is made to sensitise the public on the risk of floods, mitigate their extent and coordinate an effective action of response to the problem.

We have worked on building networks of local communities able to interact, not just virtually, while preserving their own identity and the personal relationships.

Through the involvement of people and the development of new supporting tools (new apps or existing social media, such as Facebook or Twitter), dialogue groups are formed that network people in a neighbourhood affected by a recurring event, in order to share basic concepts of city, urban planning and environment through the exchange of opinions and information and the dialogue with the administration.

The work focused on Val Bisagno through the involvement of Municipalities: 3 -

Bassa Valbisagno, 4 - Media Valbisagno and 8 - Medio Levante, and of schools of various levels and specialisations, whose students, with the support of teachers, have experimented with the technological tools after a brief training on the characteristics of our territory.

The development of the Genoese pilot project boasted the scientific support of the University of Genoa, especially the Department of Architecture and Design (DAD) and the Department of Political Sciences (DISPO).

A heartfelt thanks goes to all those who collaborated in the FLOOD-serv project and in the draft of this publication, as well as to the transnational partners with whom we had the chance of embarking on this process.

Arch. Simonetta Cenci

Councillor for Urban Planning and State property administration

at the Municipality of Genoa

Silvia Campailla

The Municipality of Genoa and European Projects

The Municipality of Genoa has, for many years, been committed to participating in European projects, and numerous projects have counted and continue to count the Municipality as a partner in important international consortia. These projects concern all the Municipality's areas of competence: culture, energy, mobility, urban planning, the environment, ICT, business, budgeting, etc. The Municipality of Genoa participates with the aim of developing the skills of its employees, investigating subject areas and testing innovative technological solutions, and, above all, improving the quality of life of its citizens.

Within the Municipality, project development is performed by the various Directorates, in some cases autonomously and, in the case of more challenging projects, in partnership with other organisations. The working method that European projects entail makes it possible to improve interdepartmental relations, create opportunities for sharing that facilitate group work, and achieve shared goals. In addition to developing collaboration between the institution’s offices, European projects also provide an opportunity to work alongside and further relationships with other operators in the area, such as the University and research centers, other local public administrations, and companies. The volume you are holding in your hands is fruit of this joint work.

Being a partner in a European project is an opportunity to give substance to the founding concept of the European Union: “united in diversity”. Within a consortium, each partner brings its own contribution, shares ideas with the others and works together to develop solutions or achieve results that have value at European level, without losing its own identity. The individual characteristics of each partner are fundamental to the European Commission in making a contribution, and variety, in

terms of geography, competencies and working methods, is rewarded.

Genoa is often asked by consortium leaders to participate in European projects for various reasons: its many years of planning experience, the geographical location and orographic characteristics of the local area, and the presence of a densely populated urban fabric featuring buildings of great historical and cultural value. The Municipality of Genoa often conducts “pilot” projects it its own local area: small-scale experiments to assess the impact of solutions and the improvement of certain situations through adoption of technologies. Many pilots funded, fully or partially, by the European Commission have already been implemented in the Municipal area, including the following: the ElihMed project, which made it possible to improve the energy efficiency of three buildings on Piazza Adriatico, benefiting the inhabitants; the R2Ctities project, which permitted a reduction in the energy consumption and improvement in the living comfort of 162 apartments in the so-called “Lavatrici” district (prefabricated buildings reminiscent of washing machines); the CCIC project, which contributed to dematerialising the municipal budget; and the Creative Cities project, which resulted in creation of the Genova Creativa website, a reference point for the city’s creatives.

A survey conducted in 2016 by the Milan Polytechnic University’s eGovernment observatory[1] revealed the Municipality of Genoa to be the city with the highest number of projects acquired, for a total of 7.48 million euros in funding granted. Genoa can also boast, in its portfolio of experiences, being the only European city, in 2013, to win three projects in the topics of the Smart Cities and Communities call for proposals: Transform, R2Cities and Celsius.

For some years, issues linked to the fight against climate change, resilience and nature-based solutions have assumed particular importance, and there are many programmes that fund projects linked to these issues. Genoa, due to the frequent and tragic flooding it has suffered, has developed specific skills. The experience gained in this field has enabled the city to participate in the following projects on the development of natural disaster prevention and/or response systems: Anywhere, Proterina and FLOOD-serv.

Since 2017, Genoa has led the Urban Agenda Partnership on Climate Adaptation. The Urban Agenda is a European Union initiative that aims to put the spotlight on cities and their problems in order to find effective solutions to the challenges they face.

The European Commission places great importance on involving citizens and stakeholders in pilot implementation processes, so-called co-creation experiences and co-design workshops, also through the development of Living Labs[2].

The FLOOD-serv project, which you can read about in greater detail in the articles dedicated to it, took particular care to involve citizens in the organisation of training and informative experiences aimed at various population groups. Active participation by citizens in opportunities for debate and information, provided by European projects, offers both stakeholders and public administrations the chance to exchange ideas and investigate the relative requirements. In order for these meetings to be fruitful, they must be organised and led by people who know how to facilitate dialogue and arrive at a shared vision; at win-win situations, in other words.

European planning helps us to improve, in order to raise our internationalisation level and increase our knowledge and dissemination of information, including between citizens and stakeholders. From a survey conducted in 2018[3], it emerged that, according to 40% of the people interviewed, “information regarding EU projects implemented by the Municipality of Genoa” is poorly disseminated. Reaching citizens with correct and detailed information is crucial in permitting them to appreciate the work carried out by the Municipality and in raising awareness and the good reputation of the European Union and its institutions.

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1 M. Nicolai (2017), “Fondi Europei: la partecipazione dei Comuni italiani. Quante risorse ricevono i Comuni italiani dall’Europa” (European Funds: participation by Italian municipalities. How much funding Italian municipalities receive from Europe), ISBN: 978-88-99626-037 https://www.gfinance.it/lp/slidebook_fondi-europei-la-partecipazione-dei-comuni-italiani/

2 A living lab is a research concept and approach, centered on the user and the open-innovation ecosystem, often operating in a local area context (e.g. city, urban agglomeration or region) and integrating research and innovation processes into a public-private-people partnership.

3 Survey conducted as part of the “Europe2020” National Civil Service project, promoted and coordinated by the Municipality of Genoa’s Directorate of Economic Development, Strategic Innovation Projects and Statistics, in collaboration with the University of Genoa’s School of Social Sciences. Sample of 800 people.

European Project FLOOD-serv

The FLOOD-serv project was developed and funded under the Horizon 2020 Programme[1]. The project's partnership involved six countries (Romania, Austria, Spain, Italy, Portugal and Slovakia) with 11 partners including five development and technological integration companies, one non-governmental organisation, five municipalities and one research institute.

Specifically, in addition to the Municipality of Genoa, the consortium partners were:

- Siveco Romania SA - Romania
- Answaretech S.L. Austria
- Government to you - Belgium
- Municipality of Genoa - Italy
- Danube Delta National Institut for Research and Development Tulcea – Romania
- Bratislavsky (Bratislava Self-Governing Region) – Slovakia
- Ayuntamento de Bilbao – Spain
- ANO Systemas de Software e Servicos LDA – Portugal
- Exdwarf consulting s.r.o. – Slovakia
- Institutia Prefectului Judetul Tulcea – Romania
- Municipio de Vila Nova de Famalicão – Portugal

The European Commission granted funding of 252,8631,26 euros, of a total budget of 322,6375,00 euros, for an overall duration of 36 months. Overall coordination of the project was managed by the Research Executive Agency (REA).

FLOOD-serv was designed to improve and enhance flood risk management by the different stakeholders at various levels (public and private) in order to put in place preventive actions, implement interventions rendering emergency response operations more efficient, and launch initiatives to reduce hydrogeological risks. The scope of these activities must necessarily also include involvement of citizens in the risk management process, as well as activation of digital and ICT tools permitting collective actions and real behavioural changes based on social responsibility.

Indeed, the overall objective of FLOOD-serv was to empower local communities to participate directly in the planning and design of emergency services by harnessing the power of new technologies, such as social media and mobile technologies, which also permit an increase in the effectiveness of public administrations in sensitising and educating the public regarding the risks, effects and impact of floods. The aim was to encourage the development and implementation of long-term, cost-effective and environmentally-sound risk mitigation actions through ICT-enabled cooperation and collaboration by all stakeholders: local governments, the private sector, NGOs and other civil society organisations.

Therefore, through exchange of expertise at transnational level, the partnership developed a platform capable of accessing a range of data originating from a variety of sources (sensors, social media and open-data), thus constituting a particularly citizen-centric tool able to deliver results in formats suitable for different technological devices (such as tablets, smart phones, laptops and PCs) in order to support a highly diverse spectrum of end users (public bodies, decision-makers, emergency personnel and individual citizens). It is therefore a tool conceived “around” and “for” citizens, for the purpose of developing proactive citizenship using also a public service app (the FLOOD-serv App) which enables expansion of direct citizen involvement.

Active participation by citizens, integrated with commonly used technologies and the collaboration of networks on various levels (networks of people, knowledge and sensors), was central to the project’s architecture. Indeed, the project was applied to contexts in which management of critical flooding/hydrogeological events is a process performed jointly by various institutional actors which often work separately, on different levels, with different software used more or less in a one-way direction: from

institution to recipients. To meet the challenges in the safety sectors, FLOOD-serv put together strategic initiatives capable of representing the start of a change necessary in order to increase effectiveness and efficiency. The experimental products and services, and updating of existing ones, if applicable, were, indeed, developed to affect and impact, in a gradual process involving various soft targets, on the behaviours of a cultural inheritance now no longer in line with real safety and well-being needs.

Specifically, the project tested its actions on certain pilot cities, including Genoa, as well as Tulcea, Bilbao, Bratislava and Vila Nova de Famalicão. These pilots were carried out in order to test, verify and validate the project's solutions under the varying conditions of these different areas of Europe. The Genoa pilot focused predominantly on preventive actions and citizen involvement, testing tools with the aim of providing a proactive and personalised citizen-centric public service to enable implementation of collective risk mitigation solutions and response actions. The Municipality of Genoa involved as local partner in the project the University of Genoa, with the Department of Political Sciences (DISPO)[2] and the Department of Architecture and Design (DAD)[3].

The Genoa area features a hydrological context that covers a surface area of 140 km^2 and 3 km^2 of underground river basin[4]. The climate is characterised by short winters, temperate summers and widespread rainfall in all seasons, peaking in autumn, with an annual average of over 1.300 mm[5]. The city is known to be affected by frequent and dramatic flooding, with disastrous economic and material impacts. The Municipality of Genoa is the local body responsible for initial response to emergencies; whatever the nature and effects of the event, it takes charge of coordinating rescue, assisting people with initial interventions and implementing the provisions of the emergency plan. In addition, it undertakes to inform the population of what to do and provides updates on the situation’s development. The Municipality of Genoa, the only Italian partner, therefore participated in the project in order to develop service applications adaptable to the context in terms of responsibility, governance and relationships between authorities, institutions and all other operators involved.

For Genoa, FLOOD-serv was an opportunity to improve the role and function of intermediate bodies at local level capable of promoting involvement of citizens, as particular stakeholders, in view of the complexity and proximity of the emerging

issues in line with the project. Indeed, the positive outcome of interventions concerning certain measures depends, in the majority of cases, on constant dialogue with social groups. Developing consultation methods also permits analysis of real needs, awareness of expectations and any misconceptions, and also engages individual responsibility.

For local government, the project represented a tool, albeit an experimental one, useful in increasing its capacity to develop services for citizens, particularly regarding flood risk management, in line with European Floods Directive 2007/60/EC, by providing high-quality, coherent and up-to-date information in the most accessible form possible to all citizens, regardless of their levl of education, and also creating the tools to enable them to actively participate in administrative and political decisions concerning them.

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1 Action funded under the "ICT-enabled open government" topic (INSO-1-2015) of the Horizon 2020 Programme - SOCIETAL CHALLENGES - Europe In A Changing World - Inclusive, Innovative and Reflective Societies. GA number: 693599

2 The DISPO working group is composed by Andrea Pirni (scientific manager), Stefano Bonabello and Luca Raffini. The DISPO was in charge for the Deliverable 2.2 – Analysis on emergency flood management public service report. Regulatory models, organizational models and ICT use. The working group also provided scientific advice for the entire duration of the project.

3 The DAD working group is composed by Gerardo Brancucci, scientific manager with the contribution of Franca Balletti, and Valentina Marin and Paola Salmona, of the Applied Geomorphology laboratory (Geomorfolab), who supported the Municipality in all the phases of piloting and testing of the ICT tools of the FLOOD-serv platform. Furthermore, Daniela Rimondi and Roberta Prampolini also contributed as external consultants, in particular for the involvement and management of stakeholders and citizens. The working group also provided scientific and technical advice for the entire duration of the project.

4 Sacchini A., Brandolini P., Cevasco A., Firpo M., Robbiano A., (2012), "Geo-hydrological risk management for civil protection purposes in the urban area of Genoa (Liguria, NW Italy)" in Natural Hazards and Earth System Sciences; Katlenburg-Lindau Vol. 12, Fasc. 4, 943 - 959

5 Faccini F., Luino F., Sacchini A. & Turconi L. (2014), "Flash flood events and urban development in Genoa (Italy): lost in translation". Proc. IAEG2014 Engineering Geology for Society and Territory, Ed. Lollino G. et al., vol. 5, 797-801

Digitalization, PA and risk prevention

the Genoese situation

Andrea Pirni

Public Administrations and Digitalisation

The Europe 2020 Strategy, launched by the EU in 2010, consolidates the European Union's commitment to strengthening the digital economy in the EU: the Digital Agenda for Europe (DAE) identifies the resources, among the opportunities arising from the growth of the digital economy, necessary in order to respond to the economic crisis. Smart growth, from which the DAE takes its inspiration, is based on improvement of European living standards by harnessing the potential of ICT in all areas of daily life - from company business to employment and from play to communication - and, in particular, in freedom of expression. This requires completion of the digital single market, in terms of both infrastructures, providing ultra-fast connections throughout the European Union, and trustworthiness and security of the systems in place. At the same time, citizens' digital skills and, not least, system interoperability, must be enhanced.

IT is in this context that digitalisation of public administrations is taking decisive steps in Italy as well as the rest of Europe; indeed, the founding principle of this macro process is linked not only to optimisation of resources but also to improvement in the performance of public administrations thanks to the extraordinary evolution of ICT systems.

Digitalisation of public administrations presents a complex - far from linear - process,

yet with particularly significant implications for modernisation of the citizen-institute relationship and for creation of the digital single market. The coordinated principle of this transition is defined by the "EU eGovernment Action Plan 2016-2020 - Accelerating the digital transformation of government", an important document outlining the vision for digitalisation of public administrations. By 2020, public administrations must be open, efficient and inclusive and provide borderless, personalised, user-friendly, end-to-end digital public services to all citizens and businesses in the EU. Public administrations must use innovative approaches to deliver services increasingly in line with the needs and demands of citizens and businesses. Public administrations will use the opportunities offered by the new digital environment to facilitate their interactions with stakeholders and with each other.

The operating instructions that public administrations must adopt as a matter of priority during this journey include, in particular, the inclusiveness and accessibility of services as well as the openness and transparency of data.

Italy's National Action Plan for Open Government 2019-2021, drafted by the Department for Civil Service Reform, constitutes the direct completion of the previous document. The Plan has now completed its public consultation process and is about to be definitively launched. In the consultation version, matters of particular significance for the purposes of this paper are the emphasis that the Plan places on supporting participation and on the culture of open administration.

The first paragraph of the Plan highlights the contribution of citizens in aiding public decision-makers in making better decisions, specifically in order to:

- open decision-making processes to participation by stakeholders, permitting inclusion of petitions by all those potentially affected by an action or public policy;
- restore citizens' trust in institutions with regard to decision-making processes;
- meet a demand by citizens for greater individual commitment and the desire for personal involvement;
- remedy the limitations inherent in traditional decision-making processes, which can lead to conflict in the local area, often due to a failure to involve the various operators and local communities;
- promote sharing by citizens of public policy objectives and tools.

As far as the open administration culture is concerned, the Plan aims to promote concrete actions to combat the sometimes-reciprocal mistrust between public administrations and citizens. Indeed, in this regard, it aims to accompany digitalisation of public administrations with a far-reaching process for dissemination of the concepts of open government, permitting direct contact between citizens and the administration facilities where these principles are best represented.

These coordinates define the frame of reference within which projects like FLOOD-serv are developed, and it is very important to consider that such projects play a particularly delicate role in translating the guiding principles of the digital transition into concrete actions adopted in specific environments. Indeed, in this case, the resulting impacts will constitute the cultural foundations upon which the relationship between the citizens and institutions of the digital age will be built.

Luca Raffini

Vulnerability, Resilience and Citizen Protection through ICTs. Experiences and Research

Social Vulnerability and Environmental Vulnerability

Social vulnerability refers to a condition in which an individuals' social interaction and autonomy are threatened by an interplay of "instability of the social roles they play, weakness of the social networks of which they are part, difficulty in developing appropriate strategies to deal with critical situations, and fragmentation of personal identity"[1]. Vulnerability is a process of disjointing of the link between individual and society, the result of "unstable insertion into the channels for accessing essential material resources (above all employment, but also the benefits provided by the welfare state) and/or due to the fragility of the relevant relational fabric (family, as well as local social networks)"[2].

The concept of poverty is static and multidimensional, since it focuses on the economic aspect. The concept of social vulnerability, on the other hand, assimilates social, political and cultural elements, as well as economic ones[3]. It also has the quality of capturing the procedural dimension of phenomena, indicating a series of factors that render certain people particularly exposed to risks. Indeed, vulnerability does not, in itself, derive from exposure to risk - of a social, medical or environmental nature - but from the inability to manage it. The capacity of mitigating exposure to risk before this materialises allows to reduce people vulnerability. "States of vulnerability",

i.e. the materialisation and "socio-economic declension" of exposure to risk[4], vary, at individual and family level, according to the availability of the necessary economic, socio-demographic, socio-medical, cognitive, relational and cultural resources to cope with it. They are also conditioned by the ability of the local and institutional context to provide tools for citizen protection and to promote citizen empowerment.

In summary, vulnerability is the result of both exposure and resilience to risk.

Resilience is a concept, borrowed from the natural sciences, defined as the ability, at individual and system level, to "absorb change and succeed quickly in returning to the initial state"[5], as well as reducing future vulnerability through adaptive strategies[6]. The rapid spread of this concept is due to its ability to integrate, both into the definition of risk and into the response by the communities involved, an environmental dimension and also a social dimension, which proves particularly useful when focusing on catastrophic events such as earthquakes and floods. Indeed, these events have a clear social dimension, in relation to their causes and effects. Of the six sub-categories of natural disasters defined by CRED[7] - geological, hydrogeological, meteorological, climatic, biological and extra-terrestrial - few are not influenced by human actions. This is particularly true in Europe, where just 4.7% of climate disasters and 6.1% of geological disasters are concentrated, but 19% of hydrogeological disasters and 18% of meteorological disasters, which are particularly influenced by human action[8]. In Italy, in particular, there is a high incidence of hydrogeological disasters, which occur in "areas very physically compromised by a high level of unauthorised building and whose management is often distorted by mechanisms linked to corruption and dishonesty"[9]. On the other hand, Hicks Masterson et al.[10] suggest that natural events turn into disasters when they interact with human systems, becoming social phenomena.

An area's seismic vulnerability, or vulnerability to flooding, is therefore interwoven with social vulnerability when it comes to determining the effects of a natural disaster on the inhabitants of a city, since the varying distribution of resources affects the ability to anticipate, manage and respond to the event.

Of the social factors that express or protect against vulnerability to disasters, socio-economic status is first and foremost, being closely connected to exposure to risk. Families of higher socio-economic status tend to dwell in buildings with better resistance to seismic events and in areas that are safer in terms of hydrogeological risks but are also better equipped to protect themselves against risks and manage

the post-disaster recovery phase. Other influencing factors are cultural capital and social capital, which indicate the quality of the social relationships surrounding the individual. Individual resources are affected by employment status, family structure, gender, age and health. Ethnicity is also a factor, not only due to the tendency of immigrant status to coincide with low socio-economic conditions, but also due to the possible reduced ability of immigrants or minority groups to access and interpret alarm signals. Families living in rented homes are also considered generally more vulnerable since they are potentially less able to control their environment, considering that those who live in rented accommodation tend not to have the resources to purchase a home or to be transient residents of the city[11].

Institutions, Citizens and Resilience Practices t rough ICTs

The concepts of situations of vulnerability and resilience lead us from a static notion of risk to a dynamic and multidimensional conception which suggests that not all subjects potentially exposed to risk have the same level of vulnerability, and that vulnerability is conditioned by the capacity for action and reaction before and after the adverse event and not only by what occurs during the event. The focus is shifted from the individual event to the phases that precede and follow it, rendering the principles of mitigation and adaptation increasingly central. mitigation is translated into the concepts of balance, prediction and planning, while adaptation presumes that the ecosystem is unstable and implies theories of imbalance, uncertainty and unpredictability. Mitigation and adaptation, sustainability and resilience, are therefore not purely technical notions: they "mobilise highly diverse visions of nature, human agency and the relative responsibilities"[12], which can have two-fold effects.

On one hand, they can promote the overcoming of a fatalist approach to environmental disasters and induce citizens to take responsibility and action. They can therefore constitute the foundations upon which to build new forms of relationship and cooperation between institutions and citizens. On the other hand, they risk "normalising" exposure to risk and legitimising a transfer of responsibility from institutional operators to individual citizens, who are called upon to take action and responsibility, as much during the pre-event phase as during the post-event phase.

Thus, the ability to promote a new, widespread risk awareness is crucial, setting it as the foundations for new communication and cooperation practices between institutions and citizens, no longer viewed as passive recipients of public actions.

This is a topic toward which there has been growing sensitivity at European level over the last decade, and concerning which the European Commission has been committed, in the field of environmental risk management, to promoting citizen engagement strategies and resilience practices, with specific focus on innovative flood risk management. This takes the form of a series of practices and actions synthesised by the concept of Flood Risk Management (FRM), which integrates strategies for prevention, protection and preparation.

The interest of Italian and European institutions in involving citizens in FRM is part of a broader approach that increasingly regards citizens as active players in policies, rather than as passive recipients, and emphasises the creation of brand-new forms of cooperation between citizens and public administrations (see Pirni in this volume), stimulated by approval of the European Floods Directive 2007/60/EC whose objective is to encourage Member States to move beyond the traditional defensive approach in favour of an approach oriented towards a strategy of risk definition and management. Cooperation between a plurality of institutional operators and stakeholders is now central, for the purposes of implementing social resilience practices, in terms of prevention, defence, mitigation, preparation and recovery.

Testing of a radically new approach to risk prevention, based on citizen involvement and on prevention, stems from the convergence of three factors:

1) the move from government to governance, decentralisation and pursuit of the principles of subsidiarity and solidarity (the legal/political and political dimension);
2) the move from a defence- and monitoring-based strategy towards a dynamic and multidimensional approach to risk vulnerability and the centrality of reference to resilience (the strategic dimension);
3) the development of information technology (the technological dimension).

The approach adopted by the European Floods Directive reflects the general move from government to governance, in other words from a traditional, top-down, vertical, hierarchical approach to the decision-making and administrative process to a reticular, horizontal, non-hierarchical approach promoting involvement of various institutional levels, experts and stakeholders. The governance approach emphasises the role of third-sector organisations, private companies and citizens[13] [14].

