PhD research proposal

Rethinking Water Infrastructures Urban development under climate change

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This document highlights the main ideas for a research proposal in order to obtain the academic admission for the PhD programme with UNESCO-IHE.
The main research topic is focussed on adaptation strategies to face urban flooding in the context of climate changes. Spatial planning is proposed to be used as a tool for exploring opportunities and potentials to alleviate the threat to increased urban flooding. A case study, from Romania, will be used to demonstrate the methodology; however the developed approach will represent a base for developing projects in other urban areas, identifying generic process and tools with emphasis on the use of local assets.

1. Introduction

The proposed research aims to integrate a sustainable, dynamic and multi-scale approach from urban planning and design perspective to the current trend of rethinking water inland systems in response to increased dramatic effects of climate change and urbanisation. It has the ambition to develop methodologies situated at the crossroad of disciplines linked to water science and sustainable development and planning.

Global environmental issues about water are a growing concern. During the last decades, strategies and policies promoted or supported by international institutions[1], and recently on the agenda of several governments[2], attest the formal recognition and serious implication of the climate impacts to present and future settlements development. In this new context, effectiveness and sustainable measures in urban areas can only be achieved through several scales action.

Along with cost effective sectorial water engineering interventions, social equity, economic prosperity, and environmental sustainability are seen, from a long term perspective, as adapting options in response to urban hydrological cycle changes.

Therefore corroborating structural, technical urban ecology knowledge with preventive and resilient actions on hydrological networks through global visions, strategies and urban projects, policies and land use regulations are considered to have the potential to revalue the relation between communities, cities, and territories linked with water and to improve spatial qualities for better liveability in urbanised areas.
The study proposes a spatial planning methodological approach with emphasis on a full project phase development, where the feasibility of identified measures will be evaluate in local contexts, with focus on the capacity to shape policies and influence sustainable development.

[1] *As for example the Kyoto Protocol to the United Nations Framework Convention on Climate Change scientific programs on environmental security of NATO and the European strategies highlighted in their "Water Framework Directive".*
[2] *Example Brussels regions who is in the process to integrate already strong policies and encourage environmental resilient urban projects*

The study will tackle how to bridge various gaps between general and transnational concepts relating to water policies versus local realities, in particular for settlements situated in vulnerable catchment areas.
Conscious about the importance of societal commitment, it will attempt to increase stakeholders, decision makers and civil society's awareness about co-productive needs, to better understand and consider challenges and vulnerabilities that land areas and cities are facing due to climate change uncertainties by making use in innovative ways of the local resources: existent structure potential and opportunities, in societies were spatial planning is an emerging practice.

2. PROBLEM STATEMENT

Key issues: Urbanisation, Climate change, Urban Flood Management, Urban Spatial Planning
Case study

Introduction: Urban Development and Water

As a major primary resource, water was always intimately linked to urban development. From water supply to economic resource for agriculture, drainage, mobility, energy provider, etc., its industrial use up to the ecological restoration attempted today, water bodies were intensively appropriate and transformed by the increasing needs of our societies. Simultaneously, water also integrated an essential aspect of protection, insofar as approaching and mutating waters create instability and floods risks. Nonetheless, protective systems were built on previous historical experience through a rigid system based on a stationary algorithm unable to respond to actual impact of anthropogenic and unpredictable climate change on urban hydrology.

2.1 Urbanisation

Through intense economic exchange, increased mobility, experimenting new ways of production and consumption, cities and 'region cities' become driving engines of the global economy.
Increase in attractiveness of the cities led to an unprecedented population growth and land cover impact, replacing traditional resilient territorial occupancy system (e.g. sensitive to topographic issues, flood plains, etc.,).
Harmful environmental development schemes perdure through chaotic, disrupted and aggressive spatial changes today with a perspective of intensification in the next decades. Effects are foreseen to worsen as tremendous population growth and urbanisation trend are on expansion: "by 2050, 70 per cent of the world's population is projected to live in urban areas."(United Nations. Department of Economic and Social Affairs. Population Division 2012)

The exceeding capacity of infrastructure discharge, along with the fabric development ecological implication, reduction of resources and increase of pollution, the failure of hard engineer to effectively respond to the flow of people ask for new approaches. Water is now an urgent issue, as a consequence of diminishing resources, irrational consumption, inefficient waste management and pollution, and last but not the least, the dramatic increase in flooding risk.

In developed countries growing concern about closing water cycles into the city seemed at the beginning to be more oriented towards water supply, headrace, storage, consummation, and reuse of waste water in order to reduce footprint (greenhouse gas production) from activities linked to local water management. (Sachs et al. 1998). This is about to change as urbanisation has tremendously increased sealing surfaces in urban areas and reduced capacity of infiltration, hence lowering groundwater table. Due to urbanisation and climate change there are major changes in the evapotranspiration values and patterns, runoff storm water is constantly overpassing the sewage capacity leading to flooding vulnerable locations in the city; high water runoff velocity and therefore increased pressure over the system.