The move from the “classic” strategy of a reactive response to disasters to proactive risk reduction, integrating a bottom-up approach into the traditional top-down one, is

also promoted by the UN. In 2017, the World Meteorological Organisation (WMO) implemented a new guidance document designed to support the planning of well-balanced strategies for integrated flood management. The aim of the Integrated

Project	Partners	Aims
FLOODsite 2004-2009 www.floodsite.net	Belgium, France, Germany, Italy, Netherlands, United Kingdom, Czech Republic, Spain, Hungary	To cover the physical, environmental and socio-economic aspects of floods from rivers, estuaries and the sea.
CRUE ERA-NET 2004-2009 www.crue-eranet.net	Belgium, France, Germany, Italy, Netherlands, United Kingdom, Czech Republic, Spain, Hungary	To consolidate existing research programmes on flooding phenomena, promote better practices and identify gaps and opportunities, with the aim of improving flood risk management in Europe.
2nd CRUE ERA-NET 2008-2012 www.crue-eranet.net/	Belgium, France, Germany, Italy, Netherlands, United Kingdom, Czech Republic, Spain, Hungary	To support implementation of the EU Floods Directive. It envisages three complementary projects: FREEMAN (communication and perception of risk; management of warning systems); IMRA (perception of risk and participation) and URFlood (communication of risk and its interpretations).
STAR-FLOOD 2012-16 www.starflood.eu	Belgium, France, United Kingdom, Netherlands, Poland, Sweden.	To analyse and compare different risk management strategies in various countries through an administrative and legal approach.
WeSenseit in progress www.wesenseit.com	Italy, Netherlands, United Kingdom	To develop a water observatory based on citizen involvement. To make citizens active stakeholders in the production, evaluation and communication of information.
Anywhere in progress www.anywhere-h2020.eu	Belgium, Finland, France, Germany, Italy, Netherlands, United Kingdom, Slovakia, Spain, Sweden, Switzerland	To promote the ability of companies and the principal social protection agencies, in particular, to respond more rapidly and react better to the high economic, environmental and social impacts connected to disasters.

Table 1 - EU funded projects on Flood Risk Management (FRM)

Flood Management (IFM) approach is “to maximise productivity and efficient use of floodplains and coastal zones, while minimizing loss of life and impact on livelihoods and assets through protective measures”.

Implementation of the Directive, and its implementation in the Member States, was accompanied and followed by a plurality of projects.

Looking purely at the last decade, the first European project on FRM was CRUE ERA-NET (2004-2009), which focused on the physical, environmental, ecological and socio-economic aspects of floods. In 2008-2012, under the Sixth Framework Programme, the second ERA-NET CRUE project, “Flood Resilient Communities – Managing the Consequences of Flooding”, was launched, with the aim of accompanying implementation of the European Floods Directive (2007/60/EC), promoting FRM awareness, tools and strategies, and stimulating coordination of projects and policies on this subject at European level. There were three complementary projects: FREEMAN, whose aim was to analyse citizens’ perception of risk, promote dissemination of the concept of resilience among decision-makers, operators and the general public, identify the factors that influence the capacity for recovery following flood events, and identify good resilience practices, URFlood, which investigated communication and widespread interpretation of risks, and, finally, IMRA, which examined the relationship between risk awareness and public participation, identifying the factors that foster citizen involvement and cooperation between institutional stakeholders. FLOODsite (2004-2009, www.floodsite.net), also funded under the Sixth Framework Programme, covered the physical, environmental, ecological and socio-economic aspects of floods. Based on an overview of floods as a combination of hazard sources and consequences for people, property and the environment, it regarded FRM as a process including pre-flood prevention, risk mitigation measures and tools for management during and after an event. The FLOOD CBA project (www.floodcba.eu) aimed to create a knowledge platform dealing with cost-benefit analysis of flood prevention measures in the context of different socio-economic environments within the EU. Its specific goals included the expansion of networking actions. The STAR-FLOOD project, funded by the EU under the Seventh Framework Programme, concentrated on methods of flood risk governance and on the strategies adopted in the dimensions that define flood risk management: prevention, defence, mitigation, preparation and recovery, with reference to various territorial contexts.

Analysis of ICT use in promoting cooperation between a plurality of operators and increasing citizen participation in FRM was recently developed by the WeSenseIt project, funded by the EU (7FP), dedicated to the development of a water observatory, based on citizen engagement, which will permit citizens and communities to become active stakeholders in the collection, evaluation and communication of information. The aim is to innovate FRM, by actively supplementing the existing database to include citizens and their direct knowledge, and to promote a progression from one-way flows to two-way flows supporting the exchange of environmental information and experiences between citizens and authorities and supporting the decision-making and governance process within a framework of electronic cooperation. Citizen engagement concerns activities such as water level monitoring, exchange of information through online tools and apps, and even involvement in the decision-making process.

Finally, Anywhere is a project, funded under the Europe 2020 programme, in which the Civil Protection of the Municipality of Genoa is involved. Its aims are, through use of ICTs, to promote empowerment of institutions and citizens, increasing their ability to proactively respond to and cope with high-impact climate events and, hence, their safety. Its goal is to implement a pan-European platform of multiple risks, permitting analysis and anticipation of risks before their occurrence, and, at the same time, to foster better coordination during emergency management and increase the population's ability to react.

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1 Ranci C. (2002), "Fenomenologia della vulnerabilità sociale" (Phenomenology of social vulnerability), in *Rassegna italiana di sociologia*, n. 4. p. 546

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Franca Balletti
Gerardo Brancucci

Urban Planning and Hydrogeological Risk in Genoa City: The Case of the Val Bisagno District

Hydrogeological Risk: Natural Considerations

"The vocation of mountains is to crumble"[1].

An apparently unremarkable statement which, however, masterfully summarises the problem of hydrogeological instability. The common perception is that the "inanimate" world of rocks or, more generally, the Earth's surface, is not a dynamic world. Far from it. "Steady as a rock" is a well-known saying, unless you happen to work with geological time scales, in which case this could be further from the truth. It is true that there are very hard rocks and other, more fragile ones. Similarly, there are very long geological time scales but also extremely short ones (one need only think of earthquakes). Therefore, to underestimate natural phenomena can be as dangerous as the phenomena themselves.

Earth's surface has always been in evolution. Indeed, the Earth's surface has always been subject to phenomena defined by mankind as "natural catastrophes" due to a variety of conditions linked to lithological and climatic characteristics and geomorphological factors such as the gradient and exposure of slopes, the presence or absence of vegetal cover and the quality of this. Landslides, earthquakes, volcanic eruptions and coastal storms are all part of the morphogenetic system that has been shaping our planet for 4.5 million years.

What is the problem, then? The problem emerges due to the presence of mankind which, in proportion to its technical abilities, interacts increasingly with the environment around it. Not, it would initially seem, changing the morphogenetic processes but rather accelerating their time scales, by performing actions on the land through agriculture, road building, urban development and increasing narrowing of rivers and their beds. Essentially, by interfering severely with the dynamics of the Earth's surface and ignoring its laws, at one time unknowingly but, as time goes on, more and more knowingly.

The Situation in the Genoa Area

The Liguria Region, in general, and the area around Genoa, in particular, especially with regard to the Tyrrhenian coast of Liguria, features a rugged morphology; indeed, the hillsides drop towards the sea with significant gradients, and flat areas are scarce and, where present, of limited size. This morphology favours erosion linked to the flow of surface water arranged in a small- to medium-sized hydrographic network. These morphological conditions intensify the water's erosive power, particularly when combined with abundant/heavy rainfall. In addition, there has been a notable change to the rainfall characteristics, in terms of both intensity and frequency, mainly due to the altered thermodynamic conditions of the atmosphere. Genoa is notorious, from a meteorological perspective, as a cyclogenetic area and is therefore "genetically" predisposed to substantial precipitation.

Of the various hydrographic river basins in the metropolitan area of Genoa, the Bisagno river holds the unedifying record number of floods suffered. The following table lists the main events documented, together with a brief description.

Of the various hydrographic river basins in the metropolitan area of Genoa, the Bisagno river holds the unedifying record number of floods suffered. The following table lists the main events documented, together with a brief description.

An initial point to note is the frequency of these events; indeed, over the course of 192 years, except between 1822 and 1892 when 70 years passed between one flood and the next, the recurrence times (normally calculated at 50, 200 or 500 years to define the various degrees of overflow) have gradually decreased (with two events in the same year in 1951), reaching an impressive frequency from 1992 to date.

Data	Evento
26 October 1822	first documented overflow of the Bisagno river at 11.30 am.
8 October 1892	second documented flood of the Bisagno river. Its flow rate at that time is estimated at between 300 and 1200 cubic metres per second. Following this event, the idea of culverting the river took form.
7 July 1908	after six hours of non-stop rain, the Bisagno reached its maximum depth at 6 am, without overflowing.
29 October 1945	overflow of the Bisagno river and the Fereggiano tributary. Submersion of the S.Agata bridge. Collapse of several bridges of the SS45 road.
25 January 1951	flooding of the streets Via Martiri della Libertà, Corso Buenos Aires, Corso Torino and Via Casaregis and the square Piazza Tommaseo.
8 November 1951	overflow of the Fereggiano and Geirato tributaries. Collapse of a newly rebuilt bridge on the SS45 road.
19 September 1953	Overflow of the Bisagno and Trebbia rivers. 10 killed.
21 March 1968	landslide on Via Digione after heavy rainfall. 19 killed.
7 - 8 October 1970	overflow of the Polcevera, Leira and Bisagno rivers. Flow rate of the Bisagno no less than 950 cubic metres per second at its mouth. 35 killed (25 according to other sources) and eight missing.
6 October 1977	overflow of the Bisagno river with no damage.
27 September 1992	overflow of the Bisagno and Sturla rivers.
23 September 1993	overflow of the Varenna and Leira rivers and other watercourses in Western Genoa. 2 killed and 3 missing.
30 September 1998	overflow in the province of Imperia.
6 e 23 November 2000	flooding of Verbone and Armea rivers and others. 3 killed. flooding at Ceriana (2 killed) and Imperia (2 killed).
25 December 2009	flooding in province of La Spezia
4 October 2010	flooding in province of Genova and La Spezia
25 October 2011	overflow of the Vara, Magra and Taro rivers and other minor watercourses, due to heavy rainfall - 10 killed
4 November 2011	floodings following very heavy rainfall with peaks exceeding 500 mm recorded in just a few hours in several areas of Genoa and its province. This resulted in overflow of the Bisagno river and the Fereggiano tributary and of the Sturla, Scrivia and Entella. 6 killed
9 e 10 October 2014	Genoa following heavy rainfall resulting in approximately 395 mm in 24 hours. Flooding of the Bisagno, Sturla, Fereggiano, Noce and Torbella, in the Municipality of Genoa, and the Scrivia, Stura, Entella and Carpi, in the Province of Genoa. 1 killed

Table 1 - Main Floods Affecting the Bisagno River and its Tributaries https://it.wikipedia.org/wiki/ http://www.biologiamarina.eu/Alluvione%20Genova.html

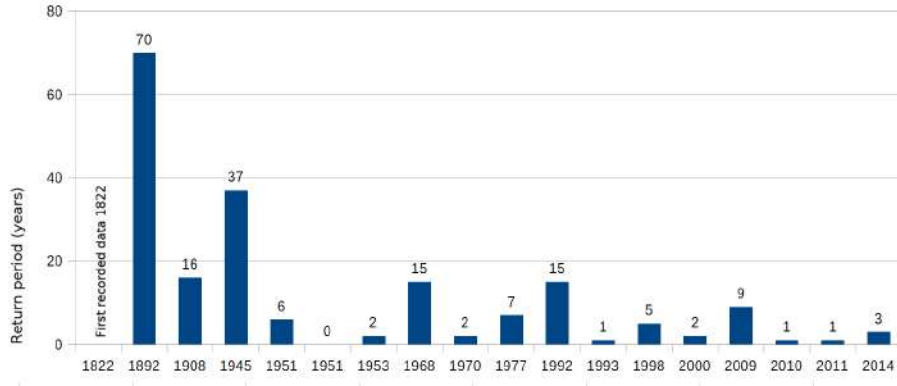

Figure 1 - Flooding return period in the Liguria Region

One might wonder as to the reasons for the intensification of these events. This subject merits a lengthy discussion which we cannot go into here. We can, however, attempt to summarise the possible causes. As mentioned at the beginning, the dynamic morphogenetics of the Earth's surface are a natural occurrence which follows its own laws and practices. When human actions enter this equation, interference between nature and anthropisation occurs. Anthropisation can also create new kinds of phenomena and certainly causes acceleration of the natural time scales. Added to this, as we have already mentioned, a deteriorating climate, with increasingly extreme events, has resulted in greater hazards and, consequently, increased hydrogeological risk.

Hydrogeological Risk: Urban Planning Considerations

Genoa is a complex city, not least from an environmental perspective, the area's morphological structure being profoundly conditioned by the arrangement of the settlement system, contributing to the creation of fragile situations that appear very difficult to rectify.

The city stretches along the coast for some thirty kilometres, joining the limited available flat areas in a building continuum, and only extends inland in correspondence to the two main watercourses - the Polcevera and Bisagno rivers - the final parts of which flow through the urban fabric.

The mountainsides, near the coastline, reach altitudes of over 600 m above sea level,

with average gradients exceeding 25%. During Italy's pre-Republican era, the hillside areas and inland valleys underwent anthropisation resulting in the characteristic "terracing" for agricultural use, particularly for cultivation of olive trees and grapevines.

In modern and contemporary times, building development for residential and production purposes and for construction of the communication infrastructure system not only saturated the flat parts of the area but also took over the hillsides up to the altitude at which building costs outweighed the expected profits. The secondary watercourses were culverted, the riverbeds modified through works that reduced their flow rate, and some parts of the beds covered in order to build roads and car parks.

Figure 2 - Urbanisation in the valley floor and partial coverage of the Bisagno stream

A fragile hydrogeological balance increased the frequency of overflow, both of rivers and of minor tributaries, resulting in material damage, casualties and unsafe conditions for a significant part of Genoa's population.

The flood that, from 7 to 8 October 1970 (Figure 3), struck the city of Genoa with dramatic effects is a tragic confirmation of the chaotic nature of the city's urban development and the folly of land management which, in the name of "affluent society" brought about the anxieties and discomforts of a precarious state that was imagined to be a thing of the past.

IL SECOLO XIX

SPECIALE

Apriamo l'indagine sulle cause della tragica alluvione di giovedì 8 ottobre

PROCESSO AL BISAGNO

Il problema dell'allarme

GENOVA

Gli ostacoli sul greto del torrente alzano il livello dell'acqua

GLI OSTACOLI

IL TORRENTE FANTASMA

LA COPERTURA

Figure 3 - Page of the "Secolo XIX" newspaper of 17 October 1970

It is only for the last decade that the challenges of making the city safe in terms of hydrogeological risk and prevention have been part of the administrative practices of public bodies responsible for governing the area's transformation.

The river basin plans, prepared and approved for each watercourse in accordance with Law no. 183 of 1989, are the reference tool for land conservation, protection and improvement and correct water use. The cognitive, legislative and technical/operational content of these tools, which override all levels of planning, are, today, an integral part of the city's municipal development plan, approved in December 2015.

The associated urban transformation operations are programmed excluding - with few exceptions - the use of undeveloped land, instead using regeneration of the existing heritage and reuse of abandoned areas and buildings.

A more complex issue is planning, in established urban areas, of works designed to increase the soil permeability and the provision of green areas and to restore culverted watercourses to safe conditions. Indeed, such works have to reckon with the difficulty of dealing with private property and the scarcity of available financial resources.

In the hillside areas, characterised by small, traditional rural centres and scattered buildings, the local protection necessary (and indispensable) in order to ensure maintenance of the terracing and control of the waterways is provided, primarily, by residents who engage in forms of part-time agriculture. The wooded areas, meanwhile, are rapidly growing, occupying meadows and agricultural areas, almost exclusively outside of any control or maintenance and creating further conditions of hydrogeological risk.

Val Bisagno: a Study District

Val Bisagno is a study district of great complexity and interest since it synthesises within it many of the contradictions and critical issues characteristic of contemporary cities. Historically, it was a small, agricultural valley, administratively independent of the city of Genoa but linked to it not only in economic terms (providing foodstuffs and labour for urban activities) but also as home to the "villa" residences of the Genoese nobility.

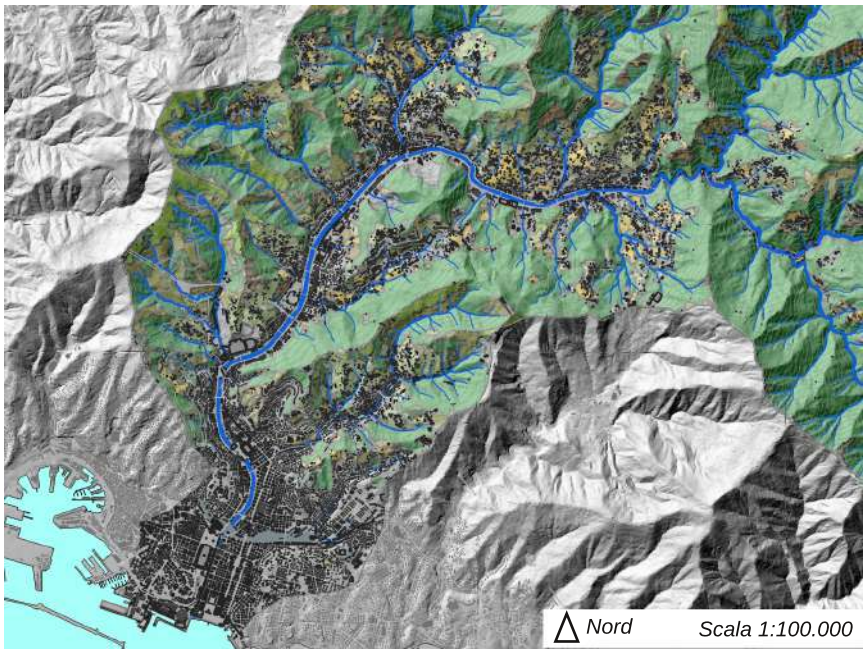

Figure 4 - Map of the lower and middle Val Bisagno

In the nineteenth century, when the Monumental Cemetery of Staglieno was established, the valley became an area hosting the less qualified urban services.

This process was accelerated following the annexation to Genoa, in 1873, of the municipalities situated in the lower and mid valley, to the extent that, upon formation of “La Grande Genova”, in 1926, when Genoa’s administrative limits reached their current extent, the valley floor was already home to the prison, the stadium, the fruit and vegetable market, the gasworks, the rubbish dump, the almshouse and many social housing quarters, among other things.

Between the mid-nineteenth century and the early decades of the twentieth century, building development was carried out under the urban planning scheme approved in 1877 which, in line with the traditional principles of nineteenth-century urban planning, proposed a succession of orthogonal grids of varying density depending on the social classes for which the works were intended. Urban development extended to the entire flat area located in the mid-to-lower stretch of the Bisagno river, even invading areas already considered flood-prone. In 1929, to promote the creation of large-scale road networks bordered by imposing buildings, coverage of the Bisagno river between the railway and the sea was commenced.

In the period following World War II, the assault on the hills (Figure 4 and 5) permitted by the urban planning scheme of 1959 - one of the worst in Italy - further compromised the valley's environmental and settlement quality. Its few flat areas were completely built up, and "1960s" buildings reached and took over many historic hillside centres, particularly those nearest to the city centre. The social housing quarters, deliberately positioned on the hillsides and almost on the ridges of the hills, provided prime streets and urban developments for private building speculation so that, over the years, they came to join the urban fabric of the valley floor.

While green pockets have been safeguarded in the flat areas (in some squares designed by the nineteenth-century scheme which went as far as to plan rows of plane trees), in the hillside areas, the building density is such that even the width of the streets and necessary car parking have been sacrificed.

Figure 5 - Urban spread on the hills in Val Bisagno

However, just above this, particularly in the most inland part of the valley, there is a framing area subdivided into two large bands. The first comprises a belt of rural centres and terraced agricultural areas (largely conserved albeit in the form of "urban countryside") and the second features large green areas, partly falling within the Urban Park of the City Walls and Fotrs, which constitutes a kind of "green lung", in environmental terms, of healthiness for the inhabitants and of perceptual quality.

Figure 6 - The green area beyond the boundary of the building

Tackling the issues associated with risk situations arising from these senseless modes of land use requires a plurality of integrated approaches and operating tools that involve local authorities and citizens in various capacities.

Courses of Action

A we know, Risk is the product of Hazard and Vulnerability (R = H x V): risk cannot be eliminated, merely mitigated, whereas it is possible to influence vulnerability with a better chance of success, minimazing damages (resilience).

Figure 7 - 8 - Cars dragged by the water of the Rio Ferreggiano (2011)

Figure 9 - Volunteers at work to remove the mud

In this perspective, there are two possible courses of action.

The first is risk mitigation through the reduction of environmental vulnerability, for instance through structural works and landscaping of slopes to reduce the hazards relating to meteorological events. It is a question of launching a complex programme of environmental rehabilitation interventions covering built-up areas and agricultural and wooded areas on hillsides, involving public and private property. It is necessary to reinforce the historic terracing, revive traditional agricultural activities, reactivate the waterway control system, check the flow rate of culverted watercourses, implement drainage areas, where possible replacing impermeable ground coverings, and prevent further land consumption.

During this phase, due to the gravity of situations that have accumulated over time, structural works are also necessary in order to enhance the safety of the main watercourse system. The works in question concern reinforcements to the banks, demolition of buildings constructed on riverbeds or within a necessary buffer zone, reconstruction of coverings deemed non-removable, and redesign of bridges and footbridges.

In the last decade, the city has undergone many such works, the most significant regarding the Bisagno river itself, considered one of the nation's most critical situations. The first construction site concerned the covering, between the railway embankment near Brignole Station and the outlet to the sea, which should permit a

significant improvement to the watercourse's flow rate. The safety enhancement project also includes the construction of two floodways, for the Fereggiano, a tributary on the left bank of the Bisagno, and for the Bisagno itself. The smaller channel, into which the Noce and Rovare watercourses also flow, is complete, while excavation of the tunnel, intended to channel waters from the Bisagno to the sea, from an intake located halfway up the valley, is due to commence in 2020.

The second course of action, already mentioned in the previous chapters and specifically tackled during the FLOOD-serv project, is to reduce social vulnerability, for instance by implementing awareness rising campaign concerning the problem of flooding, with the aim of increase the capacity of adopting self-protection measures. During the FLOOD-serv project, through the activities developped with local stakeholders, we had the opportunity to experience first-hand the amount of misinformation that still exists with regard to natural phenomena. Misinformation increases the risk of becoming a casualty during extreme events. It is therefore necessary to provide citizens with at least basic training during "peacetime" in order to empower them to be resilient during such events.

1 Maifredi P., 1974

Stefano Bonabello

Use of ICTs for Risk Prevention in the Municipality of Genoa

Risk Prediction and Prevention in National and Regional Civil Protection Legislation

Italy's legislative reference framework identifies the importance of risk prediction and prevention in Article 3 of Law no. 225 of 24 February 1992 - "Institution of the National Civil Protection Service"[1]. Paragraph 2 of the said Article specifies that "prediction consists of activities conducted, with the contribution the competent scientific and technical experts if applicable, aimed at identification of probable risk scenarios and, where possible, prediction, monitoring, surveillance and vigilance in real time of events and the consequent expected risk levels". Paragraph 3 goes on to specify that "prevention consists of activities designed to avoid or minimise the possibility of damage resulting from events", natural or connected to human activity, ordinary or extraordinary, and that "prevention of different types of risk takes the form of non-structural activities relating to warning, emergency planning, training, dissemination of knowledge and civil protection, as well as informing the population and applying technical standards, where necessary, and practice activities". Non-structurally, it also involves regulation of human activities in the area and identification of constraints and, structurally, active or passive landscaping works (such as embankments, forest waterway arrangements, and reinforcement of slopes).

The legislation therefore provides for an integrated framework of public and private organisations, tools and scientific methods which permits identification, within risk scenarios, of different criticality thresholds and levels for each possible anticipated event, taking into account the specific features of the areas, subdivided at regional level and by alert zones[2]. This framework requires systemic integration of institutional bodies (Presidency of the Council of Ministers - Department of Civil Protection and National Centres of Expertise for specific areas of study and research, monitoring and prediction) and local authorities (Regions and Autonomous Regions, Metropolitan Cities, Provinces and Autonomous Provinces, Municipalities and the network of Functional Centres throughout the area) through functional links “for the purpose of supporting the civil protection authorities” (Directive of the Presidency of the Council of Ministers of 27/02/2004, paragraph 1), also regulated through agreements and covenants.

The system is divided into: a prediction phase, “consisting of assessment, supported by appropriate numerical modelling, of the anticipated situation in terms of meteorology, snow science, hydrology, hydraulics and geomorphology as well as of the effects that such a situation may have on the safety of life, property, settlements and the environment” (Directive of the Presidency of the Council of Ministers of 27/02/2004), supplemented by monitoring and surveillance in delayed time (medium/long term) and real time (short/very short term); and a risk prevention phase, which begins with identification of different criticality thresholds and levels for each possible anticipated event and is developed through the actions set out in the Regional Prevention and Protection Programmes, as already indicated, in their general principles, by Art. 108 of Italian Legislative Decree 112/1998.

The Regional Programmes constitute the synthesis and implementation of the functions, tasks, organisational recommendations and guidelines, technical and scientific studies conducted at national level, and everything in place within the various local bodies (river basin authorities, dam managers and hydrogeological risk authorities), with the relative constraints.

The Liguria Region has structured its prevention and protection programming as a comprehensive system of regulations (summarised in Table 1, below) which it has assembled in the online database of laws and regional provisions and which is presents in a simplified cartographic representation within the Region’s geoportal (Figure 1).

Regional Law n.9 of 17/02/2000	Updating of the regulations and allocation of administrative functions concerning civil protection and fire prevention to the local authorities.
Delibera Giunta Regionale n.877 del 06/08/2004	Map of critical issues
Regional Council Decision no. 618 of 06/06/2008	Map of critical issues (update of Regional Government Decree 746/2007)
Regional Law n.9 of 17/02/2000	Updating of the regulations and allocation of administrative functions concerning civil and fire protection to the local authorities
Decision no. 1489 of 06/12/2011 Decision no. 17 of 13/01/2012	Regional Law 9/2000 - Approval of flood risk map extract together with associated safeguard regulations and protection measures
Decision no. 498 of 27/03/2015	Adoption of the draft updates to the warning system and the civil protection planning guidelines
Decision no. 1057 of 05/10/2015	Approval of the regional Meteo-hydrogeological and Hydraulic Risk Warning and Management Operating Procedure and the provincial and municipal Emergency Planning Guidelines

Table 1 - List of regional regulations relevant to the prevention of hydrogeological risk

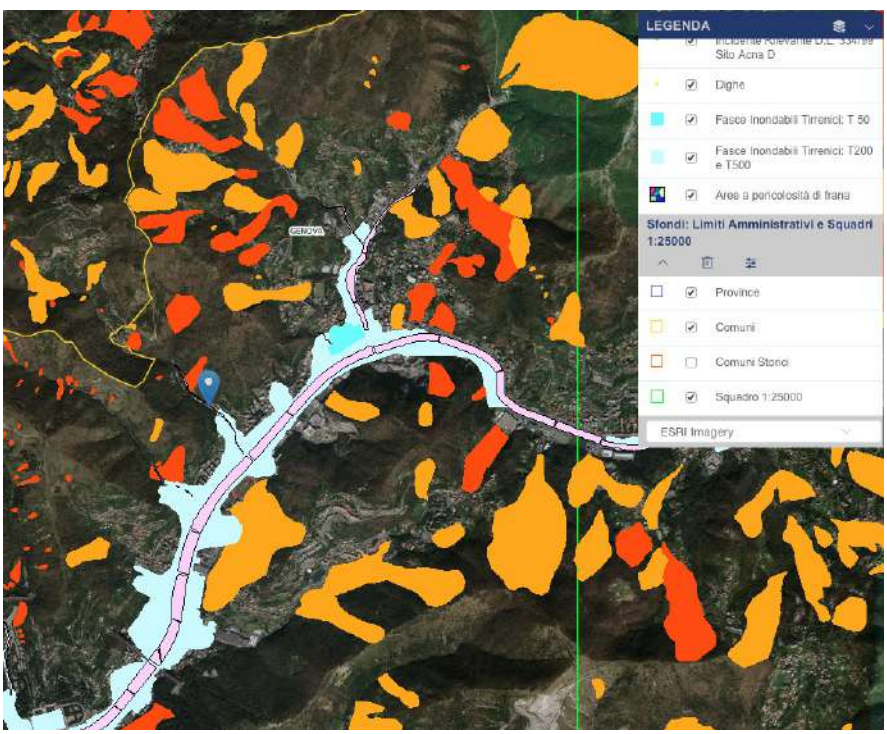

Figure 1 - Liguria Region Geoportal - Excerpt from the criticality map - T50 and T200 flooding areas

Risk Prevention and Emergency Planning in the Municipality of Genoa

The hierarchical and functional models derived from the legislative framework of Italian national laws and regional laws of Liguria change during planning and local application of flood emergency plans, sometimes with unexpected effects. The risk prevention component, which is included in these plans (prevailing over prediction, which remains largely the responsibility of the subordinate levels), requires the construction of complex and flexible organisations capable of meeting economic, political and social needs within the various scenarios envisaged.

Firstly, the needs of local communities and, in particular, those featuring a significant presence of people in conditions of vulnerability (due to their age, health, employment or lifestyles) who, through their response capacity, ultimately determine the variability of the event's impact and the degree of associated risk. Local authorities should be capable of advising, training and involving the local population in order to increase its actual and perceived safety, also through formation of organisations of various kinds which not only play an important role in the security and protection of the area but are also a vehicle for participation and establishment of a culture of prevention.

Secondly, the needs of the various private operators with varying degrees of organisation who, being stakeholders often at odds with the flood risk prevention recommendations and guidelines, require aggregation and mediation of their needs in local authority political process.

Thus, demands for multi-level governance on legislative models interact with this complex set of important risk prevention operators.

Through Municipal Council Decision no. 40 of 21 July 2015, the Municipality of Genoa, in accordance with the national and regional requirements, approved the Municipal Emergency Plan, a tool for planning, prevention and prediction, management and overcoming of emergencies resulting from natural disasters, in partnership with the International Centre on Environmental Monitoring - CIMA Research Foundation[3].

This Plan, specifically, links methods and procedures for activation and intervention in an emergency to pre-established risk scenarios to which the area is subject and preparatory activities to be carried out in anticipation of emergency events studied, identified and described in the first part of the Plan's General Report. In support of

the relative planning, specific computerised mapping and databases, informative documents and thematic maps were identified (Figure 2).

The maps of the Emergency Plan's Operating Manual are updated periodically and are available in the version approved by Municipal Executive Committee Decision no. 58 of 06/04/2017 on the website of the Municipality of Genoa, in the technical maps archive[4], and on the Municipality of Genoa's geoportal, online consultation application[5], both in simplified form for public consultation and in complete form for consultation by civil protection personnel and the offices of the Municipality and Administrative District Councils. The Municipality's technical mapping shows the emergency areas for the purposes of civil protection, strategic buildings, strategic infrastructural works, the hydrographic network and hydraulic hazard areas, the most sensitive exposed elements and references to the relative criticality maps and regional river basin plans.

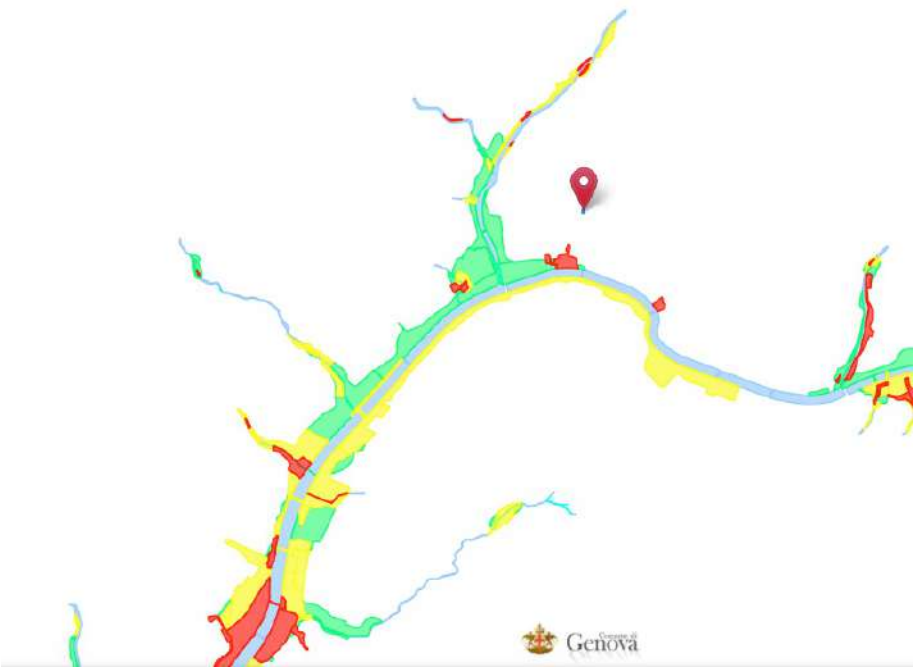

Figure 2 - Municipality of Genoa Geoportal - Excerpt from the criticality map - T50 and T200 flooding areas

Use of ICT for Flood Risk Prevention in the Municipality of Genoa

Communication and information, through the various types of technological devices, constitute the common elements that enter into the relationships between individuals, groups, institutions, and local levels and spheres. They act as a means and structure for transmitting content, as a channel for receiving questions and as a method for communicating decisions.

Through use of specific information and data processing and telecommunications technologies (known as ICTs) - the underlying pattern onto which the lasting fabric running through the organisational models for risk prediction and prevention (information, awareness-raising and training, safety protocols, databases and roles), derived from a national and regional legislative model, is laid - is digitalised and, at the same time, arranged in networks, access points, processes and applications that operate the various services offered.

The Municipality of Genoa has developed flood risk prevention activities (summarised in Table 2) that make use of specific ICT tools. In particular, for the preliminary phases of design and development of models and thresholds and identification of areas, the information contained in the Region's databases was input into the applications used by the Municipality's technical services, on the terminals of the municipal network. This data and information, processed by the technicians and approved by the political bodies, was then placed at users' disposal both within the Municipality's private telecommunication network (Intranet or VPN - Virtual Private Network) and on the public web through the website of the Municipality of Genoa, in a section dedicated to civil protection, in summarised and simplified form. Some informative elements have also been made available through traditional electronic media - television, radio and satellite - for brief citizen awareness-raising campaigns on appropriate risk prevention behaviour and actions.

Other, simplified informative elements have been made available on specific apps (data access services running on mobile telephones), namely the "Io non rischio" (I don't risk) project and app.

On 31 January 2019, the Italian Department of Civil Protection and the Agency for Digital Italy signed a cooperation protocol for development and implementation of shared governance between the regional networks, the national civil protection system and the various institutional and private operators involved in risk protection

Activity	Brief Description	ICT used
Definition of probable risk scenarios	Acquisition of documents and data created by the Region and local study: Mapping of hydraulic risk areas and interaction with river basin plans Identification of exposed elements Definition of specific vulnerabilities	[Intranet and Internet - of the Regional Government of Liguria] Databases on the municipal VPN Municipality's geoportal
Identification of action priorities	Identification of areas (roads, city parks, car parks, etc.), buildings (houses, shops, etc.) and activities (weekly markets, school activities, etc.) subject to prevention requirements	Databases on the municipal VPN Municipality's geoportal
Provision of resources	Identification of resources for responding to emergencies (in the documentation/databases of the municipal organisational units)	Databases on the municipal VPN
Implementation of risk-reduction actions	Identification of the characteristics of exposed people and the relative specific vulnerabilities (municipal civil protection documentation / databases)	Databases on the municipal VPN
Information and training	Design and production of periodic citizen information campaigns on risks	[Intranet and Internet - of the Regional Government of Liguria] DBs on the municipal VPN Municipality's geoportal
Urban planning and protection of the area	Drawing-up of thematic maps using a catalogue/database of georeferenced information	Databases on the municipal VPN Municipality's geoportal

Table 2 - Use of ICT in the Municipality of Genoa's Various Flood Risk Prevention Activities

and emergency management activities, placing citizens at the centre of processes for redesign of these according to the "once-only" paradigm (in order to prevent public administrations from asking citizens for information already held by the public service network). Among the initiatives envisaged by the agreement are "metadatation" of civil protection plans and definition of cartographic standards for unification of geographical portals. For risk prevention and prediction activities, this agreement will mean technical regulations and standards on integrated use of ICT between the various spheres of civil protection (national, regional and local), favouring interaction over simply transmitting data, also through network redundancy (ensuring availability during actual emergencies), use of remote data storage technologies (cloud technologies) and development of services and applications capable of operating on

the variety of devices (smartphones, tablets and multimedia screens) increasingly used by individuals and communities.

The Municipality of Genoa will be called upon to involve citizens not only in the consumption but also in the production of information useful for refinement and definition of risk prevention actions in the area and for validation of prediction models, as part of management of this flow of information and consolidation - in “peace” time - of an emergency management model that can draw - during “disaster” time - on the information and data known to the area, communities and existing services in order to formulate the correct guidelines for orientation of civil protection intervention.

1 Text updated through Decree Law no. 93 of 14 August 2013, coordinated through Conversion Law no. 119 of 15 October 2013.

2 Directives of the Presidency of the Council of Ministers of 27/02/2004 - “Operational Guidelines for Organisational and Functional Management of the National, State and Regional Hydraulic and Hydrogeological Risk Warning System for Civil Protection” - and 24/02/2015 - “Operational Guidelines concerning Preparation of the Part of the Management Plans Relating to the National, State and Regional Hydraulic Risk Warning Plan for Civil Protection” pursuant to Italian Legislative Decree no. 49 of 23 February 2010 implementing European Directive 2007/60/EC

3 A non-profit research organisation committed to the general interest of the nation, founded by the Italian Department of Civil Protection, the University of Genoa, the Regional Government of Liguria and the Provincial Administration of Savona - Centre of Expertise of the Civil Protection System, pursuant to Art. 2 of the Prime Ministerial Decree of 14 September 2012, by decree of the Head of Department of 24 July 2013, published in Official Journal no. 241 of 14 October 2013.

4 http://www.comune.genova.it/content/cartografia-delle-zone-rischio

5 https://mappe.comune.genova.it/MapStore2/#/viewer/openlayers/1000000604

The Municipality of Genoa in the FLOOD-serv project

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The role of the Municipality of Genoa as FLOOD-serv project Pilot case

The aim of the Genoa case study was to promote a network of engaged citizens informed on flood risks and to provide tools to encourage participation in management of hydrogeological problems, tapping into the potential of ICT (Information and Communication Technology).

The city of Genoa, in particular, investigated the aspects relating to information sharing between citizens and public administrations during the pre- and post-emergency phases. As already said in the previous chapters, during hydrogeological emergencies, Italy has an operating protocol, managed by the Civil Protection System which acts at state, regional, provincial and municipal level, performing the essential functions of prediction, prevention, rescue, overcoming of the emergency and return to normal living conditions in areas affected by disasters or catastrophes[1].

Genoa's contribution to the actions of the FLOOD-serv project, therefore, concerns the aspects relating to hydrogeological risk prevention, monitoring of the area before flooding occurs and overcoming difficult situations during the post-emergency phase. This orientation of the Genoa pilot is the result of joint consideration by the project's working group but also by local civil protection operators which, by administering questionnaires on vulnerability to the residents of areas at risk of flooding, gather information useful for safeguarding people and property during emergencies.

The role of the Municipality of Genoa in the FLOOD-serv project consisted, in summary, of: coordination of stakeholders' work, collection and dissemination of data to be shared with citizens, receipt of information from citizens, and dissemination and sharing of information throughout the area.

The University of Genoa, as a local partner of the FLOOD-serv project, supported the Municipality of Genoa through activities by its Department of Architecture and Design (DAD) and Department of Political Sciences (DISPO).

Specifically, the Geomorfolab Laboratory of the DAD Department contributed to implementation of the pilot, dealing with the planning, organisation and implementation of the technical tool test phases through involvement of local stakeholders, schools and citizen associations. The DISPO Department, meanwhile, collaborated on the project during the phase of comparative mapping of the legislation, organisational models and good practices for flood emergency management in the project's various partner countries. Finally, both department analysed the results, from both a qualitative and quantitative perspective, relating to use of tools and citizen participation during the pilot's various test phases, as well as contributing to dissemination of the project.

Job Centre, an in-house company of the Municipality of Genoa, as a local partner of the project, performed the function of project management, dealing, in particular, with coordination of activities and management of relations with the partnership coordinator.

Val Bisagno was the area identified by the Municipality of Genoa for the pilot's tests. It is an area comprising three of the Municipality's Administrative Districts crossed by the Bisagno river: District 4 - Media Val Bisagno, District 3 - Bassa Val Bisagno, and District 8 - Medio Levante. Over time, this area has been affected by various episodes of flooding, from the terrible event of October 1970 to the more recent floods of 2011 and 2014. The population is therefore relatively attentive to matters of hydrogeological instability.

The Role of the Population in Land Management and Reduction of Hydrogeological and Flood Risk

The European Union has, for some time, emphasised the importance of citizen involvement in activities concerning land protection. The Municipality of Genoa, by

adhering to the FLOOD-serv project, took the opportunity to analyse the role of the population in hydrogeological risk prevention and to identify the various modes of interaction between citizens and public administrations.

International debate on the concept of land and on the different approaches to the study of land development is wide-ranging and multifaceted, as is the debate on the links between land and landscape, which involves various approaches and schools of thought, and multiple disciplines, from geography to urban planning, from ecology to environmental geology, and so on.

Landscape as a "tool for increasing settled populations' sense of belonging and affection for their land, achieved through a process of identifying with places: the social perception of the landscape … to which the European Landscape Convention attributes particular importance"[2].

The story of identity "serves to arrive at a set of rules and standards which, by continuing the local tradition, may be defined as the statute of places"[3], and "definition of the statute of places cannot be separated from definition of the place and the identity of the place, the statute being necessarily built on identification of forms of description, interpretation and representation of the identity of the place for which common rules for transformation of that place are to be formulated"[4].

The role of local identities is crucial in "sustainable development" processes if land planning is to move towards predominantly local development, which may be better defined and shared than sustainable development of a general nature.

The process of involving citizens facilitates cultivation of the local community and development of social networks which, in the FLOOD-serv project, play a part in the topics of hydrogeological and flood risk prevention.

Awareness of one's own area, through knowledge and interpretation of the elements that characterise it, is key to the construction of a local identity. In the FLOOD-serv project, identification of these characterising elements is not only a resource for self-protection in times of flood emergency but also an opportunity to protect the area in "peacetime".

The actions of the pilot have permitted testing of various systems for gathering reports from citizens which, if georeferenced, make it possible to create analytical maps of the area and to have a base of shared knowledge that can also be used for self-protection under risk conditions. These shared maps are a potential element for

consideration by decision-makers when planning interventions in the area, thus taking into account the priorities identified by the local community.

ICT Tools to Enable Citizens to Cooperate with the Public Administration on Hydrogeological Risk Management during "Peacetime"

The Municipality of Genoa's interest in researching solutions linked to the spread of ICT and in sustainable planning is demonstrated by the creation of the Genova Smart City association in 2010 and by its continual participation in European projects aimed at a transformation of the city with greater attention to sustainability issues.

The vision of the Genova Smart City association is of sustainable development with the objective of improving citizens' quality of life through environment-friendly transformation of the area. Use of information and communications technologies has the capacity to cultivate social relationships as part of the "human-centred" Smart Community approach, based on an organisational model founded on the principles of solidarity and cooperation.

The communication procedures tested during the FLOOD-serv pilot in Genoa have been adapted in order to gain the interoperability features indispensable for integration into the Municipality of Genoa's IT systems, with particular attention to its geoportal on which the majority of the area's georeferenced data is currently managed.

Through the participation and involvement of people, citizens could, contribute to the creation of new services and improvement of existing ones, as well as providing useful information and personalised services. Furthermore, the activities for testing of these systems could, in future, constitute a stimulus for creation of social networks and mutual assistance between citizens (individually or grouped into associations), private bodies and public administrations.

In this way, citizens can actively participate in collection of territorial data which, once stored in the databases, will become information useful for prevention and management of flood risk situations and promotion of behaviours and actions aimed at increasing urban resilience during episodes of flooding. Such information services could also be used to build or consolidate "people networks"; citizens who coordinate themselves in relation to specific situations, ready to intervene during "peacetime".

The FLOOD-serv project envisaged three subsequent test phases for fine-tuning of the IT platform that forms the basis for the project proper. The Genoa pilot added a further phase of testing, to validate the hypothesis regarding the data required, test the suitability of the app for collecting and sending reports, and monitor citizen involvement. This “pre-test” phase will be described in details in this volume.

The results of the pre-test were analysed and used by the Municipality to orient planning of the pilot’s activities, identify the various types of citizens and stakeholders, investigate the best methods for involving these, and hypothesise several validation elements and a feedback system.

Pilot in Genoa: selection of data and information

Since the launch of the FLOOD-serv project in 2016, the data used by the public administration with reference to the issue of hydrogeological risk has been analysed.

The data may be stored in Geographic Information System (GIS) tables and therefore be georeferenced, as in the case of the risk maps published by the Regional Government of Liguria and the Municipality of Genoa which contain the boundaries of flood-prone areas, landslides, etc. Alternatively, it may be alphanumeric data, recorded in tables, such as datasets on inhabitant vulnerability and lists of commercial activities in flood risk areas.

In view of the FLOOD-serv workshop held in Genoa in July 2017, the data was analysed and the tables for collection of information on the area in “peacetime” (pre- and post-hydrogeological event) were consequently restructured for the Genoa pilot (Figure 1).

During this phase, the information in question was that which the public administration considered it possible to receive from citizens. During the subsequent “pre-test” phase, on the other hand, citizens and associations were asked what information they considered it possible to receive from the public administration and what information they could provide on the area in order to prevent hydrogeological risk.

Citizen reports could also relate to those “identity-forming” elements of the local community to be preserved in the event of flooding, such as movable or immovable cultural assets with which the community identifies (Figure 2).

Figure 1 – Working table - Genoa 20 July 2017

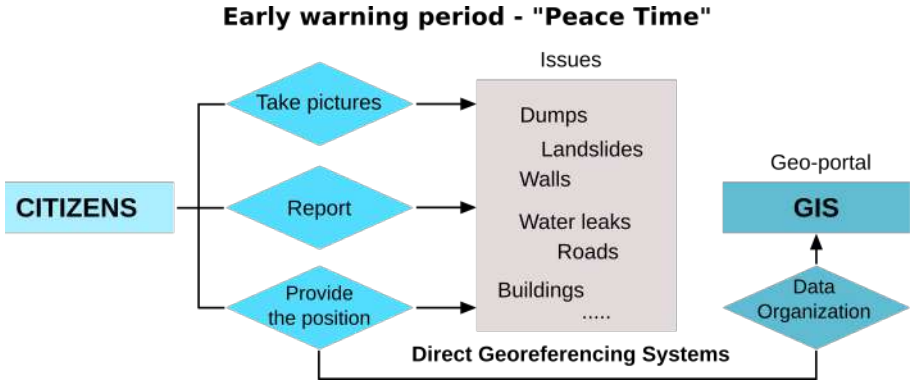


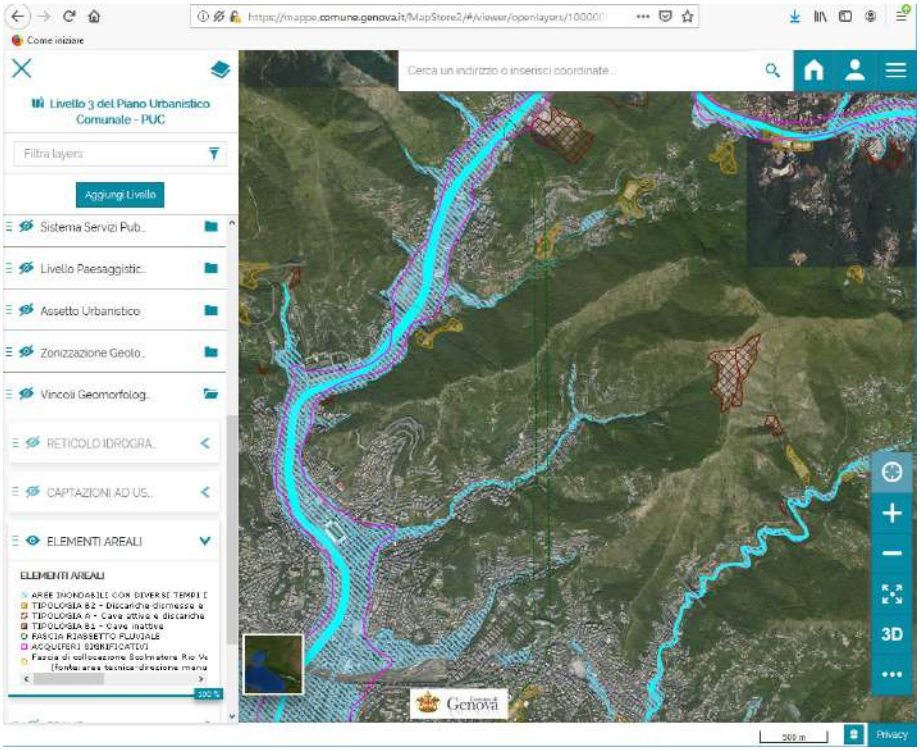
Figure 2 – Vulnerability identification - Data analysis - Genoa 20 July 2017

Georeferencing, both of data produced by the public administration and of citizen reports, makes the information more usable and results in greater knowledge of the area for application in land planning.