New approaches are demanded with special attention on the hydrological process at different scale: re-establishing infiltration, enhancing the capacity of transpiration and evaporation, regulate and control runoff water in the condition of climate change uncertainty.

Differences in urbanisation and industrialisation phases, in collective awareness degree about threats and potentials developing and developed countries but differences in European Union countries and cities make it difficult to coordinate action to form a coherent global response to urbanisation trends and to the impacts of global warming. Romania urban and peri-urban areas are considered case studies highlighting these aspects.

Despite a population decrease, urban areas in Romania suffered an ecological disequilibrium for decades, first due to aggressive socialist urbanisation and later by the uncontrolled urban sprawl of the last 20 years. Modernist (socialist) interventions of high density assemblies (Sandqvist and Zahariade 2003) placed on green areas – often arisen from mutation of flood plains, or forests, etc., to intensive concrete high-rise dormitory, nowadays cities are experimenting infill urbanisation, economic corridors of flow and an increase privatisation of the public realm. Decreased control of public administration has completely unbalanced the power equilibrium insofar private sector secure full benefit of land use with complete disregard to the interest of society at large.

2.2 Climate change

Climate change brought/ changes in water cycle, atmosphere, and dynamic of the ocean with effects from rise of sea level through melting on the earth glaciers, flooded territories, unpredictable and localised natural extreme events with on-going alterations on the hydrological cycles.

Scaled down at the territorial level, soil experiences show an increasing impact on runoff and evaporation, and direct effect on river flooding. (De Smet, L; De Sutter, R 2008).

The effects of urbanisation and climate change met today in vulnerable urban areas are translating into flooding or /and alternation with drought phenomena. Increases in sealing of surfaces, deforestation, and urbanisation of flood plains, artificial drainage are accelerating the effects of climate change. In spite of regulation and systematisation of water bodies, due to decay and lack of maintenance of the defence system (Filotti, Andrei 2013a), rivers and small river branches, completely integrated in the city landscape have the potential to become threats to the city safety.

Designed for the discharge based on last century statistics, flood protection in Romanian context is not capable any longer to assure the safety of the cities. Recognised as problem in the Romanian Water Management Plan and by the water sector professionals, the problems are still ignored at the society level, since collective awareness (Filotti, Andrei 2013a) about the implications and uncertainty of the phenomena are almost inexistent. Defective management of some parts of defence system (e.g. lakes) are reducing threshold capacity of the system, development plans use to ignore flooding areas.

2.3 Dealing with floods – adaptive strategies

Traditional flooding protection was based on reducing exposure through increasing threshold capacity (Zevenbergen 2011). Nonetheless the use of excess of uni-sectorial engineering, large scale approaches, damming, deviations, drainage and canalisation systems are not anymore enough (Shannon 2008). In some cases including forecast of future trends are even harmful and counterproductive when dealing with flooding: for example channels increase speed of flow and pressure on the system resulted in upstream discharge. From an urban planning and design point of view, artificial surface water bodies often create ruptures within urban structure or miss the chance to enrich environmental and social aspects of a site.

Rigid interventions cannot and might not assure full system efficiency against vulnerability brought by climate change , due to exceed of their physical capacity and in some context weakness of the

capacity to manage and organise an adequate response to risks (people awareness, evacuation plans, insurance system, recovery plans). Lately a lot of attention focused on segregated[3] effects of climate change, through flexible strategies attempting to restore the hydrological equilibrium, reduces damage in case of overwhelming threshold capacity and/ or to lower pressures on systems as quoted before.

In urban flood management this strategic approach is called 'adaptive' capacity of a system and is related to several scale- catchment areas, city up to parcel and building infrastructure. Considered passive protection, based on improving robustness and resilience of the system (Zevenbergen 2011). it covers a full range of actions from physical to normative one (from project to policies[4]). Spatially, it acts like a process of complementary actions, often multi-functional 'urban tools', as for example in networks of green spaces, public spaces, decongestion voids, green roofs, infiltration drains, meandered corridors of water flow including naturalisation, playing a role in normal and extreme climate events to reduce runoff, increase infiltration and evapo-transpiration for a better atmospheric hydro and thermo exchange in the city.

One of the conditions for this official agenda is linked to the quality of water. Since waste water is still a problem in Romania (Filotti, Andrei 2013b), the cleaning aspect becomes primordial for adaptive intervention at least for any river and catchment area direct intervention. [5] Waste water facilities and treatment project are becoming opportunities to launch the debate for adaptive resilient approaches. The European projects in Romania of canalisation, and the waste water treatment should be a first step to identify opportunities to integrate further measures.

Urban flooding modelling is an increasing preoccupation in Romania, but no measures for resilient of waters system is integrated into the Romanian Water Management Plan, yet. For example restoring natural rivers' courses are treated out of any systemic hydrologic approach, and subject to a confused legal procedure that express lack of priority. Nonetheless, territorial water system in Romania has suffered tremendous changes (Capelle,T 2012) with important impact on the ecology, a, high degree of pollution (Filotti, Andrei 2013b) and dysfunctions that requires urgent interventions.