The Municipality of Genoa's geoportal is accessible to everyone via the web and is a tool providing a service to citizens and supporting governance of land planning and monitoring (Figure 3).

At this point, the issue concerns the modes of interaction between citizens and the methods for receiving reports: through a dedicated website, by telephone, by email, through use of a specific app or via a web/mobile platform (with georeferencing of reports and the option of sending photographs).

Knowledge of dedicated softwares already used in Italy and abroad is useful in selecting a tool appropriate to the requirements of public administration-citizen communication. The Municipality of Genoa is implementing the Metropolitan Digital Agenda through the PON METRO project (Axis 1).



Figur3 3 – The data that can be consulted in the Geoportal of the Municipality of Genoa

The FLOOD-serv Platform components

The FLOOD-serv system acquires information from a large number of external sources, such as sensors, social media, open data and dedicated software.

The FLOOD-serv platform comprises various components:

- the Portal (FP);
- the Emergency Management Console (EMC);
- the Territory Monitoring System (TMS);
- the Citizen Direct Feedback (CDF) and teh mobile App (APP);
- the Social Media Component (SMC);
- the Semantic WIKI (SW).

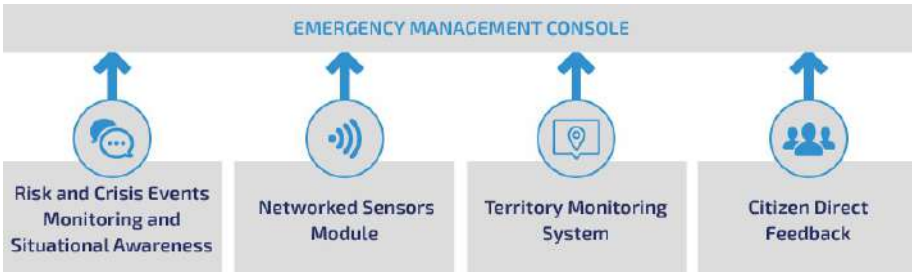


Figure 4 – Scheme of the FLOOD-serv platform.

The Portal is conceived as a two-way information gateway: citizens can search for information on floods or send reports using the citizen participation form. The FLOOD-serv Portal offers news, multimedia galleries and archived data reports. This Portal is the front-end of a series of other components of the computer system developed during the project.

The mobile app (APP) and Semantic Wiki (SW) are designed for citizens. The reported data entered by citizens using the Portal's citizen participation form or via the mobile app is received and processed within the Citizen Direct Feedback (CDF) component, which constitutes the reporting system's back office.

The emergency management console (EMC) receives and monitors relevant data from a variety of sources, both internal and external to the FLOOD-serv project (from other components, such as emergency reports sent by citizens or meteorological and sensor data). The EMC analyses crisis situations and proposes a Plan of Action for Crisis (PAC); a list of operations or activities to be performed in chronological sequential order using the resources necessary to combat flooding.

The Territory Management System (TMS) receives satellite and/or aerial images (taken by drones or aircraft) and is capable of locating and positioning them on a

digital map of the area in question. By analysing subsequent images, taken at pre-established times, the TMS is able to recognise changes to the area and also, through intelligent processing, classify the nature of events that may be directly related to flooding. The data generated by the TMS is sent to the EMC for further analysis.

The Social Media Component (SMC) is intended to monitor and raise citizens' awareness of issues relating to floods. It gathers, monitors and analyses articles, opinions and posts on floods from various social media and web sources, displays them and organises them for further analysis. This provides an additional tool for learning about citizens' concerns and feelings, which aids the development of long-term strategies and, in the event of an emergency, efficient communication with citizens through multi-channel messaging. Indeed, in an emergency, citizens who have become acquainted with one another and communicate between themselves and with the public administration during "peaceful" times can become operators, partners and sources of information in real time.

The Semantic Wiki (SW) contains general information and knowledge on river overflows as well as specific, contextualised knowledge relating to the FLOOD-serv project. This tool is aimed both at specialists in the field of floods and risk management (such as researchers) wishing to search for information or contribute to systematising knowledge on floods, and at citizens interested in the subject of floods and flood risk. The entries in the SW are written in a brief, encyclopaedic style, starting with a definition of the term followed by further explanations. In general, the aim is to keep the text relatively short and to refer to the contents of other entries, connected using links, for details.

The Genoa pilot, as previously mentioned, has focused on "peacetime" and, for this reason, in 2018 and 2019, during the three test phases of the FLOOD-serv project, the Portal, the mobile app (APP), the Semantic Wiki (SW), the Citizen Direct Feedback (CDF) and the Social Media Component (SMC) were tested, while the components associated exclusively with times of emergency (the EMC and the TMS) were not considered.

The CDF and the SMC were tested by the Municipality of Genoa and the personnel of the project's local partners (the University of Genoa and the company Job Centre), while the other components (the Portal, the APP and the SW) were tested by citizens.

Contributions to Implementation of the FLOOD-serv Platform

The FLOOD-serv project workshop of 19 and 20 July 2017 was also an opportunity to set the parameters for development of the various components of the platform, particularly in relation to the needs and features of Genoa users. In summary, the requirements examined were those relating to the users, the features and the data stream. Certain details specific to Genoa were subsequently developed during implementation of the FLOOD-serv platform and its components.

With regard to citizen participation, data relating to the creation of the “network” was analysed, with particular focus on the methods of citizen registration for access to the platform and the feedback system (using follow-up tickets).

With reference to existing social networks (Facebook, Twitter, etc.), which are possible channels for communication between citizens and public administration, the form provided by the FLOOD-serv platform - Social Media Component (SMC) - envisages use of “key words” to launch “campaigns” to select communications circulating on the web during a certain period and on certain social media pages. On the topic of “floods” in Genoa, the period that provides the best results is autumn, when the topic returns to the fore, or when orange or red alerts are issued.

As far as citizen reports are concerned, the FLOOD-serv platform makes it possible to send data through the form provided on the project’s portal or though smartphone apps. Using the Citizen Direct Feedback (CDF) form, the platform assigns a “ticket” to each report, rendering it necessary to structure a system for dealing with the issues reported in order to provide feedback to citizens. The CDF form envisages a system for validating reports (which are accepted or rejected by the relevant offices), thus providing citizens with a response to what they have reported.

Given that the Administrative District Councils receive reports from citizens via email, the Flood-serv project permitted testing of an app that makes it simpler and less burdensome to save the data received in such reports.

The Municipality of Genoa, as pilot case, has participated to the development of the FLOOD-serv platform through different test plashes. The contribution was not only from a technical point of view, testing functionalities. Actually, the main contribution was the collection and analysis of stakeholders’ feedback, both on tools and on contents. The main activities carried out to reach this aim are described in the following chapters of this volume.

1 The Italian Department of Civil Protection (instituted by Law no. 225 of 24 February 1992) deals, at national level, with prediction, prevention, management and overcoming of disasters and catastrophes, both human and natural, and emergency situations. It also deals with forest fire prevention and hydrogeological risk. Over the years, its aims and functions have remained unaltered while its organisation has changed, particularly with regard to the transfer of responsibilities to local level.

2 Balletti F. (a cura di), 2007, "Sapere Tecnico-Sapere Locale. Conoscenza, Identificazione, Scenari per il Progetto" (Technical Expertise-Local Expertise. Knowledge, Identification and Scenarios for Planning), Alinea, Firenze, Pag. 212

3 Quaini M. (1998), "Il percorso identitario e locale del PTR" (Identity and Location in Regional Development Plans), I Conferenza di pianificazione del Piano Territoriale Regionale

4 Magnaghi A. (2000), "Il Progetto locale" (The local project), Boringhieri, Torino, p. 123

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Two-way communication between citizens and public administration: considering content

When introducing a question about communication between public administration and citizens regarding hydrogeological and environmental risks to the discussion, it is essential to consider a broader conceptual approach that involves the social construction of awareness and knowledge of the area by the people who inhabit it. It is well known, indeed, that people's social perception of an area "passes via understanding and ownership of the space, in relation to which culture and communication are key factors"[1]. For this reason, we must be open to the possibility of interlinking three aspects: perception of society, communication and the area, in order to understand how to promote correct knowledge and awareness of the role of the area in individuals' daily lives[2]. It is believed, indeed, that such a situation can constitute an essential requirement when attempting to improve the response of the various social operators to actions for protection and management of the area. It is therefore necessary, once again, to keep clearly in mind that "it is how we see ourselves, others and the environment in which we live that guides our perceptions and also our actions which, in turn, alter the context"[3].

When living in an environment in which hazards are increasingly transforming into risks[4] and both are growing, it is essential to reflect and take action in order to consolidate a greater culture of risk within which the aspects of perception and

communication take on a primary role in understanding collective behaviours in situations of potential damage or post-event emergency. Indeed, whether we think of risk as a product, attribute importance to its perception or assessment, or engage in its management, risk is, in any case, increasingly found to be a socio-cultural construct[5]; in other words, we are dealing with society's construction of reality. From this perspective, let us remember that "Douglas and Wildavsky[6] previously outlined a cultural theory of risk in which individuals could be divided into categories, arranged by ideological types, according to their perception of and reaction to catastrophic events, based on sharing of values and attitudes"[7], where social perception of risk and the attitudes and behaviours of social operators under conditions of uncertainty become priority concerns. In other words, it appears unimportant to talk about an objective level of risk but, rather, essential to observe its social perception and communication, if we are to implement a sound culture of risk that affects the sense of security of the communities living in an area. It is this very sense of security that can make people feel either free from hazards or potential victims of them, and can offer the possibility of preventing, eliminating or reducing the seriousness of damage, risks, difficulties and undesirable eventualities[8].

Human perception is made up of a set of psychological functions that permit the individual to acquire information on the condition of and changes to the environment - through the actions of specialised organs such as the five senses and the participation of behavioural components such as motivations and emotions - and is influenced by social context. In this way, social perception indicates the influence of this type of context on the preceptive process. According to this view, perception is therefore also interpersonal, linked to cultural background, stereotypes and prejudices; the relationship established between individuals and their environment - and hence the perceptions that the former develop in and on the latter - always occur according to a circular interchange and are influenced by the social context in question[9].

Collective memory contributes, together with these elements, to forming social perception, since it consists of the memory, or set of memories (of varying degrees consciousness), of an experience lived or mythicised by a collective. For this reason, the feelings of the past are an integral part of people's identity: it is the memory of events, either directly experienced or passed down in oral or written tradition, that evolves alongside the evolution of social groups, contributing to the creation of social perception[10].

Social perception, being an influence of the social context on the action of perceiving, assumes a preoperational nature, becoming, at the same time, both stimulus and information; a spur to action. For this reason, in the interrelation between individuals and the environment, it is extremely important to consider this perception, particularly where related to critical situations in which aspects of the local area take on a predominant role. It is therefore necessary to focus particular attention on identification of those variable elements that can become key factors, capable of highlighting those perceptive dynamics that affect the social perception of risk and the very creation of a risk culture.

The following is an initial, if not exhaustive, list of these factors[11]:

- catastrophic potential: people tend to worry more about events that are concentrated in space and time rather than diluted events, even where the latter cause much more extensive damage;
- familiarity: people worry more about less familiar risks;
- understanding: people are more afraid if the potential damage is the result of dynamics whose workings they do not understand;
- scientific uncertainty: people's fears are inversely proportionate to their scientific knowledge of the subject;
- personal control and free will: individuals fear events over which they have little or no control more than those they largely control (or have the illusion of controlling);
- reversibility: finality frightens people in all cases, even where the events in question are not negative.

In line with what the European Union has sustained for at least 20 years, we believe that involving an area's populations must now be considered an integral part of the process of dealing with land planning, viewed in all its dimensions, including those critical issues brought into play by the concept of risk highlighted here. In other words, "each process of reducing an area's risk/hazard must necessarily involve the local community, and each improvement to an area's safety is always clearly also a restoration of its social relations"[12]. Indeed, it is citizens who come to play an active part in taking on local area values. However, to achieve this requires a considerable institutional commitment in the form of training and awareness-raising among the area's populations; a programme structured around a communication system with well-defined components, designed to genuinely engage citizens.

IGenoa Pilot Case - Objectives and Methodological Aspects

Within the framework of the FLOOD-serv project, the Genoa pilot case, founded on citizen participation during pre- and post-flood phases, focuses specifically on the aspects of social perception that act as a spur to action. Indeed, actions can become concrete and effective through a process of communication between PA and citizens, which must be understood as two-way communication. In fact, the concept of public communication, according to the Italian Home Office, "refers to the idea of two-way information flows between citizens and public administrations and is therefore characterised not only by the intention of the sender to communicate something but also the ability or option of the addressee to receive it"[13].

The term "public communication" is used to refer to a set of processes that permit all operators to network with one another, compare values and exchange ideas with the aim of contributing to the achievement of a shared goal. The FLOOD-serv project's Genoa working group set itself the objective of structuring communication tools relating to hydrogeological risk, focusing on the potential of citizen engagement through ICT tools for improving the relationship between PA and citizens.

Tackling a complex problem such as that of two-way communication between public administrations and citizens required planning of an ongoing process, based on a working method that could spontaneously and creatively stimulate reflection and ideas during group discussions. For this reason, each internal group meeting was organised as a brainstorming session; a decision that enabled the project's activities to proceed despite the difficulties presented by the complexity of the subject under discussion. This brainstorming work, repeated during the early months of the project, led to identification of certain essential elements that guided the activities of the Genoa pilot through the periods that followed.

The goals identified fell essentially into three categories:

- for institutions: collection of information on the area;
- for citizens: sense of security and civil responsibility;
- for the project: usability testing of the tools created by the project itself.

These goals and the consequent activities highlight the way in which the central elements of the work focused on three broad groups:

- critical points, i.e., vulnerabilities (of the area and its people);
- people's awareness and perception of the safety of (and in) the area;

- set-up of communications networks.

While, on one hand, the elements of perception/awareness and network creation revolve directly around communication, on the other hand, work that supports and implements a sound risk culture must necessarily involve the concept of the area's vulnerabilities, referring, in this case, to both environmental and social vulnerabilities.

Vulnerability is a very complex concept, normally used to identify a local fragility and weakness, of a human or social nature, which is open to multi-disciplinary interpretation, progressing from the idea of something to be contained to the belief that it can be a condition offering potential for development.

For some, vulnerability is viewed as a matter permitting work on problems arising from the uncertainty typical of complex systems in order to best respond to the expectations of planning that is intended to be sustainable. For others, it is considered to be one of the direct consequences of pressure (on the area or its society), and others, still, "consider it to be an intrinsic property of systems, regardless of the intensity, frequency and extent of any problems that may occur"[14]. If one accepts the latter view, according to which vulnerability is a constituent element of a complex system, then it may be perceived as the system's own predisposition to instability which, if observed and comprehended, offers the opportunity to radically alter the system's structure, functions and organisation, as a result of anthropogenic and/or natural external forces[15].

Often, the concept of vulnerability has been associated with that of resilience; indeed, local risk management has given rise to numerous and significant interpretative keys that focus on the relationship between resilience and vulnerability[16]. In this regard, resilience is used as the opposite concept to that of vulnerability, in that resilience strategies, rather than making it possible to live with uncontrollable hazards and risks, aim to achieve a reduction in systems' vulnerabilities.

For its part, resilience is used as a "key concept for innovation of local risk management strategies, complementing risk and hazard reduction objectives with a plurality of objectives linked to the quality of the area"[17].

Today, some maintain that an approach that "favours analysis of a community's abilities to deal with the impact of a disaster, rather than focusing solely on vulnerability factors" is increasingly popular[18], it being understood that, in order to increase an area's resilience, it is necessary to understand its vulnerabilities. Hence, use of the concept of resilience has, in recent years, tended to prevail over that of

vulnerability. According to Mela[19], the constant reference to resilience that dominates studies and actions on the topic of natural or anthropic disasters may be justified by the fact that this approach focuses its attention on a society's endogenous resources and ability to self-transform in response to a negative event, as opposed to concentrating its energy on elements of weakness to be remedied through external interventions. On the other hand, however, knowledge of an area's vulnerabilities can, in "peaceful" situations, highlight those weak points that can hinder or, conversely, promote resilience, in order to permit action on these to increase the system's ability to respond to a traumatic event. Following this line of thought still further, Mela defines "a community's structural resilience" as a set of factors that represent intrinsic characteristics of that community, built up over the years, which can influence its ability to respond effectively to a negative event. These characteristics are wide-ranging: social, environmental and relational, forming a network of factors, namely economic development, social capital, information/communication and community competence, together with others of a sociopolitical, cultural and psychosocial nature.

Preliminary activity

The FLOOD-serv project's Genoa pilot working group, during an initial brainstorming phase, focused its reflection specifically on the vulnerabilities of the area (in geophysical terms) and its people (social vulnerabilities). This long and complex task gave rise to summary outlines highlighting the factors mentioned above which, if given due consideration, can contribute to reducing the weaknesses and, consequently, building the resilience of the area.

After classifying the principal hydrogeological problems as landslides, land instabilities, soil erosion, overflow of watercourses, and floods, the group went on to identify vulnerabilities in relation to hydrogeological events: vulnerabilities of the soil, of the physical space (caused by anthropic transformations) and of people.

Among the main vulnerability factors pre-existing hydrogeological events and which could be worked on in order to reduce the area's weakness, the following identified:

- land remedial works: terracing and retaining walls;
- watercourse regulation works: dams, weirs and embankments;
- infrastructure and public transport: tunnels, underpasses, cuttings and

underground railways;

- completely or partially underground structures: car parks, business premises, artisan's workshops, storage areas, and association and social venues.

Consideration of social vulnerabilities - certainly less complex than that of geophysical vulnerabilities - originated from reflection on people's awareness of the conduct that should be adopted in pre- and post-hydrological event situations or, in other words, what may be described as "knowing what to do".

In this case, four different categories of people considered most exposed to hydrogeological risk were identified, each associated with conduct to be familiar with, in order to know which strategy to implement in case of need. These strategies are not exclusively applicable to one category of people but partially overlap depending on the needs brought about by the traumatic event in question and by the type of people who find themselves dealing with it.

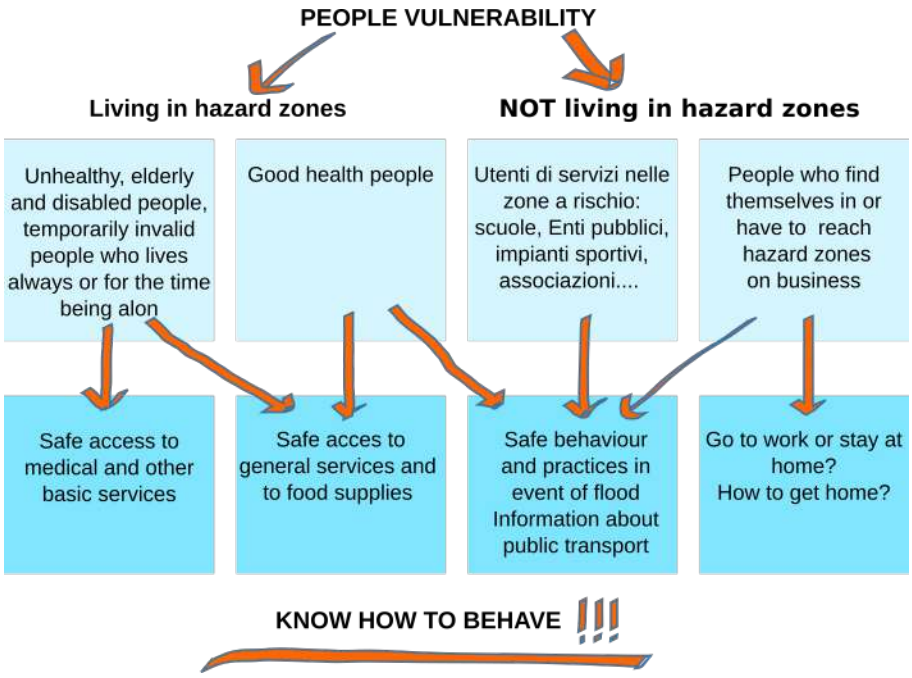

Table 1 - People vulnerability

Knowing what to do can not only genuinely reduce the risk of becoming a casualty of hydrogeological events but also contribute to building people's sense of security in their day-to-day environment. For this reason, it is important to have an awareness of how to deal with a critical situation by adopting behaviours and strategies that, despite being associated with "common sense", can escape people's attention.

The vulnerability elements highlighted thus far are intended to provide an understanding of the difficult conditions experienced by citizens - both in "peaceful" situations and following a hydrogeological event -, rendering interpersonal cooperation essential in order to build local resilience. Indeed, "in social systems, knowing how to live with uncertainty requires implementation of strategies for dissemination of knowledge and information as well as adoption of forms of participation, negotiation and cooperation"[20]. Disseminating knowledge and information and adopting forms of participation and cooperation are activities that can only be carried out through committed communication between institutions and citizens, not forgetting, furthermore, that a truly communicative environment makes it possible to effect changes with regard to people's sense of security as well.

The extensive brainstorming work conducted within the project raised interesting considerations also concerning aspects of communication, focusing reflection above all on "what" and "how" to communicate in pre- and post-hydrogeological events. Specifically, the elements identified were grouped into two distinct sections:

- data that can be managed by the platform created by the FLOOD-serv project (i.e., information that public administrations should provide to citizens); and
- data that can be provided by citizens (who decide, voluntarily, to communicate information to the public administration).

The elements belonging to these two groups were, in turn, separated into data communicable prior to an event and data to be sent during an emergency phase following an event. These two lists cannot, of course, aspire to be exhaustive, but take into account the work carried out and the complexity dealt with when implementing resilience strategies.

With regard to data that public administrations should communicate to citizens and that are manageable by the FLOOD-serv platform, a list was produced which envisages both information already managed by the Municipality of Genoa, mainly through the Civil Protection, and information that are still not available for genoese citizens.

The reflections that led to drafting of these lists of communication elements are also the fruit of careful examination of “good practices” already in place in Italy with regard to the provision and use of ICT for communication between PA and citizens.

INFORMATION FROM PA TO CITIZENS

For everybody

- real time evolution of the situation
- activation of alarm systems in the absence of electrical power
- map of waiting areas - where to go during the event, where help can be found;
- map of shelter areas - where to go to spend the night;
- map of safe areas where people can move their cars, including safe routes to get there;
- map of underground car parks, both public and private, to be avoided;
- map of basic services situated in a safe zone, including safe routes to get there;
- information on opening or closure of public sites (cemeteries, sports facilities, ...)
- “rules of conduct” to follow in heavily frequented places situated in at-risk areas (such as railway station, hospitals, shopping centres, etc.);
- cooperation of the administrators of apartment building situated in at-risk areas by providing all residents with official communication on conduct to adopt;

For emergency operators

- a database and map of infirm persons (even if only temporarily)
- a map of urban areas for assembling people based on the list of “daily events”;
- set-up of a “certified” broadcasting channel covering all bands and responsible for communicating possible future floods.

INFORMATION FROM PA TO CITIZENS

Reports of:

- illegal landfills (particularly dangerous if situated on the edge of overflowing rivers);
- landslides and collapse of rocky materials (walls and unstable slopes);
- damage to road ;
- damage to buildings and walls;
- water infiltration;
- persons who are infirm (even if only temporarily).

Box 1 - Pre-emergency situation - non-exhaustive list

INFORMATION FROM PA TO CITIZENS

For everybody

- procedure for self-reporting of damage suffered using a simple interfacing method (e.g., through photographs and comments);
- map of temporary urban traffic alterations;
- map or list of emergency and assistance services created ad hoc for affected areas (e.g., emergency medical services, general practitioners, places where life-saving medicines are distributed, etc.);
- real time information on restoration of services (water, electricity, refuse collection, etc.);
- information on opening or closure of public sites (cemeteries, sports facilities, …) and commercial activities
- list and map of available clearing equipment (e.g., draining machines, vans, trucks, etc.);
- map of places where flood-damaged objects can be stored, even if bulky (e.g., temporary refuse deposits created ad hoc);

Per addetti all'emergenza

- areas where mud and debris are still present
- list and map of situations that needs clearing equipment or personnel
- a list and contact details of people willing to help restore urban spaces (volunteers, etc.);
- set-up of a “certified” broadcasting channel covering all bands and responsible for providing information on the development of the reinstatement situation.

INFORMATION FROM PA TO CITIZENS

Reports of:

- damage suffered (self-declared)
- areas where mud and debris are still present
- situations that require clearing equipment (draining machines, vans, trucks, etc.);
- locations that require reinstatement equipment
- re-opening or continued closure of commercial activities
- their own willingness to volunteer to help restore urban spaces
- persons who are infirm (even if only temporarily)

Box 2 - - Post-emergency situation - non-exhaustive list

Internal brainstorming by the Genoa working group was aimed at structuring the activities of project's subsequent phases, in order to improve involvement of people on various levels in an information/participation process permitting use of the data collected in order to increase the performance of existing services, contribute to creating new services with a bottom-up approach, and provide useful information and personalised services.

Within this framework, European projects like FLOOD-serv can represent an opportunity for debate on the many and various aspects of population participation. Such projects can also offer valuable opportunities to cultivate the local community, learn about local culture, develop networks and social capital, and educate people on the topics of risk and protection of the area.

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Valentina Marin
Paola Salmona

Citizens as a Data Source: Considering Tools

Within the theme of a two-way communication between PA and citizens, the biggest challenge for the Genoa pilot was certainly the one linked to whether and how the citizen can contribute to the collection of information on the territory, to be communicated to the public body. The municipal government is normally viewed by citizens as a preferred interlocutor for reporting problems concerning the area or situations that may be a disturbance or hazard to the community. Indeed, it is considered the authority responsible for taking care of the city, particularly when it comes to general issues not linked to a specific field of action already codified and managed by other operators (e.g., fires: fire department; illegal activity: law enforcement; emergencies: call 112, etc.). However, reporting methods are not always effective or organised, and this can cause problems in terms of both effective response by the administration and citizens' perception of it. For instance, it is not unusual for citizens to direct their reports to newspapers and local media or publish them anonymously on social media rather than duly sending information directly to the Municipality. Often, these actions are due to a lack of appropriate tools or to miscommunication to citizens, who are therefore unaware of any options for dialogue with the public administration that may already exist. A typical consequence is that many people decide not to communicate because they do not know who to approach

or which procedure to follow, or because they are convinced that their report would not be followed up.

In recent years, the development of new technologies and the growing popularity of smartphones has resulted in numerous proposals that enable citizens to send reports not only by email or via special online forms but also using smartphone and tablet apps. These systems naturally require back office management by the administration receiving the reports, which are already structured, thus facilitating the work of checking, sorting and dealing with problems. The majority of these applications, already in use in some Italian municipalities, are used for general reporting concerning various types of area maintenance issues, from roads to streetlights, trash and animals.

Assuming that citizens are often those who know their area best, in the context of the project, it was decided to consider the possibility of harnessing this potential, with specific regard to the topic of hydrogeological risk. Effective gathering of information known to citizens, as well-placed observers, can support the public administration in its task of managing the area, particularly in order to identify symptoms of instability or potential risk situations with a view to prevention and mitigation of possible future flooding. The chosen path was that of testing an effective digital tool capable, on one hand, of facilitating the reporting procedure and, on the other, of focusing those reports specifically useful for combating hydrogeological instability. This type of synergy enables the administration to take full advantage of citizens' extensive knowledge of the area in which they live while, at the same time, permitting improvement of participation by these citizens in management of their area, making them more attentive, aware and responsible.

Reporting... How? A Preliminary Study in Genoa

The Municipality of Genoa, participating as a pilot city in the FLOOD-serv project, took on the specific task of testing, within a social context, the platform's tools developed by the project's technical partners, designed, in part, to optimise citizen participation as described above. As a first step, before the tools envisaged by the project became operational, it was deemed opportune to verify, at local level, the extent to which citizens were prepared to use ICTs in the context of shared

management of the area and what types of tools were most suitable. With this in mind, at the end of 2017, a preliminary test was conducted in Genoa with the aim of institutions and relevant stakeholders discovering, together, what information citizens can communicate to the administration in order to improve management of the area, from a flood prevention perspective, and how they can do this.

In order to best define the reporting methods for the preliminary test phase, analysis of the state of the art was performed in relation to:

- current methods for reporting critical issues of a general nature at municipal level, and types of reports received by the Municipality in 2016;
- relevant georeferenced data on the Municipality's GIS (reports, maintenance, interventions, etc.).

Among the various items of information collected through this analysis, it emerged that, at the start of the FLOOD-serv project, one of the possible ways for citizens to make a report was through a form provided on the Municipality's website. However, analysis of the reports sent to the Municipality in 2016 revealed that most were from institutions (schools, hospitals, etc.) or from the local police following inspections, sometimes requested by telephone by citizens. Very few reports were made directly by citizens using that form. This is an example, then, of a tool useful on paper but, in reality, used only by institutions and little-known to citizens and therefore not effective for this purpose.

Based on the information acquired, a prototype tool was then especially developed, to be tested by a small group of stakeholders during the preliminary phase. Three experimental objectives, in particular, were considered:

- To propose and validate an information structure for communication by citizens to public administrations
- To test the use and features of digital tools and applications for collecting and sending reports
- To reflect on methods for involving citizens.

Developing a Testing Tool: mugugn.app

The reporting structure

As a preliminary consideration, it was decided that the focus would be on specific elements or signs on the territory that could be easily located and described by a citizen, “symptoms” of situations that could become a danger in case of significant rain or flooding or which could worsen their effects. This type of communication is specific to ordinary signals, which can already be considered useful to the Municipality in “times of peace”, that is, outside of emergency situations, in view of pre-emptive interventions. In general, situations of undeniable danger tend to be known to local technicians, however, a wide-spread and constant gathering of smaller signs could help the Public Administration identify situations that are still forming or the chance of a problem to arise over a longer period of time, in areas that were not of concern previously.

The second consideration concerns feasible choices to facilitate the signals’ management by the Public Administration. Since it is important that the post-production process, meaning the work needed to interpret, validate and intervene on the basis of what is communicated, is reduced to its minimum. The complexity of the phenomena across the territory and the subjectivity of its inhabitants can bring about notifications that are difficult to interpret and frame. The same situation identified by a number of people can indeed be interpreted from a variety of viewpoints and can be described in terms of different issues, bringing about unclear information. If it is true that human intervention is always necessary to manage warnings, reducing time and effort, allowing for a preliminary automated screening system, could improve the efficiency of the entire process. From this standpoint, it becomes of key importance that citizens be provided with clear instructions on how to describe any relevant issues they come across.

On the basis of these two considerations and of the preliminary analysis of the current situation of warnings, previously compiled, and of the current data scheme of the Municipality of Genoa’s geo-portal, a form has been put together to be applied to reportings of possible territorial elements that are indicative of decay and that could be tied to a potential hydro-geological risk. This form was designed in such a way that it may be compiled per type of problem per territorial element concerned by said problem, thus suiting the possibility of it being integrated into a database.

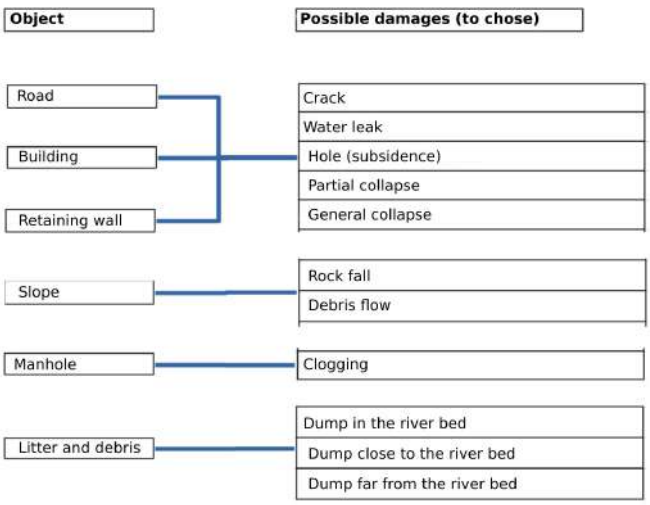

Figure 1 - Data scheme for reportings

A trila app: mugugn.app

Considering that the general objective of the FLOOD-serv project concerns the use of ICT tools to ensure public participation in collective risk management, right from the preliminary test phase the warning system considered was one that would make use of mobile devices. A number of commonly used device functions, those of smartphones and tablets, are particularly suited to notifying and describing potential risk situations. First and foremost, the ability to geo-reference notifications thanks to integrated GPS capabilities, now a fixture in all smartphones, giving users the chance to locate situations in a specific point in space, and which can be identified with coordinates and easily represented on a map. One of the advantages, beyond being able to skip the locating process during post-production, is that the presence of a high number of notifications made by different people in a defined area can be a first indicator of the validity and importance of an anomalous situation.

The use of mapping is also important when it comes to not only sending geo-referenced information directly from where the issue is located but notifying about situations in visible yet inaccessible areas, being able to also refer the location calmly at another time (using the same mapping system without GPS or via a description).

Based on these observations, an app was created by the Geomorfolab[1] with

functions that were considered to be best suited to providing the most effective combination of precision, reliability of notifications and usability.

Specifically, the main functions integrated concern: finding one's own location on the map, locating elements on the map and taking pictures, along with typical GIS applicative functions to associate alphanumeric information to geo-referenced points.

In order to reduce production time and costs, it was decided that the developing team would simplify and adapt an already existing Open Source app to their needs: Geopaparazzi[2] issued by HydroloGIS s.r.l. and used for high-profile campaigns, especially in the context of land surveying, in naturally inaccessible environments.

The created app was named mugugn.app, from the Genovese word "*mugugno*" meaning "complaint", and it offers two options for sending reports and notifications:

- a "free" mode, through which the user can insert open text messages corroborated by photographic imagery;
- a "guided" mode, which, through a series of drop-down menus, the user can compile the above-mentioned form, which adds added information in order to improve the description at the heart of the notification (Figure 2).

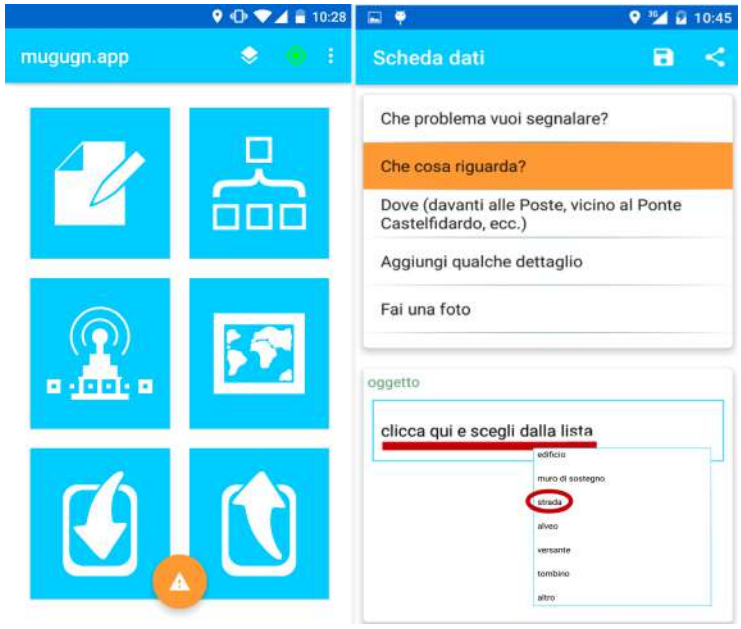

Figure 2 - mugugn.app opening screen and guided mode for reporting

The use of both options, free and guided, responds to the main objective of this first trial, that is, testing the possibility of a future two-way communication between the institution and the citizen. If, on the one hand, the guided notification system is functional when it comes to optimising its interoperability with the current data structure belonging to the Municipality of Genoa, on the other hand, the chance to carry out unrestricted notifications allows for both further in-depth analyses of "items that previous notifications had not yet considered through the terminology used by citizens to describe the issue at hand and for giving space to any open suggestions or "mugugni" regarding the problem, all useful to institutions for the best chance of getting a clear read of the situation.

Having been adapted from a tool used by technical experts for surveying, mugugn.app does not offer a captivating interface and is not entirely intuitive in its use. For example, being conceived to produce information gathered on the field altogether in the form of a GIS map, it does not have a sharing function nor one for sending single notifications, an aspect that is extremely useful when being used by citizens. This method, instead, requires users to share a file that is saved automatically in the device's internal memory, an operation that is not difficult per se, but which many smart device owners have never carried out. Having considered that this phase was a preliminary test phase and was not aimed at all citizens but at expert users or who were in any case very interested in the matter at hand, this limitation in the app's actual usability was deemed acceptable and it was decided that users would be supported on the spot or remotely by issuing detailed instructions.

The First Experiment with Stakeholders

Involvement and test methodology

Once the tool was prepared, an experimental test phase was designed for a deliberately short period of time (1 month) involving a group of "privileged witnesses", involved previously and accurately trained.

The smaller group included:

- technical experts who operate in the territories of selected Municipalities, as either personnel working in municipal technical areas or who operates under Aster, Amiu, both participated companies of the Body;
- associations that are present on the territory concerned by the pilot and that were

registered during the launch seminar for the FLOOD-serv project held in partnership with the Medio Levante and Bassa Valbisagno Municipalities, back in February 2015;

- high school students
- students from the University of Genoa who are taking part in the Applied Geomorphology course at the Polytechnic School.

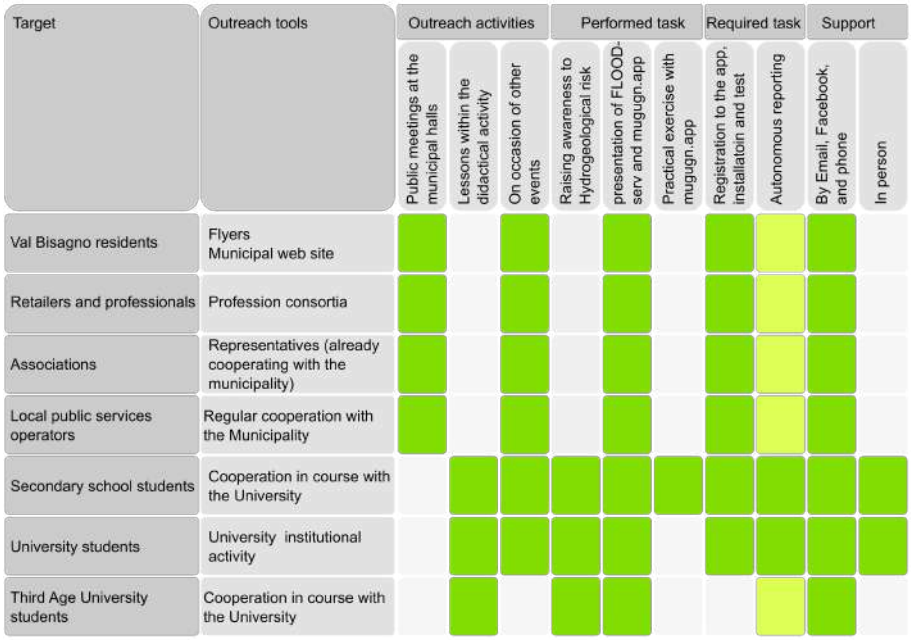

Figure 3 - Stakeholder groups and engagement methodologies

The ways in which these groups were formed and involved in the project when it came to subjecting them to the test stage were of three kinds:

- **organising targeted informative and training sessions** in which the objectives and tools of the project were illustrated in detail along with activities involved in the pre-test. With this method specifically, a session was held in the Bassa Val Bisagno Town Hall, in the presence of representatives from the three Municipalities involved in order to promote the creation of privileged witnesses groups, along with a session that took place at the Order of Engineers of the Province of Genoa, aimed at raising awareness of professionals towards the use of the app.
- **organising targeted teaching activities at high schools**, partially through

classroom lessons about risks and active citizenship, through presenting the project itself and a practical demonstration of how the app can be used. This method was applied in two schools: the Agricultural Technical Institute and Professional Agricultural Institute and the D'Oria Classical High School.

- **sharing over the web and printing an illustrative brochure**, creating a **web page** on the Genoa Municipality website[3] and that of the Geomorfolab[4], initiating a **closed group on Facebook**[5]. This method was applied in order to allow for a fast and direct mutual exchange of information throughout testing periods and to let this space be used for comments and ideas that relate to the concept of urban hydro-geological risk as well.

It is important to specify that in this phase mugugn.app was not intended to be an operational tool, rather it was to be a showcase for demonstrating in a practical manner a number of possibilities ICT had to offer. The app's availability was thus limited to those who were actually interested in the relative issues and the app was made available to be installed via download only to those who had registered to take part in the test. An exception was made for high school students, since notification activities were considered to be a key part of study courses, therefore, in this case direct access was given to the app.

Data analysis

During the experimentation phase and its conclusion the following actions were carried out:

- analysis of notifications and comments gathered via the app, Facebook group, email and face-to-face events
- monitoring the privileged witnesses group, in view of the objective of building up networks, exchanges and engagement of citizens alongside the Administration.

Total notifications reached 64, divided up as illustrated by the following table.

Contact mode	**N° participant**	**N° reports**
Public meetings	28	16 (9 free mode and 7 guidate mode)
Activities in shools	120	48 (6 free mode and 42 guided mode)

Table 1 - Participation in the pre-test phase.

With regards to the users involved in public awareness events, participation was scarce. Reasons for this mentioned by number of those who failed to send notifications at all included technical difficulties, lack of time and not having observed critical situations worth notifying. This final aspect can be linked to the fact that during the experimental phase, the weather conditions were often pleasant, which made the issue hard to perceive than in other, worse, atmospheric conditions. It also surfaced how actual participation was penalised by the fact that notifications were merely an exercise to provide indications on potential communication methods between public administration and citizens, rather than being an already active tool which could therefore bring about an actual intervention on behalf of the Local Authority.

A different and much more satisfying result came from the schools. Among other reasons, this undeniably depends on a greater effectiveness of engagement when the request to use the app had been preceded by a practical demonstration phase with the students themselves, allowing for them to be “accompanied” in their use of it. The positive outcome achieved in the school activities emerged clearly, even beyond the numbers recorded. Indeed, even though only one of the two schools completed their notifications, carrying out the work with their teachers, the outcome was still very positive. Particularly, good results were recorded both in terms of the interest shown

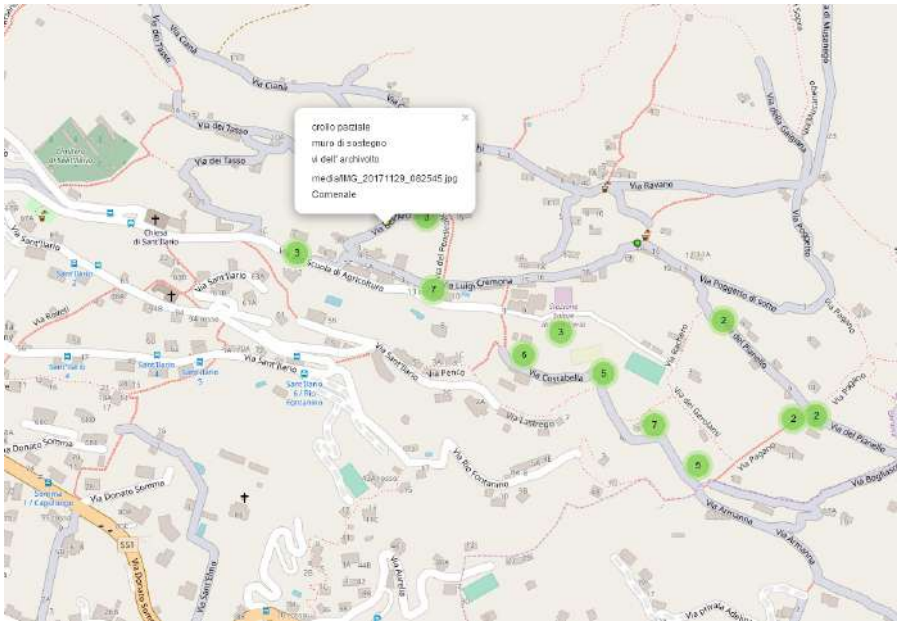

Figure 4 - Map of the georeferenced reports made by secondary school students.

by the students with regards to the issues at hand and in the way they were able to easily interact with the proposed app, and even more so in terms of the satisfaction of the teachers with regards to the teaching activities they were able to provide. It is interesting to point out that, for example, a number of students involved carried out their own notifications independently, outside of their group work and school boundaries. In order to provide an outcome to the students' participation and to make the fruits of their labour more tangible, using the notifications obtained by the schools, an interactive online map was produced (Figure 4), in which by clicking on each element, users can gain information that had been provided by those who had made the notifications.

Consideration on the pre-test and mugugn.app

This preliminary test activity was realised within the FLOOD-serv project through the single Genoa-based pilot trial, with the understanding that all considerations that surface from the analysis of the emerging data would be useful in elaborating a method of actively engaging citizens in the subsequent experimental phase for the platform and its specific connected services.

Other than the technical results, this experiment undoubtedly gave us a first chance to assess the fundamental aspects relating to engaging citizens and their participation via ICT as well. Specifically, it was possible to understand to what degree citizens are willing and able to use ICT tools for carrying out notifications.

The gathered data was analysed from both a quantitative and qualitative point of view. On this basis it was possible to formulate a number of observations, both on the methods and processes of engagement, and on the technical aspects. Both kinds of considerations, described below, were very useful for the subsequent test phase for the FLOOD-serv platform.

As for the technical aspects and those relating to content, the experience turned out to be very useful. Firstly because the novelty of introducing a specific notification system via an app was positively received. During the various mugugn.app presentation events, people were very keen on the chance to send notifications regarding critical situations located in their area; particularly speed of notifications via a smartphone, instead of having to fill out a form via a PC or at an office was very much appreciated.

Regarding notifications relating to the territory, the possibility of geo-referencing the data was confirmed to be key, even though during the experimental phase a number of difficulties were noted with regards to the GPS system. Most smartphones today feature GPS, however, this can often be inaccurate especially in densely built-up areas. In order to overcome this hurdle, additional descriptive data of the location and reference points becomes significantly useful, which are optional in mugugn.app when creating a notification. It was decided that mugugn.app would not ask for this extra data as a mandatory requirement as to avoid making the notification's creation too heavy, however, in light of the above considerations, this aspect could be reconsidered.

As for the decision to give users the chance to choose the kind of notification, free or guided, the outcome was overall positive. In total 49 guided notifications were received along with 15 free notifications, with a clear preference for the former in the case of schools and an equal balance between the two when it came to individual notifying users. Guided notifications, as was predicted, were confirmed to be useful to direct volunteers towards inserting a particular series of data which otherwise would have been left out and to summarise the content of notifications and make them easier to classify based on their criticality. As can be seen in the figure below, the classification of the types of decay and items concerned was shown to be useful and effective. The use of the generic "other" category was very limited, however, the use of an excessively technical language, deriving from the Municipality's data structure, may have created comprehension issues (Figure 5).

Furthermore, the analysis of free notifications received also underlined the fact that in most cases the decay categories identified could have been contained within the guided notification structure provided. The use of the free notification option, however, in some cases could have depended on a faster compilation process or on a need to insert a longer comment, rather than on an absence of an equivalent section in the guided option. To summarise, no indications emerged that would bring the developers to see a need for integrating the data structure provided with other categories, a structure that is compatible with the municipal geo-portal, an excellent starting point.

However, from the notifications' spatial distribution analysis, what does emerge is that they almost entirely concern suburban or urbanised hillside areas, hardly ever focusing on the valley area or the city centre. This outcome, other than being clearly

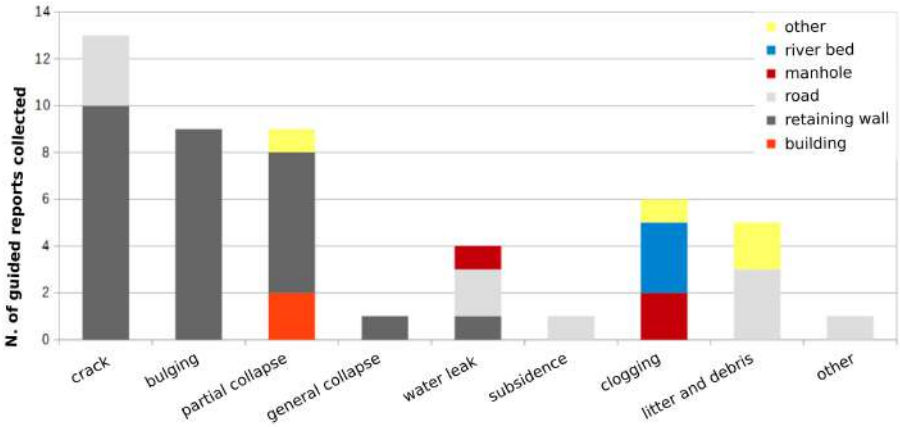

Figure 5 - Issues reported through guided reporting

correlated with the involvement of the agricultural institute located in the hillside area, is also the result of the greater sense of involvement felt by those who are used to walking across the territory and of the greater ease in making notifications during non-daily situations, that is, during one's free time and outdoor excursions. It is necessary to consider this distribution in order to read the results achieved in the correct light, from which we can gather that the majority of notifications is tied to potential hydro-geological risks connected to load-bearing walls collapsing, as is the case, for example, of agricultural terracing. It is plausible that the notifications gathered concerning more urban contexts would be more linked to other aspects, such as, for instance, those tied to non-sewage wastewater and manholes, therefore it is not possible to exclude the chance that there may be a need to integrate the data structure with more decay or item categories. For the same reason it remains advisable that there be an "other" field and an open field for comments in any data structure considered for these purposes.

Final Considerations

Regarding the proposed app, we were able to establish that the tools to be used in communication between citizens and the administration, if user friendly and intuitive, can attract the attention of users and significantly increase the quality of dialogue between citizens and institutions. It must, however, be kept in mind that not all apps are developed in view of being multi-platform and those that are Open Source generally tend to be oriented towards devices using Android operating systems. This

brings us to the matter of which kind of technology to utilise, whether developers should focus on a very specific “turnkey” tool or on a more generic but flexible tool, from among those already available, while also taking into account the fact that according to the Digital Administration Code a public body must prefer, when available, Open Source ICT solutions. On the same note, an alternative worthy of consideration could also be the use of a Mobile Web App, a recently available tool which, being by nature usable via the web, does not require download times and can be used with an ordinary browser on any device, whether fixed or mobile, Android or other.

As for involvement, we can reflect on the fact that the test underlined a series of difficulties, along with a number of strengths. Indeed, it was seen that, if on the one hand the subsequent phase will be needed in order to determine new stakeholders who are interested in the matter at hand are who are willing to commit to testing the platform, on the other hand the potential benefits deriving from this experience will need to be well-communicated through effective feedback systems.

From the analysis of the gathered notifications, what also emerges is the need to coordinate actions aimed at educating and raising awareness with regards to issues concerning hydro-geological instability and flood risks, in order to increase knowledge of the problem and make more people responsible when it comes to managing a common asset. A greater informative dialogue between the Public Administration and the public itself and greater levels of involvement in understanding and caring for their territory, which includes attempting to innovative forms of citizen-administration dialogue, would allow them to become more aware, first and foremost about the existing risks and the small and large signs that can help them recognise such risks, along with the just as important ability to underline the importance of their contribution to managing the territory. This way, a virtuous cycle could be initiated aimed at encouraging greater levels of awareness about a number of issues and more responsible attitudes on behalf of individuals.

These considerations were provided to the technical partners of the project in order to adapt the ICT tools’ definition with regards to FLOOD-serv to specific needs. However, some results of this experiment may well be archived by the Local Administration in view of any future development that might concern citizens, Public Administration and ICT, whatever the project.

1 Applied Geomorphology laboratory of the Department of Architecture and Design of the University of Genoa http://geomorfolab.arch.unige.it/

2 https://geopaparazzi.github.io/geopaparazzi/ accessed on July 2019.

3 http://www.comune.genova.it/content/fase-testpresentazione-mugugnapp-25-ottobre-2017 accessed on July 2019.

4 http://geomorfolab.arch.unige.it/index.php?option=com_content&view=article&id=144:flood-serv&catid=1:lavori-in-corso&Itemid=8 accessed on July 2019.

5 https://www.facebook.com/login/?next=https%3A%2F%2Fwww.facebook.com%2Fgroups%2Ffloo d.serv.genova%2F accessed on July 2019.

Roberta Prampolini
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Engagement activities for institutional users, stakeholders and students

The Approach

In organising the second project phase, that concerns engaging directly and interacting with stakeholders, careful assessments were made with regards to the choice of which interaction method to use and how to select the subjects of this dialogue. These assessments guided the choice towards a qualitative work method – predicting the use of sociological research techniques in line with such an approach – and the selection of two citizen groups – one made up of professionals and experts, the other of young school students located in the pilot phase of the project – with whom the same dialogue and discussion issues were tackled.

In recognition of the fact that when one refers to method, they refer to a route that is more complex than a mere series of steps, the researcher is always placed before a number of choices and must be able to express their ability to modify existing techniques, adapting them to their own specific problems and to imagine new techniques when necessary[1]. Even in the specific case of the previously planned and organised FLOOD project it was necessary to change course mid-project: solutions needed to be imagined that could best adapt to the variety of situations that would arise case by case. Specifically, the choice had been made to use the World Café

technique, both in the interaction phase with experts and in the work phase with students, however the circumstances made it necessary to use a brainstorming approach in order to best engage with the subjects involved throughout the workshop organised with technical experts and professionals.

The World Cafè

The two techniques differ from one another: the World Café manner is specifically an effective technique used to start up informal yet constructive and concrete discussions regarding issues that concern a 360° view of the life of a community. The method is based on that developed by The World Café[2] which offers a flexible format capable of taking on various forms according to the circumstances and needs put in place by any work context. Workshops dubbed World Café, can involve a large number of people (at least 12) and provide the possibility of opening up a dialogue and developing a shared understanding of the various situations in focus, encouraging the transmission and evolution of participants' ideas who, operating within an informal dialogue, can mutually influence each other.

The name of the technique refers to the fact that the informal situation is recreated "around a table" where material is placed for taking notes, drawing and writing, that is, all that is needed to pin down the many ideas that can arise from informal conversations, just like when discussing topics in front of a "cup of coffee".

During a World Café a single question can be posed to stimulate discussion, or a series of questions provided in succession over time, allowing groups to carry out a broad exploration of the issues at hand. The choice of questions is thus crucial. These should be as simple and clear as possible, capable of triggering a debate, inviting in-depth analysis and research, opening up new possibilities and focusing the attention on what is useful. The management of such questions and of the work at each table is usually assigned to the facilitator, a researcher whose job it is to observe and jot down what takes place, while also moderating or, when necessary, stimulating the conversation.

Generally, these workshops are organised with at least two moments in which each participant is called on to express their own personal opinion or idea, writing it down, for example, on a post-it[3]. In each of these moments the group discusses collectively all of the single ideas proposed and elaborates a synthesis and/or a list of particularly

relevant elements. Finally, the collective elaboration process culminates with a plenary section in which the various positions that emerge or the different operational ideas gathered are illustrated, generally by the facilitator.

The brainstorming technique

As for brainstorming, a term first coined in 1957, we can say it is a creative group technique based on the expression and sharing of ideas and its purpose is to solve a problem. When adopting this technique, every work session focuses on a problem and aims to gather the greatest amount of ideas as possible within a pre-established timeframe.

Also during a brainstorming session, it is necessary to create an informal and relaxed atmosphere when working as to encourage members of the group to express their ideas freely, even those they may at first seem crazy. Indeed, it is through embracing ideas as broadly as possible that creative solutions can be identified for a problem.

The discussion moment cannot be open to an excessively large number of participants, at most 12-15, it must have a “topic”, that is, a discussion focus point that is clearly defined, expressed via a simple question, and it must include the presence of a facilitator to keep up the flow of ideas and be able to gather what emerges in writing.

Following the actual discussion phase, where ideas are expressed and welcomed without prejudice or criticism by other members of the group, a secondary moment is organised (in a second meeting or after a short break) for assessing and selecting the various solutions that have arisen[4].

The engagement techniques used in the FLOOD-serv pilot case in Genoa

Between the two methods described there are a number of clearly common aspects: the aim to create moments in which to compare notes that are open and informal, the ability to allow for multiple and original positions to emerge, the will to collect data allowing for assessments and elaborations in a future moment, both by stakeholders and researchers. These aspects allow for both techniques to be used, using the same note-comparing themes, to gain, on the one hand, results and data that are compatible and, on the other, dialogue situations that are effective and constructive.

Indeed, for the workshop day with the technical experts, considering the number of participants, the decision was made to proceed by adopting the brainstorming technique while when working with students the World Café method was chosen. This configuration allowed us to use the most suited technique for each situation, both in terms of time available and number of subjects involved.

Building Together

The engagement work in the second phase of the pilot was carried out on multiple occasions: the first was during the workshop entitled “Flood risk: knowledge, territory, technology” organised in Genoa on 12th October 2018. The second took place over the course of February 2019 as an integral part of the testing activities of the FLOOD-serv platform tools, at three of Genoa’s schools, which will be discussed in detail in the next chapter.

The discussion topics were the same, albeit tackled with different analysis techniques. The first focused mainly on the contents communications need to incorporate within the dialogue between citizens and institutions – both ways – while the second focused also on the most effective tools that should be adopted in order to realise such exchanges of information.

Every event had the aim of organising an activity that was capable of gathering and sharing between participants operational suggestions and recommendations regarding the issue of using ICT systems between citizens and public institutions.

The opinion of the stakeholders

In the case of the workshop with the stakeholders, every discussion topic was assigned roughly one hour and the collective dialogue took off with a few relevant brief comments, written individually by each of those present on post-its and revealed to everyone else after being systematically collected on a panel that organised them into macro-areas.

The brainstorming approach turned out to be suitable for developing the discussion while also allowing for a fair number of operational recommendations and original thoughts worth reflecting on, at a more theoretical level, to be gathered. The workshop was aimed at qualified stakeholders, invited to the workshop and who

represent institutional bodies or associations that work with and have extensive knowledge of both the issues regarding flooding and critical points and opportunities at the heart of an ICT and a non-ICT dialogue between the Public Administration and citizens. This meeting of minds was facilitated by two researchers and focused on discussions concerning two specific areas: one was the role, tools and general methods of two-way communication between the Public Administration and the citizen through ICT, while the other explored the potential contents of said communication between citizens and the administration.

Here we attempt to resume the topics that emerged from this discussion. The various points were shared by all those present and were the subject of intensive and in-depth discussion.

Feedback	PA must be able to provide answers to the notifications sent by citisens; each notification must be met with a commitment to tackle the issue with relative communication.
Procedure	PA must help the citizen to understand which are the channels and the reference offices to report a problem
Quality of reports	the communication tools must lead to more comprehensive reports, also to allow a first assessment of any urgency
Authenticity of reports	provide tools and procedures to distinguish and quickly assess the reliability of the reports from internet's overall "background noise"
Requirements of "certified" users	citizens involved in reporting activities should have, at least at a basic level, the ability to read the territory and events, a certain digital competence and time to participate continuously
Ability to interpret by PA	in addition to strengthening the communication tools and exchanging knowledge on the territory, a certain versatility is also necessary in interpreting the contents
Direct relationship with citizens	support ICT tools with forms of direct contact with the populations of the areas at risk through information meetings, practical exercises, specific initiatives in order to encouraging a self-protection culture.
Knowledge of the tools	get to know the different ICT tools in depth to adopt truly effective channels and means of dialogue. Often the limit of the tools adopted by the PAs lies in the fact that they are intended for information (unidirectional) and not for communication (bidirectional)
Institutional websites language	graphic, language and organization of the institutional websites should make their use easier and more immediate. It is necessary to arrive at a compromise between technical language wording and a language that, albeit simplified, is formally accurate and effective.
Use of multiple tools	to aim for a transparent and fast communication, especially in emergency situations, there need to be multiple channels to reach as many users as possible. In the case of social media it is necessary to certify its authenticity in order to validate its contents.

Regarding the contents that the two parties, citizens and Public Administration, can exchange, the following elements have emerged.

Information and operating methods in communication from citizens to the PA

Gather testimony from citizens	to ask citizens for their opinion not just referring to the critical aspects of the area but also to the potential resources that can be used to improve or solve dangerous or precarious situations.
Identify the conscious citizen	PA should be able to recognise a citizen who is aware of these issues, compared to the unreliable complainer, in order to gather notifications that can be considered reliable since they come from a reliable source and make the correct assessments accordingly.
Establish a mandatory certificate for a building/place	to force real estate operators to state the risks associated with a given complex/building, so that everyone is obliged to be aware of the hydro-geological risks of the place in which they live.

A final issue discussed was the subject of a debate among those present. Some suggested the idea of also establishing certified operators located within the territory (such as AMIU employees and Municipal Police officers) in order to assign them the task of providing the Public Administration with information regarding the territory's critical aspects. Those who were for the proposal believe it to be useful and necessary that operators on the field, thanks to their direct observations, also take on the commitment of notifying authorities, while those opposed to the idea believe that this job should not be given to employees who are already committed to other activities. In the intent of those who would propose this solution, one can glimpse an attempt to overcome the idea that counterposes the service-using citizen on the one side and the service-providing Body on the other. This is a cultural stance which turns the citizen into an active collaborator of the Public Administration in managing a public asset, one that belongs to the community.

I**nformation and operating methods in communication from the PA to citizens**

Through communication the Public Administration has the chance to:

Develop a prevention and self-protection culture	preparing and initiating communication campaigns aimed at broadening individual and collective skills
Develop skills in using institutional web sites and social media	preparing and initiating communication campaigns aimed at increasing individual IT skills, cultural skills to be able to distinguish reliable sites from unreliable ones and to spread an attitude of respect towards ethical and civil rules on social media
Spread a civil protection culture	teaching citizens to "be unprepared" (an expression suggested by one of the participants) and aware that, knowing that there can be dangerous situations one cannot always imagine beforehand, this way they will be able to face emergencies with tested intervention plans and protocols.

IFurthermore, according to some participants it could be relevant:

Adequately train PA employees responsible for communication	it will be key, according to a number of participants, for institutions to equip with specific skill sets those working in the administration who are called upon to be able to use ICT or traditional dialogue tools, and make sure they are well-versed in the rules and manners of communication.
Unite, where possible, institutions which focus on a single issue	to reduce and simplify work concerning a specific problem with an organ that represents more than one skill set thus allowing for a well-rounded management of the same problem.

The above-listed points were generally shared by all, even though the last element was not developed sufficiently, and a number of applicative difficulties were brought up with regards to a model of this kind.

Students opinion

The other engagement activity in the central part of the project involved a group of young citizens of Genoa from the local high schools, in order to understand the points of view of young boys and girls who not only experience Genoa's territory but, because of their age, are used to regularly making use of ICT and social networks. In this context, engagement with the younger band of the Genovese population was particularly meaningful when it came to testing the ICT tools, as required for the project (see following chapter), while their opinions were also considered to be of key significance.

This activity allowed us to gather and share among the students of different high schools of Genoa, all located near the Bisagno stream and therefore within the interested area of the FLOOD project, suggestions and operational recommendations with regards to using ICT in the dialogue between citizens and public institutions; in this case the discussion was organised in the form of a World Café.

Adding to the topics used during the brainstorming session with stakeholders, the first of which referred to the content of the communication between citizens and the PA and vice versa while the second focused on the means of communication that can be adopted, a third topic was proposed, developed solely with the students of one school (the classical high school). This third aspect has concerned the lexicon of communication and in practice has been declined in themes and words useful to populate the semantic wiki that accompanies the FLOOD-serv portal.

The schools involved in the project are: the Andrea D'Oria Classical High School, the Firpo – Buonarroti High School (CAT programme) and the Bernardo Marsano Higher Education Institute. The students involved are from different classes and are aged between 14 and 22 years old.

For the sake of greater legibility of the results achieved during the various events, the recommendations are listed below and are divided by topic and school.

Liceo Classico Classical State High School

During the event the 27 students from the first year of the Andrea D'Oria Classical High School were divided into 5 work groups.

With regards to the communication contents between the Public Administration and citizens, the students provided the following recommendations:

Territory	The areas at risk should be made known
Public transport	the administration should inform citizens adequately about the public transport situation and its routes in case of emergencies, they should provide information about which means are functioning regularly during a weather alert and about any route changes in real time
Accessibility	any changes in accessibility, traffic situations, closed or interrupted roads should be made known in an accurate manner in real time
Opening hours for basic services	any changes in opening hours for pharmacies, shopping centres and shops selling basic necessities should be communicated in real time
Schools	inform of any changes to timetables and of closure (in good time !)
Emergency number	make sure every citizen knows that number as the reference number for anyone within the city
River levels	this information should be made easily accessible so that citizens get used to monitor such data, considering its importance when it comes to initiating self-protection procedures

As for communication content to the Public Administration from the citizens, the latter can report in general situations of danger, which involve or not people, and more specifically the following aspects:

Buildings	buildings that are too close to the water's edge and which are in a potentially dangerous situation
Elements of the territory	such as unstable walls, cracks, blocked manholes, river and stream sections with waste and trees, animals, ...

With regards to the tools to use in communicating, the PA could use:

ICT	institutional we sites real time web maps social media: Facebook for older generations, Instagram with dedicated #, for younger generations
"Traditional" Communication	official TV channels, Such as Rai's Regional TG radio (which can work when there is no electricity); means on the territory itself: information given via megaphones, intercom informative systems for buildings in areas at risk, large signs at public transport stops that provide information about the ongoing situation.

In the opposite direction, citizens could use:

- emergency numbers (including text messages);
- front desks in public offices;
- official web sites of the Administration.

In the case of the students from the D'Oria institute, a further topic was discussed which focused on the methods and key words that need to be taken into account when putting together a Semantic Wiki within a portal that aims at risk prevention across the territory. As for methodology, the discussion brought out the need to avoid words that are too common and the need to calibrate content in order to avoid confusing users with too much and apparently "off-topic" information. The key words suggested are those that according to the students seemed "hard to understand" for citizens and around which the true meaning can come across as being uncertain, ranging from an entirely incorrect understanding and an imprecise interpretation. The suggested words are as follows: incline, slope, susceptible to flooding, embankment, overflowing, water level, debris, wetlands, water management, irrigation, riverbed, viaduct, terracing, safety regulations, atmospheric agents.

Firpo - Buonarroti State High School
Building Environment and Territory (CAT) programme

During the event the 44 students from the fourth and fifth years of the Institute were divided into 5 work groups. Specifically, the students were asked to take part in the workshop activities, taking on their future specific technical environmental and territorial role.

As for communication content from the Public Administration to technical experts, the students provided the following recommendations:

Bureaucracy	Reference offices for technicians, where technical experts can provide their reports (there is currently a state of great confusion so a higher level of clarity would be appreciated)
Territory	provide morphological information on areas at risk, hydrogeological conditions, hydrographic network, soil characteristics Flooded / flooded areas in real time, also through interactive maps
Train behaviour	specific training for technicians about how to behave in case of an emergency. These, in turn, can transmit the knowledge acquired in different contexts, even informally
Education	educational and awareness campaigns, including on-line, regarding the issues of areas at risk
Public transport	situation of the public transport network during emergencies

The technical experts, on the basis of their own skills and experience, could in turn inform the Public Administration about:

- roads, bridges, underpasses that are in critical conditions or which are in need of maintenance;
- unstable walls;
- stream and riverbeds
- landslides, unstable slopes or terracing;
- non-compliant buildings;
- maintenance status of structures and infrastructures;
- situations of pollution or environmental risk

As for the tools to be used for communication, the Public Administration could use**:**

ICT	web sites, including institutional ones e-mail and certified electronic mail smartphone apps Social Media web maps managed by the PA and accessible to technicians
"Traditional" Communication	radio and TV releases official weather reports megaphones and speakers posters, including on public transport variable message panels training courses for providing information targeted meetings with PA technicians signage that provides data on water levels light systems in the Lanterna that provide varying levels of alert

The experts could in turn use:

ICT	"Social Alert" smartphone app e-mail and certified electronic email Social Media PA web sites and portals, including password-protected areas SMS
"Traditional" Communication	TV programmes dedicated to where notifications should be sent CB transceiver hotline for technical experts reports to technicians' desks collaboration between professionals and PA technicians various types of public meetings where reports can be brought up

Bernardo Marsano Higher Learning Institute

During the event the 56 students from the fourth and fifth years of the Institute were divided into 5 different work groups. The students' skill lied specifically in the fact that they are studying matters that concern urban green management, cultivating the suburban territory and territory management in general.

As for the contents of communication from the Public Administration and experts, the students provided the following recommendations:

Public transport	inform about changes to the public transport during emergencies
Territory	safe zones and risk areas in the city, clearly indicated
Commercial activities	changes made to opening hours during emergencies
Behaviour	indicate what behaviour should be enacted during emergencies
Funds	inform about how funds assigned to territory management are spent; inform about funds assigned to damages

The experts, on the basis of their skills and experience, should in turn inform the Public Administration about:

Territory	situations of environmental or territorial decay; state of the rivers and streams presence of abandoned waste
Infrastructures	state of maintenance of roads accessibility of communication routes, roads and motorways state of maintenance of aqueducts lack of or limited efficiency in lighting systems
Buildings	need to check buildings that appear to be in critical conditions
Feelings	sense of unease due to the manner in which the territory is managed

Regarding tools for communication, the Public Administration could use:

ICT	Apps that provide maps of areas at risk SMS and text messages in general dedicated and certified portals where technical experts can register in order to receive information
"Traditional" Communication	certified TV channels dedicated to emergencies TV and radio stations that can be dedicated to broadcasting information in case of emergencies cars provided by the PA with megaphones (indicating safe zones among other things) audible alarms dedicated electronic displays signage systems that indicate the level of alert loudspeakers located throughout the city (with electric generators) municipal delegates presiding over the territory

The experts can in turn use the following means:

ICT	web sites, including institutional ones, with areas for experts apps for smartphones e-mail “Social Media Emergency”
"Traditional" Communication	hotline call centre dedicated to the differently abled and the elderly front desks for information/notifications at local and municipal offices dedicated to experts

Considerations on the Results

Involvement activities organized within the various project phases have achieved a dual purpose: on the one hand, they have been able to stimulate dialogue among the participants through the experimentation of forms of interaction organized according to precise operative indications, which have been constructive in terms of exchange of opinions and information. On the other hand, they allowed the collection of a large number and a great variety of suggestions on the topic of the use of ICT and on the contents considered necessary and indispensable in the dialogue between citizen and public institutions.

Moreover, through the elaboration of the collected data and the critical analysis of the different moments of involvement, the project team was able to evaluate the choice and the use of different involvement methodologies, obtaining original cues of reflection. In this regard, it is particularly clear that the young students, generally not very interested and little involved in social interaction processes, have been able to

make a significant contribution on the subject of investigation, but have also been able to offer suggestions and indications on how to propose and stimulate discussion on territorial issues among the youngest population groups.

1 Gazzola A., Prampolini R., Rimondi D., (2014), "Negli spazi pubblici. Utilizzatori temporanei e pratiche sociali a Genova" (In public spaces. Temporary users and social practices in Genoa), FrancoAngeli, Milano

2 www.theworldcafe.com

3 In general the participants are asked to “do more than one table round” meaning to take part in a table’s particular discussion and then change after a predetermined amount of time.

4 Bezzi C., Baldini I., (2006), "Il brainstorming: pratica e teoria" (Brainstorming: practice and theory), FrancoAngeli, Milano

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Students as e-Citizens: activities in the schools

Within the scope of the Genoese case study, as already mentioned in the previous chapter, the decision was taken to suggest a series of activities with the schools, in the opinion, given also the results of the preliminary test, that it would be the most effective response and the one most consistent with the purposes of the FLOOD-serv project. In particular, this activity meets on the one hand the objectives of sensitising the citizens and arousing their responsibility vis-à-vis the hydrogeological risks, and on the other hand the need to test the digital tools developed in the project that serve to encourage participation by all and sundry in managing their own territory, thereby helping prevent and reduce the effects of floods.

The identification of the school target for the communication activities and tests has been motivated by the conviction that the topics of risk, prevention and active participation are essential to tomorrow's citizens, and starting to get familiar with these issues as students might make the difference in their future. Furthermore, as is the case with environmental education, facing certain topics at school ensures a transfer of information to the parents as well, thereby expanding the extent of the message.

Based on this, an educational activity was suggested with the aim of drawing the

school community towards the issues of land instability, improving the knowledge of the causes and the perception of the effects, and putting forward some prevention and mitigation strategies. The addresses have been accompanied towards an improved understanding of the characteristics of their own territory as regards hydrogeological issues, and from there towards an active and informed participation.

More specifically, the following topics were delved into:

- knowledge of the territory and the hydrogeological risk factors
- self-protection measures in risk situations
- concept of resilience, contextually linked to the Val Bisagno areas and strongly associated with flood-related events
- participation and active citizenship as tools of prevention and mitigation of the effects of floods, by sharing information on the territory
- technological tools serving to survey, manage and communicate the risk.

Moreover, tests of the ICT tools arranged by the technical partners of FLOOD-serv were conducted with students. This activity, besides lending a concrete contribution to the improvement of such tools, enabled students to also understand the viewpoint of research and public administration, as well as the hardships and the work underlying a citizenship development and involvement process.

Organisation of the Activity

Considering the type of activity proposed, the decision was taken to involve the senior secondary high school students within the area examined, i.e. the three Municipalities of Bassa Valbisagno, Media Valbisagno and Medio Levante. Out of these, as already pointed out, the choice fell on three schools with different characteristics: a high school specialising in classical studies (liceo classico), an agricultural college, and a technical college for surveyors. In each school, one to three classes have been involved, depending on teachers' willingness to cooperate, for a total 128 students.

The activity has been conceived with a special focus on the multi-disciplinary approach and pursuant to an experiential methodological orientation. Accordingly, both activities within the school (classrooms and computer rooms) and field activities

(excursions along Torrente Bisagno) have been put forward, based on the following organisation:

1. presentation of topics to the teachers and detailed co-design of the activity to be performed with the classes, depending on the specific needs
2. classroom activity, with one part of classroom-taught lesson (2 hours) and another part to test the ICT tools of the FLOOD-serv platform for the public administration-citizen communication (2 hours)
3. field activity in Valbisagno for a survey of risk elements (4 hours)
4. computer room activity of post-processing of data collected (2 hours) and Word Café for the shared processing of contents discussed (2 hours)

Hereunder we provide more detail on the activity undertaken, to better understand the experience as a whole and be therefore able to contextualise the results achieved as best as possible.

Training and Tests

During the first classroom meeting in all the schools, the topics of risk prevention, active citizenship and the possibilities offered by the ICT have been tackled, in order to provide the students with a framework to the testing and field survey work they were later going to face.

Firstly, the concept of risk in its classical expression has been introduced using the definition provided by the Civil Defence website[1]. This definition, contextually linked to the topic of hydrogeological risk and exemplified for the specific territory of provenance, allowed us to discuss in depth with the students various aspects associated with past flood events, land instability (indiscriminate urbanisation, abandonment of peri-urban environment, etc.), the concept of risk prevention (monitoring, maintenance, reading of “warning signs”, etc.), and the importance of self-protection and participation by all and sundry in managing the territory and mitigating the harmful effect of flood events (active citizenship, participation, etc.).

Linked back to this topic, the objectives and activities of the FLOOD-serv project were introduced along with the issue of ICT tools as new opportunity to improve the two-way communication between territorial administration and citizens. Thereafter, examples were provided of similar tools of dialogue used in Italy and abroad to report

various types of elements, not strictly related to the risk problem (e.g. Fix my street[2], Sensorcivico[3], etc.).

That was followed, in the second part of the meeting, by the guided tests conducted on the ICT tools arranged by the technical partners of the project and conceived for communication, access to data and communication between citizen and authority. The testing activity was structured in the same way for all pilot cases of the FLOOD project and envisaged:

1. submission of an anonymous **preliminary questionnaire** aimed at gathering information on the user, more specifically: the personal details, use of the Internet and the relationship with computers, the perception of flood-related risk and the expectations about digital tools of communication and dialogue between citizens and administration.

2. implementation of the **test on one or more tools of the FLOOD-serv platform** of interest to Genoa's case, i.e. the **app** for reports, the **portal** for information and reports, and the **wiki** on the topic of flood. This phase was carried out through the help of a handbook on how to conduct the test step-by-step and through the request, for every tested function, of declaring whether or not the user succeeded in performing the required operation plus any comments. The type of instrument to test was chosen in accordance with the type of school and education of the students: in particular, whereas the portal was tested by everyone the Semantic Wiki was only tested with the classical high students, and the app only with the students from the technical schools.

3. submission of an anonymous **final questionnaire** to gather the user's assessment of the tested tools plus any remarks (a questionnaire per user for each tested tool).

Field Experimentation: the Excursion in Val Bisagno

After introducing the topic and the problems with the students and presenting to them the tools proposed by the project, it was deemed useful to organise an educational outing to guide the students, through first-hand experience examples, on how to read the territory and recognise potential risk elements, such as warning signs of possible situations capable of degenerating in case of flood events. This experience was also achieved by experimenting ICT solutions for the detection of risk elements, especially

the FLOOD-serv app. For all those who could not use this tool for various reasons (lack of mobile devices or non-compatible devices), the same survey work was in any event performed using a cartography prepared ad hoc, suited to a subsequent quick georeferenced digital reproduction, the Field Paper[4].

The routes to follow, within the project area, Val Bisagno, were chosen by taking into account the specificities of the various schools involved as well as logistic factors.

The excursions with the agricultural college and the technical college for surveyors with an environment and territory slant were carried out on a stretch of Genoa's historic aqueduct route from Molassana to Rio Torbido (5,5 km). Along this entirely pedestrian route, in fact, it was possible to illustrate various types of problems relating to both the relationship between urbanisation and hydrogeological risk in the valley floor (figure 1 on the left), and to abandonment of the peri-urban environment, with resultant decay of agricultural terracing and increased risk of landslide on the slopes (figure 1 on the right).

The excursion with the liceo classico students, instead, moved from the Mouth of the

Figure 1 - Studentd during the excursion in the Val Bisagno

Figure 2 - Examples of constructions in the river-bed observed during the excursion along the Ferreggiano river

Bisagno stream, then along the Ferreggiano stream, places sadly known for the 2011 flood that caused human casualties. This route, almost entirely urban, provided the opportunity to delve into hydrological aspects and highlight the catastrophic results of wrong urban planning choices (Figure 2).

Analysing Data and Information: Cartography and Word Cafè

The aim of the final meeting with the schools was to make the students reflect about the data and the information obtained during the preceding phases of the activity and gathered on the field. In this case, too, the working method varied between the two types of schools: on the one hand the technical ones (agricultural college and college for surveyors), whose students can be regarded as future professionals of the territory, and on the other the liceo, whose students were put to work especially on the topic of communication.

One part of guided and participatory discussion was carried out with everyone through the Word Cafè technique, in which the students debated with each other around various issues, to eventually come up with a series of own proposals. This activity and the results obtained have been discussed in the preceding chapter.

Moreover, for the technical schools another type of activity, concerning the data collected on the field through the app and the Field papers, was also proposed. After

Three-step activity
1 – In class: Awareness raising on flood risk / Training / Testing / Questionnaires 2 – In the field: learning what can be reported (Val Bisagno) 3 – In lab: discussing the issues / word cafè / making report maps
Three type of schools involved
1 – Technical school for surveying (2 classes, 43 students) 2 – Technical school for agriculture (2 classes, 56 students) 3 – High school - classical studies (1 classe, 29 students)
Three component tested
1 – Portal (all) 2 – Mobile App (only for technical schools) 3 – Semantic Wiki (only for classical high school)

Table 1 - Scheme of the activity carried out with schools

a short introduction on the topic of computerised cartography, open data and possible sources of information relating to the territorial data, the students were given instructions to autonomously elaborate a specific web cartography with the reports they themselves collected on the field, using the Open Source UMAP[5] software.

Results and Considerations on the Activity

Given that, for the purposes of the FLOOD-serv project, the test envisaged three steps (initial questionnaire, test properly so-called and final questionnaire), the only results that have been taken into account are those of the students who have completed the full programme of tests for at least one component of the platform, while discarding those that for whatever reason covered the programme only in part. They are altogether 93 students.

Here, more than the specific results of the tests on the features, no doubt significant for the technical partners and for the development of the FLOOD-serv platform, what we intend to highlight are some aspects emerged from the overall processing of the results, of interest to the Public Administration from the viewpoint of a future adoption of ICT tools for the two-way communication.

Students' approach to the Internet

The sample taken into account in this phase of tests has by nature very homogeneous and specific characteristics. Having involved a first year class at the liceo and 2nd to 5th year classes at the technical colleges, an age group ranging from 14 to 22 years, with a prevalence of male students (63%), emerged.

When we analyse the results of the preliminary questionnaire, what emerges is that the level of access to the Internet is very high, with a minimum, already quite high, of 71% of students stating that they have access to the Internet from school computers, 93% from home, and the near totality (99%) declaring that they are able to use the Internet from smartphone or tablet. Consistently with this condition, the students say they are confident of their ability to use computers and Internet, with some subtle variations gathered in Figure 3.

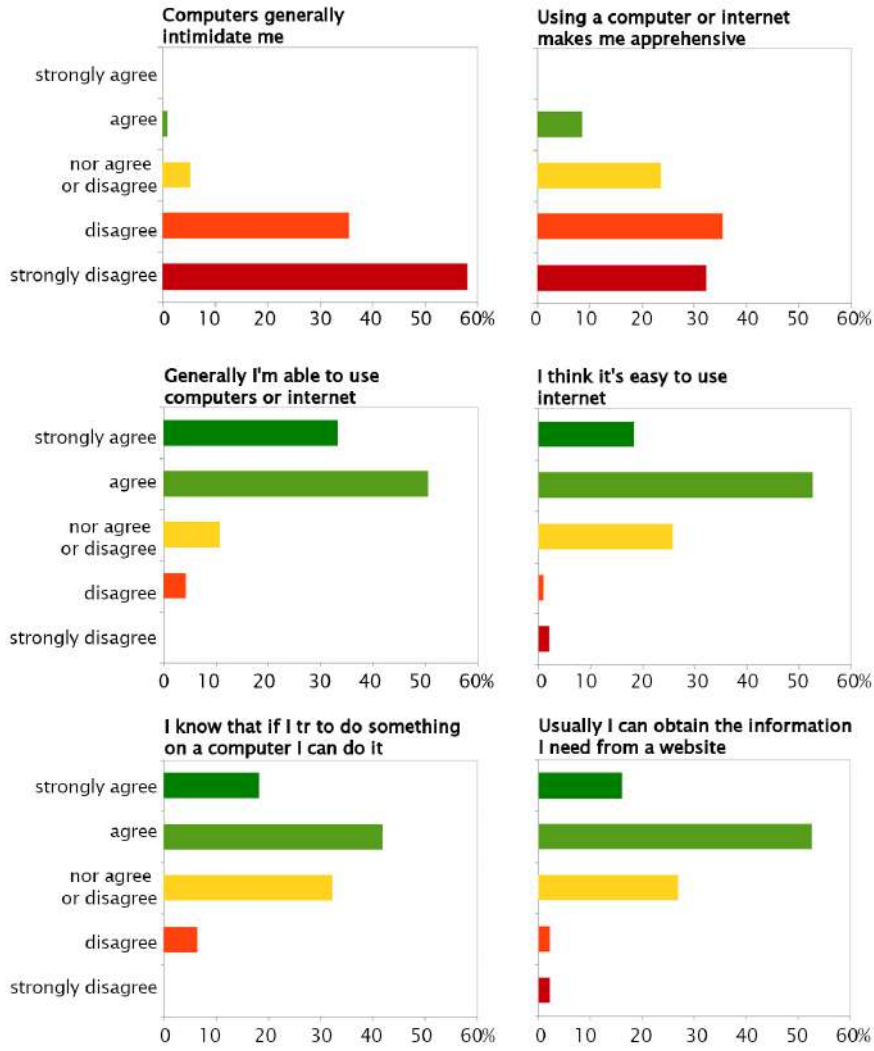


Figure 3 - Students approach to computers and the Internet

Concerning the type of activities performed with the digital devices on the Internet, most of the students consider themselves advanced to very advanced users as regards both use of social networks (38% advanced; 32% very advanced) and Internet searches through the main search engines (43% advanced; 24% very advanced). A different self-evaluation concerns their skills when it comes to sending e-mails (only 29% state that they know how to use them at an advanced or very

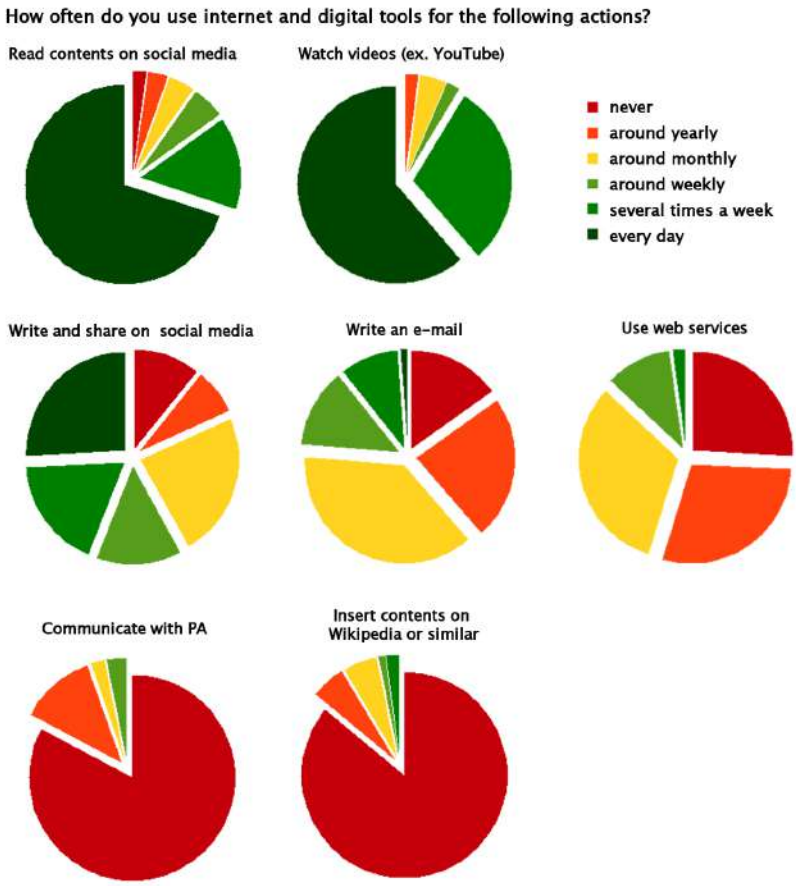


Figure 4 - Use of Internet

advanced level) or actively using web, blog and wiki services (43% declare that they never had any experience in entering contents into a wiki). This same picture is fairly reflected by the answers given about the frequency of use of the various Internet features, as clearly evinced by Figure 4. No doubt the young age and the role of students who mostly do not work have a strong impact on the type of Internet use, which turns out to be especially passive and linked to recreational or at the most research activities. Use of this means as potential system of communication with the authorities is not part therefore of the experience of the interviewed students. This fact has indeed lent even greater interest to the performance of the subsequent test on the FLOOD-serv platform.

Q8. How often are you concerned that a flood may occur in your town which ...: (values in %)	Never	Very rarely	Rarely	Some-times	Often	Very often
A. … may endanger you or your property	12	14	17	36	18	2
B. … may endanger people close to you or their property	8	16	25	30	14	7
C. …may affect your town/city	12	10	16	29	25	9
D. … may affect your school	27	18	17	26	9	3
F. … may put at risk you, your relatives and your friends and colleagues in their transportation	10	11	14	29	28	9

Table 2 - Flood risk percetion

Flood risk perception and tools of communication with the public administration

The second part of the questionnaire briefly investigated the students' level of awareness of the flood risk situations in Genoa. The results (Table 2) evince the fact that the general perception of the risk is not high, despite the fact that the schools taken into account are all situated in areas historically affected by flood-related phenomena and that all the students knew the effects of the 2011 and 2014 floods in Val Bisagno. What in particular emerges is a greater generalised worry (about the city and the relocations) rather than a specific one (the school).

Lastly, the students were asked an opinion on any tools, such as apps and website, to manage the communication between citizens and Public Administration on the topic of floods and on the features they should contain. This exploration, introductory to the execution of the test, has highlighted the fact that the near-totality of the students see as very useful and quite useful both the website (41% quite useful; 43% very useful) and the app (50% quite useful; 34% very useful). As regards the app, both the proposed features were given a positive evaluation, with 87% deeming very useful to quite useful the possibility of making reports and 81% that of sending photos and videos to the public administration. As regards the website, most of the students deem it very useful to have an alert level (57%) and quite useful to have information on the floods (54%), galleries with photos and videos (55%), specialist information on a wiki (56%), the opportunity of reporting to the Public Administration (51%), and the chance visualising charts and tables about floods in Genoa (49%).

The results of the tests on the FLOOD-serv platform

Based on simple step-by-step instructions, each student then conducted a test properly so called on the tools proposed by the FLOOD platform. Before carrying out the test, the role of "validators" was clarified; apart from gathering an opinion on the tested features, in fact, the activity also had the stated aim of checking the actual operation of the tools still at a developmental phase and highlighting any bugs or malfunctions.

Depending on the orientation of the different classes and the slant given to the activity undertaken with them, the testing of various tools was proposed, with the following results:

– Portal (for everyone; 75 tests; 63%)
– App (only technical schools; 26 tests; 19%)
– Semantic Wiki (only liceo; 18 tests; 17%)

The testing activity performed on the FLOOD-serv platform tools has not presented any special difficulties, save for the app, concerning which incompatibilities have arisen with some types of mobile devices that have actually reduced the number of students able to perform the test. Verification of the various portal features has highlighted a few minor malfunctions, reported to the developers and later solved, and some elements susceptible of being improved upon according to the students. As for the wiki, instead, no problems have manifested, and this perhaps less familiar tool has attracted a lot of interest. Useful cues have then arisen from filling out the final questionnaire where the opinions on the tested tools were set out (Figure 5).

It is clear from the previous figure that most of the students view the tested features as quite useful, with a general picture slightly more favourable for the wiki and slightly less for the app, possibly influenced by the difficulties arisen during the installation phase. As predictable, since we are dealing with a sample of young persons, the tools tested proved easy to use and with an interface deemed quite intuitive, albeit not particularly appealing, by the majority.

Lastly, some of the interviewed persons said they were familiar with similar tools, including the Civil Defence website, the website of the Regional Agency for the Environment (ARPAL), the app to liaise with the Municipal waste collection Enterprise (CleanApp), etc.- Most of them held the view that the tools put forward were worthier

or much worthier (respectively 75% worthier and 5% much worthier for the portal, 56% and 6% for the app, 53% for the wiki).

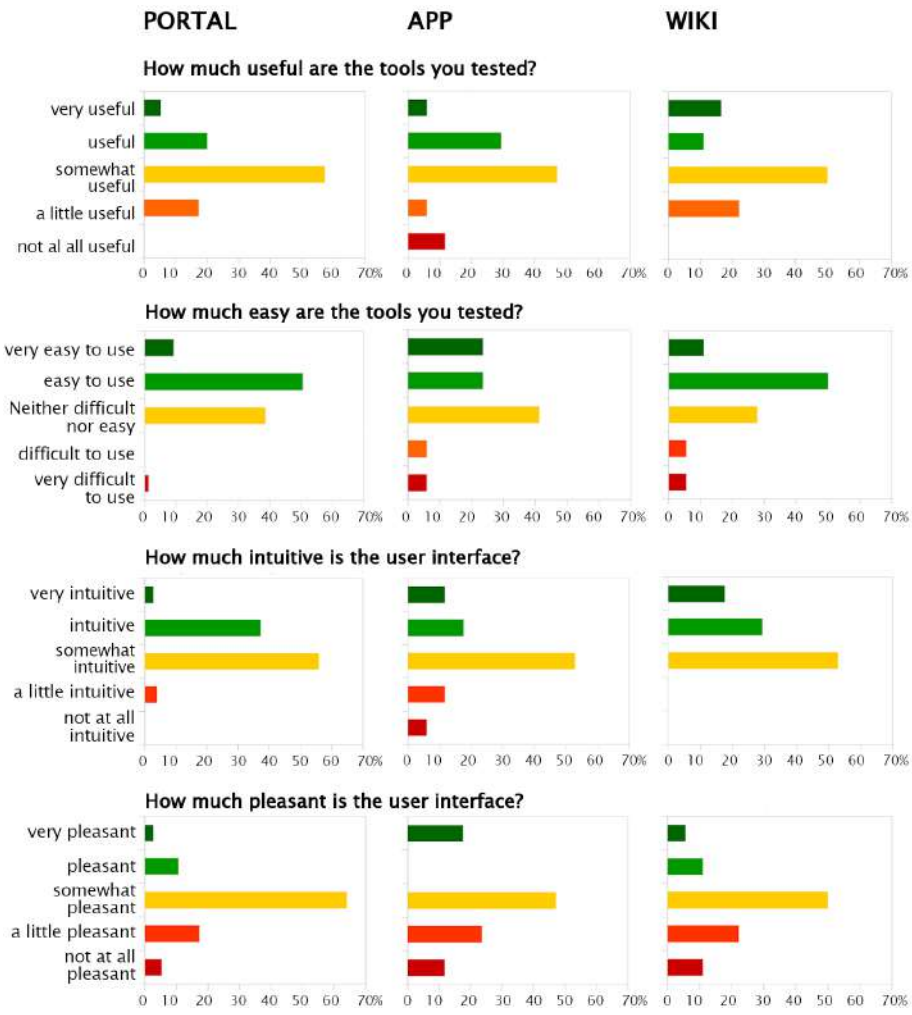


Figure 5 - Evaluation of the tested FLOOD-serv ICT tools

Reading the territory and reporting potential risks: results of the excursion and processing of collected data

Likewise positive and interesting were the results obtained in the second phase of activity, i.e. testing the tools on the field to report and reprocess the data on ad hoc cartographies in the computer room.

The reporting activity, conducted both on the FLOOD-serv platform app and on other tools made available, including the paper map of the Field Paper, has involved students transversally. However, the response of the different schools involved has predictably reflected the skills acquired during the study programmes. Particularly noteworthy was a difference in the ability to read the territory and the type of problems identified, more closely linked to building elements for surveyors (walls, cracks, holes, etc.) and to vegetation, the agricultural elements and the outflow of water for agronomists (mowing, collapsing dry-stone walls, state of the vegetation, etc.). In both instances, however guiding students to a realisation of the possible type of relationship with risk situations did not prove easy.

At the last meeting, in the computer room, the students were shown the overall results of the reports through the use of open source software for computerised cartography that allows one to visualise the various elements correctly placed on the territory. To this end, examples of cartographies created with desktop software (QGIS[7], Figure 6) and web maps (LeafletJS[7]) were shown. This part of the activity served to illustrate the potentialities offered by the use of apps for reporting that exploit the GPS features of smartphones and accordingly allow us to locate reports in real time. In addition, some of the issues relating to cartographic Open Data were dealt with in detail. That was the case of the possibility of freely obtaining georeferenced territorial information from the portals of public administrations, such as the geoportals of the Municipality of Genova[8] and the Liguria Region[9]. The importance of being able to integrate in a single environment various levels of information, from the areas at risk to the type of existing vegetation or urbanisation, together with the feedback detected, was illustrated through examples.

Lastly, the students were guided to the construction of their own georeferenced web map via a simple online software, UMAP (Figure 7). The results have proved quite interesting: thanks to the easy use of the instrument and students' familiarity with computer tools, it was possible to quickly draw up simple cartographies, for which the utmost freedom of expression was ensured to enable the students to experiment.

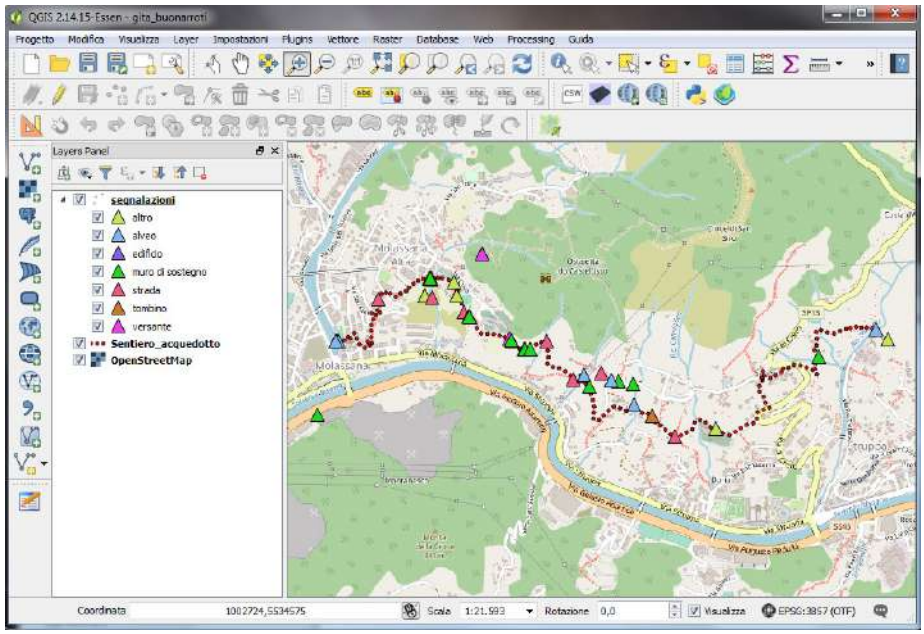


Figure 6 - Map of reports collected during the excursion in QGIS.

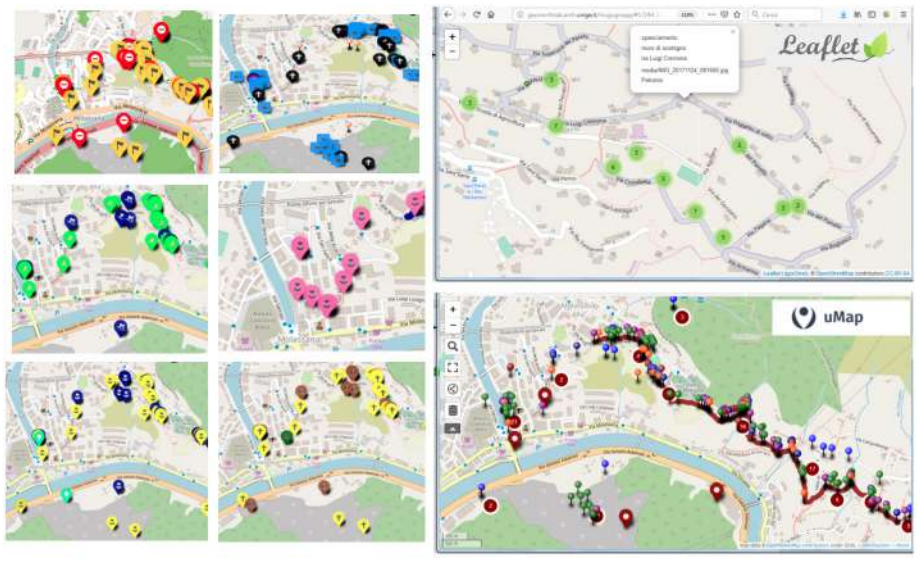


Figura 7 - Web map realized with LeafletJS and web map realised by the students with UMAP

1 R = P × V (× Val), where: P is the dangerousness of the event analysed, i.e. the likelihood that a phenomenon occurs in a given space with a given return time; V is the vulnerability, i.e. the aptitude of a given element to endure the effects associated with the dangerous phenomenon; Val is the value which the element exposed to the danger takes on in terms of human lives, and in economic, artistic, cultural or other terms. (source http://www.protezionecivile.gov.it, accessed on July 2019).

2 http://www.fixmystreet.com - accessed on July 2019

3 https://sensor.comune.bolzano.it - accessed on July 2019

4 http://fieldpapers.org/ - accessed on July 2019

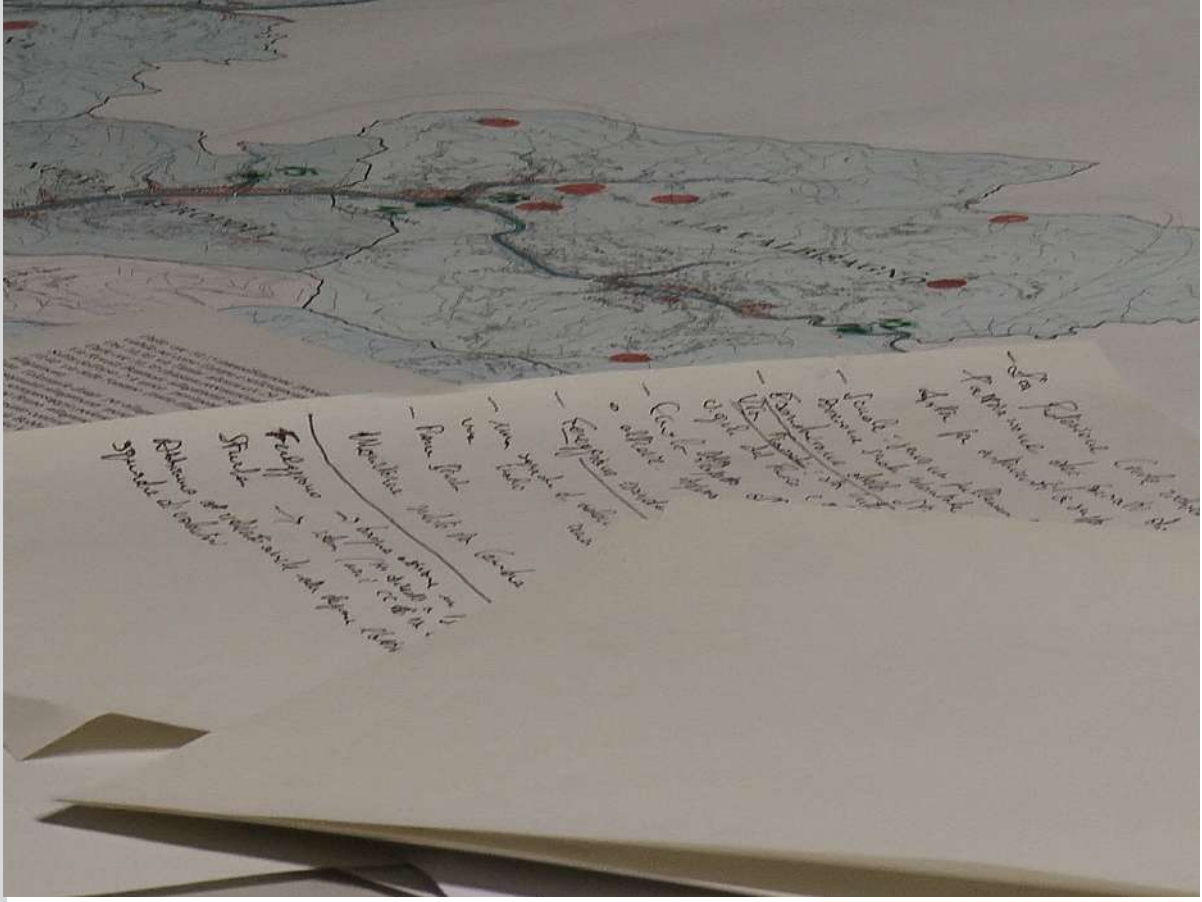
5 https://umap.openstreetmap.fr/it/ - accessed on July 2019

6 https://www.qgis.org/it/site/ - accessed on July 2019

7 https://leafletjs.com/ - accessed on July 2019

8 https://geoportale.comune.genova.it/ - accessed on July 2019

9 https://geoportal.regione.liguria.it/ - accessed on July 2019



Lesson learnt and future developments

Department of Architecture and Design - University of Genoa

Successes stories and critical issues from the Genoa pilot case

The trial of Genoa's Pilot within the scope of the FLOOD-serv project was carried out simultaneously with the other European Pilots and pursuant to the specifications of the technical partners, while also keeping in mind a series of issues that emerged as work went on, which were tackled and developed through a series of supplementary activities.

In particular, as regards involvement of the population, the unfolding of the project has highlighted some difficulties, but also some strengths. In a city in which the experiences of active participation in managing the territory are still limited and the mistrust of novelties is almost a cultural fact, we deemed it fit to involve in the project activities, above all, stakeholders interested in the topic and willing to commit themselves alongside the Public Administration in the experimentation. If in the initial phases, in fact, enlarged involvement initiatives were undertaken to lend publicity to the project goals, such as public meetings and communications by e-mail or through the Web, in the trial phase properly so-called we addressed a narrow group of "privileged witnesses", such as associations, professional societies, institutional stakeholders, and university research groups. This category of players was then flanked by a series of specific and in-depth activities with the students of some of the high schools in the pilot area, Val Bisagno.

Addressing groups already established, such as school classes, professional societies and persons already active in the social field granted the opportunity of contacting and interacting with various homogeneous samples of citizens. Once the contact was made and the topic of hydrogeological risk introduced, all the groups displayed a substantial interest, both in the topic dealt with and in the tools proposed.

As regards the contents dealt with, what arose from the activity undertaken with the citizens is a fair level of general knowledge on the issue of floods in Genoa, albeit one mainly linked to what was reported by the media or strictly associated with one's specific field of activity. Conversely, the ability to link such events and the resultant damages to the territory with the various natural and man-produced factors involved proved more defective. This element is particularly significant, bearing in mind that the activity of Genoa's Pilot deliberately focused on the issues of pre-event and post-event territorial management to reduce the risk and mitigate the effects of floods. What emerged therefore is that if, thanks to the work of the Civil Defence and the effects of such awareness campaigns as IoNonRischio, the focus on the emergency phases has improved over the years, the ability to pick up warning or risk signals outside alert times is still deficient. Besides, the hydrogeological risk is still perceived by many as a topic on which the common citizen has his hands tied, and which has to be left to the care of the Public Administration. This position translates into a general erosion of the citizen's responsibility. Having discerned this difficulty, the choice fell on deepening the issue of active participation through the activities and methods described in the preceding chapters. The actual involvement of stakeholders and students within the scope of the project was indeed very important in this sense, being aimed at changing the citizen's viewpoint by letting him realise the significance of participation, thanks also to such tools as reporting. We may say that this was one of the most important challenges that came out of the project.

Based on the results of the activities performed and the analysis of reports, the need arose to stipulate targeted education and sensitisation (awareness raising) actions around the issues of land instability and flood-related risks, to improve both the knowledge of the problem and the sense of responsibility for sharing the management of a common asset. An improved information of citizens on the part of the municipal Administration and a greater involvement of the same in knowledge of and care for the territory, also by experiments forms of direct citizens-administration dialogue, would result in strengthening their awareness, first and foremost of the existing risks and of the small yet weighty signals serving to recognise them, and, not

less significant, in highlighting the importance of their contribution to management of the territory. In this way, we might activate a virtuous circle aimed at gaining a greater sensitivity to some problems and a more responsible conduct by individuals.

Turning now to the tools proposed, the possibility of using ICT solutions to manage the risk of floods is generally appreciated, including by persons belonging to rather advanced age groups, once basic training has been provided. The use of ICT tools, in all their different expressions, is in line with various projects backed up by the Municipality of Genoa that envisage digital literacy actions around some topics of common interest (waste, self-protection, etc.). Some doubts, however, emerged transversally about the use of ICT tools as sole system of communication between Public Administration and citizens concerning the risk: supplementing them with more traditional tools is a required step.

Specifically as regards the tools tested, the portal has been viewed as an already common tool, relatively speaking, and as one deemed reliable. There are in fact many persons, including not so young ones, who consult Internet websites to garner information or perform operations, and the possibility of reporting a problem has been seen as just a further feature of an already familiar tool. The app was instead perceived as a more innovative tool, one of basically more immediate use, especially for younger people, and the chance of communicating through an app was appreciated as a positive invitation to participate. In this regard, however, all the groups have stressed the need to have a certain and reliable feedback from the Public Administration to reports and communications, in order to activate a truly constructive dialogue.

The other major challenge for the Public Administration, from the viewpoint of adopting digital tools of communication with citizens, besides that of involvement, will be to organise itself internally to manage effectively, at back-office level, the volume of reports it is going to receive, both through suitable feedback and pointed answers and to better communicate the potential benefits arising from this type of instruments.

In a first phase of experimentation the following phases could be envisaged, for example (Figure 1):

- the municipality informs some groups of citizens about the flood and hydrogeological risks and provides them with adequate tools to report elements relating to the problem
- the citizens report according to the suggested methods

- the Municipality verifies the reports and gives feedback, also by publicizing the behaviors virtuosos of those who provided them
- other groups are motivated to participate.

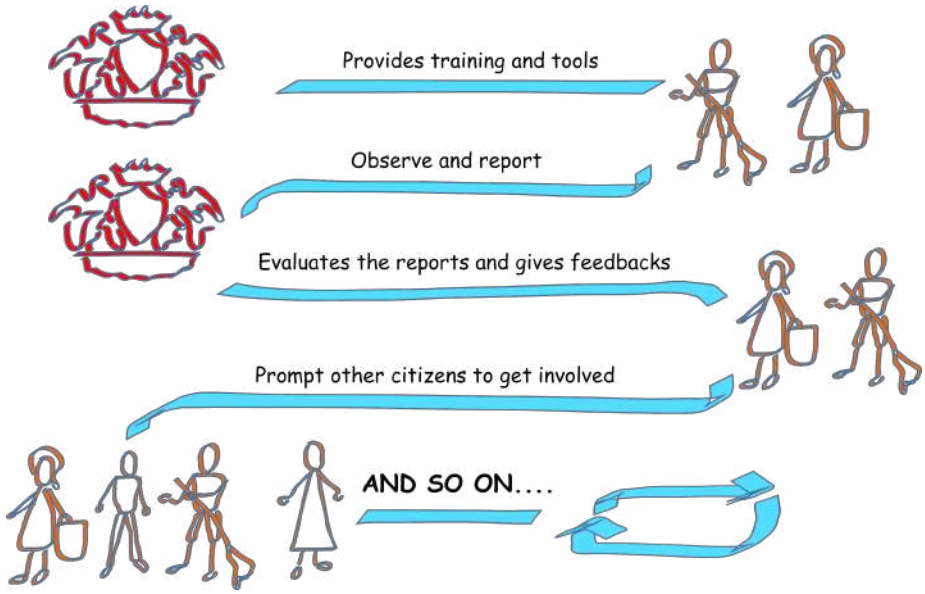


Figure 1 - The virtuous circle of citizens reports

Department of Political Science
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Collaborative networks and engaging citizens. A model

Resources

The past few decades have required a profound transformation in the Public Administration with regards to many focus points: from the relationship with the political decision-making sphere to the relationship with the citizens, from the re-engineering of procedures to the formation of human resources. These "requirements", deriving from a framework of needs of a society that is in a constant state of change, became even more necessary due to a reduction in resources that has weighed down public institutions for some time now.

One of the key directions along which the Public Administration's evolution developed is the gradual engagement of citizens within not only the mere implementation of initiatives but also the previous steps, that is, during the joint elaboration of services and assessment of needs. This is in order to realise actual citizen networks – as individuals and as groups – capable of encouraging the best outcome for public intervention.

In this context, the FLOOD-serv project became an excellent opportunity to raise awareness regarding the resources needed by the Public Administration in order to

improve its performance in the field of risk prevention/mitigation and more. The necessary premise to notifying about these resources is tied to the specificity of FLOOD-serv which aims to be a principally technological project both in its approach and final products.

The various phases into which the project is articulated allowed those involved to emphasise the need for greater resources or rather more refined resources in order to improve the project's results in the reuse phases or to contribute to the scientific starting point of other projects that follow the same direction. The factors are four and are briefly explained in the following paragraphs.

Hybridisation

The specificity of the project depends on the proposal of both a technological dimension of the platform and a participatory dimension with regards to the citizens. Each of these advances through an input/output scheme identifying the informative resources needed to allow for adequate and coherent answers to be elaborated. To proceed via a logical process that mutually confirms the results of each area of the project produces and alternation between technological development and engagement of citizens while maintaining a stable distance between the two spheres. It is therefore necessary to strengthen the hybridisation of the two components during the design phase and development phase of the platform. It is thought that such hybridisation, already difficult to achieve because it implies a significant effort of dialogue between very different areas of expertise, could have a positive impact on the project, even encouraging the strengthening of the resources later mentioned.

Trust

In today's society we are witness to a systematic drop in citizens' trust in institutions: this is a critical aspect for projects of this kind, especially if the context within which the platform operates has an emotional connotation such as that of the risk of flooding. Not less significant is the proliferation of informative devices for risk management – or their experimentation from which there follows no consolidation of a single tool – risks distancing citizens from sharing in collaborative directions in favour of adopting individual risk prevention and mitigation strategies. It is necessary to strengthen citizens' trust in institutions by first empowering the latter's ability to listen and therefore to respond, thus creating a continuous state of interaction.

Involvement

Engaging with citizens is strictly correlated with trust. It is necessary that the "mere user" logic be overcome and replaced with one that makes citizens actual "players", involving them, first and foremost, inside the continuous and qualified selection process of information to be inserted into the platform. This means involving them throughout the platform's development, which could even mean modifying the implementation process in a significant way.

Multi-channel communication

Citizens can vary in their choice, according to the aspects that define their group – whether they be age, cultural, etc. – of informative channels they use and they tend to adopt ever more often typically subjective informative short cuts. Multi-channel communication systems should be able to respond to the different "communicative styles" citizens may have in the same way, without producing useless and confusing redundancy in the information provided.

To put it very briefly, the resources that require fine-tuned are:

- a project approach in view of hybridisation;
- active trust that is mutually stimulated between institutions and citizens;
- selective citizen involvement as individuals or groups of information carriers (not just with interests) throughout the phases of the project;
- targeted multi-channel communication capable of not falling into providing redundant information.

Added Values and Elements to Improve

The project's realisation allows us to establish at least three objectives that can be pursued through the strengthening of the above-listed resources:

1) shared risk semantics
2) an assessment of citizens' central role
3) the accurate selection of information.

Shared semantics

The key concepts and subsequent terms used when facing the risk of flooding need to be constantly updated and be made available in a way that goes beyond the sphere of operators, so that the synergy between institutional intervention and individual citizens' attitudes may keep on improving. We believe the first step is to review the meaning of the words:

- risk components
- danger
- vulnerability
- potential damage
- people, goods and activities exposed to risk
- risk scenarios

The accurate communication of the outcomes of the information sharing process remains of vital importance.

Citizens' centrality evaluation

The ECM components developed in the project require an active involvement of citizens, both in individual and group terms, such as stakeholder associations that can contribute to spreading greater awareness of risks and virtuous behavior in case of danger. A tool for activating collaboration networks can be set on the following indicators:

Involvement	How much do citizens know, use and how much do they evaluate the tools of the components supplied by the FLOOD-serv EMC?
Networking	How much do the tools provided by the EMC support / strengthen relations between citizens and between citizens and institutions? How much do they favor the formation of new groups?
Training	How much do the tools provided by EMC reinforce the resilience of neighborhoods and citizens?
Attivazione	Are the tools provided by EMC actively or passively used? Possibly encouraging the activation of new initiatives or projects by citizens?

Selection of information

EMC components must be based on high quality, certified and up-to-date information. The sources of information are of three types:

1)operational instructions from the emergency plan of the Municipality

2) information held by citizens as individuals or as associations - or networks of associations

3) the information available in the municipal DBs - some of which are geo-referenced and accessible via geoportal.

These three information sources must be directly transferred to the EMC. However, it is necessary to activate a further flow: the information that the institutions need to optimize risk prevention and mitigation actions must be integrated and updated by the citizens according to a linear procedure, so as to update the existing dynamic DBs.

From this, in short, a model emerge (Figure 1), in which the EMC is at the center of an information flows that virtuously connect the institutional dimension and the dimension of citizenship - or individual citizens and groups. The information produced by the different actors compose the dynamic databases (georeferenced portal), which make up the third pillar that supports the architecture of the model.

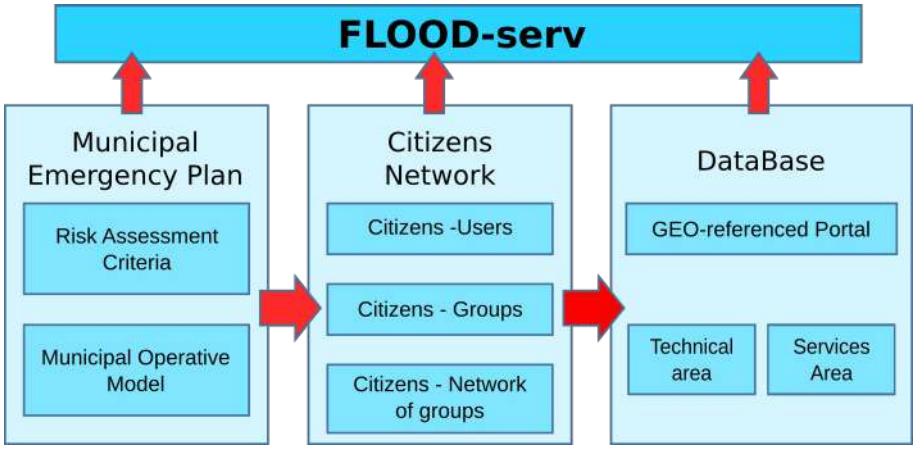

Figure 1 - EMC structure

Conclusions

The European Flood-Serv project has represented an opportunity to successfully try out citizen involvement processes for the prevention of hydrogeological risk; in particular, Genoa's Pilot project has tested communication "during peacetime", hence in a pre- and post-flood emergency.

The remarks that stem out from an analysis of the activities undertaken with the citizens, set out in this publication, are the result of integrating varied scientific skills, provided by the University of Genoa (DAD and DISPO Departments), with the territorial and administrative skills of the Urban Planning Directorate at the Municipality of Genoa. The communication contents and methods have been investigated with the main institutional stakeholders, citizens' associations and high schools in the area selected for the experiment: Val Bisagno.

The two-way communication between Public Administration and citizens envisages mutual trust and the activation of different channels of dialogue; the case of the digital platform of the Flood-serv project represents a challenge which, designed to support those who intervene during emergency time (Civil Defence), can be used to manage the hydrogeological risk "during peacetime" as well, as was the case with Genoa's Pilot project where citizens were involved as "carriers of information" about the territory.

The citizens, with the help of ICT technologies, can interact using mobile devices and smartphones, and thereby activate an “immaterial” meeting place enabling the implementation of relationships between them and with the Public Administration. Use of these tools allows an expansion of the possibilities of citizen participation and the most extensive dissemination of information and knowledge. From a perspective of multi-channel communication, however, “digital” tools must be accompanied by such “analogue” instruments as workshops, theme-based itineraries and participation panels, so that each citizen is in a position to choose the communication mode best suited to his or her needs.

All this in order to facilitate network construction processes for local communities that are capable of interacting, not just virtually, but also in relation to the territories, taking responsibility vis-à-vis self-protection projects in times of crisis and collection of information to eventually attain a collective awareness enabling the prevention of the hydrogeological risk.

Lastly, in accordance with the culture of open and transparent administration (Open government), digitation processes facilitate the direct contact between citizens and Public Administration, thereby contributing to combat the lack of trust that sometimes characterises this relationship. The Public Administration, by enabling the use and accessibility of the data that concerns the community at large (Open data), allows the acquisition of information, raises citizens’ awareness and facilitates their involvement in the decision-making processes.

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Daniela Rimondi

Adjunct Professor at the DAD Department. Co-founder of the research group INSITO which focuses specifically on inclusive processes and citizens' participation in planning and territory management.

Roberta Prampolini

PhD in Governance and Complex System Sciences, with a current focus on socio-territorial studies, specifically on: visual, urban sociology and INSITO Society and Territory, she collaborates with the DAD Department and with public and private bodies.

Genoa University - School of Social Sciences - Department of Political Sciences (DISPO)

Andrea Pirni

Associate Professor of Political Sociology at the DISPO Department. Coordinating the master's degree course in Public Administration and Policy, he teaches Public opinion sociology and institutional communication, Participation and activation processes, Social innovation and political change.

Luca Raffini

Temporary research fellow at the DISPO Department, with a main focus on, among other aspects, participation, social innovation and digital media.

Stefano Bonabello

Technical-scientific functionary at the DISPO Department, with the role of coordinating training courses for local police operators and a primary focus on urban security, change and innovation in public administration and complex organisations.

This book presents the results of the Genoa participation to the FLOOD – Serv FLOOD emergency and Awareness SERVice project.
The project aim has been to promote citizen involvement for a greater awareness of flood risks and related impacts and to support the Public Authorities in implementing mitigation strategies.
The project through the potentialities of ICT tools aims to make citizens aware about flood risks, to find out shared mitigation actions, and to cooperate with local stakeholders for the best exploitation of their specific knowledges about hydrogeological hazard before and after a flood.
The project has been implemented in the Genoa districts of Media Val Bisagno, Bassa Val Bisagno e Medio Levante.