2.4 Planning System

In a context of increased mobility of goods and people, political and economic sectors were completely transformed by the administrative decentralisation and de-concentration. Growing urbanisation process, struggle for land, lack of resources and weakness of the public administration in its decision making processes along with private development have brought a fundamental redefinition of public and private territories.

In this new configuration of cities and regional 'hegemonies', in order to reposition themselves at the regional or global scale, not just successfully but also in a sustainable way, cities need to adopt the new practice of spatial planning, were the city making of today means collective[6] input on the process.

Spatial planning gave administrations the opportunity to integrate external driving forces, in multilevel governance infrastructure, making room for a coherent lecture that enlarges the merge of intervention on the structure outside administrative boundaries. Thinking simultaneously globally and locally, allows for a co-productive process that can integrate and balance the greater good for civil society with stakeholder's interests.

[3] *Effects of climate change were defined as 'segregated' as far as a series phenomenon encountered seemed to describe shift from a variable, diverse climate process towards a succession of antagonist one.*

[4] *Cities like Brussels develop strong policies and financial encouragement measures to improve the flexibility of the system through parcel and local buildings adaptive strategies. Institution in charge: Brussels Institute for Environmental Studies*

[5] *Measure for increasing infiltration, evaporation, and temporary or long term storage of pluvial water can be considered as far as storm water is considered to be cleaner then runoff water or catchment area water.*

[6] *Involvement of key stakeholder, consultancy and involvement of society, negotiation of several interested with focus on public interest*

Ultimately clear vision of sustainable strategic urban actions, identifying urban policies and formulating urban projects, as well as correlating actions and institutional competencies broadly define how the process can work to reposition the city in a dynamic new regional and national context. Within this framework the urban projects are used "as strategic interventions that articulate, test and eventually correct long term visions about a desired urban future [...]". (Loeckx, Localising Agenda 21: Action Planning for Sustainable Urban Development Program and United Nations Human Settlements Programme 2004)

In certain societies, this became a common ground for multidisciplinary practice[7]: a chance to introduce new paradigms into the profession of urban planning, looking at opportunities in context of assets, with an increased awareness about potential development, the quality of build environment and the enhancement of public space. In such cases, urban flood management, and all water issues are integrated part of planning.

Although spatial planning is officially on the agenda of developed countries at global level, in certain contexts the inertia of the system or conditions are not yet in place for adoption, while the master planning is not functioning anymore. Within the European Union, important gaps can be seen between its member countries. There are countries in which historical planning background and administrative infrastructures have developed spatial planning approaches over last decades and also countries for which the model is brought by the European Union integration. Romania is one of the latest examples of such country and consequently needs to re-evaluate the role of planning apparatus, which was completely disregarded during the economic boom of 2000 – 2007. It is necessary to understand and re-establish its role, with political, administrative, social and economic realities in a sustainable format. There is a tremendous need to state the importance of research, information exchange, and alignment of professional experience, innovation and cooperation in any urban project, based on a critical approach.

2.5 Case study (in work)

With a complex structure and network, Bucharest, capital of Romania is a city that suffered tremendous changes: At the regional level, last century of water system mutation has created ecological problems, which was accompanied with unprecedented forced urbanisation and change in urban fabric patterns. Last decades of urban sprawl and lack of canalisation/ drainage system, aggressive sealing process of permeable surfaces has increased the vulnerability facing climate change.

The new official requirement for risk and vulnerability maps has provided Bucharest with analysing tools that have to be integrated in solution oriented research approach.

The present study considered Bucharest an interesting ground to evaluate the possibility of the integration of adaptive measures at different scale, in regard with an urban fabric and type of development common to a series of Eastern European Cities, but also in respect to the economic and social and political context.

The project proposes to look for spatial structure potentials to increase retention capacity of the urban system, which are not yet studied in an integrated way. The research will focus on different scales, from main rivers catchment area, existent flood defence, vulnerable areas, the role of the neighbourhoods, in draining and reducing pressure on the drainage system, the role and availability of the public and private land.

[7] *Although an holistic approach in planning it is not a new concept, and there are several samples that could be quoted as exemplary intervention of XIX and beginning of XX, where water domestication respond to hygienic and ecological solution as well as structuring development axis, and public space. (Filotti, Andrei 2013b)*

It aims to develop and evaluate blue green strategies on local context and develop a methodology to evaluate the impact, the benefit of alternative solution to hard engineering action, the multifunctional potential of actions and therefore added societal value. etc.,

3. RESEARCH objectives

Key issues: multidisciplinary importance, benefit of redundancy on urban structure, political and societal engagement

3.1 Where sustainable spatial urban development meets urban flood management in a sustainable productive potential

Research question: What are the tools necessary to develop new methodologies for an integrated approach?

The renewal of the discipline of water management meets Romanian urban planning and design in a process of redefinition and shift towards a spatial approach. The present proposal considers this situation as an opportunity to explore a possible common ground, confront and correlate methodologies. In such a context, disciplines traditionally have kept autonomy of intervention with no outcome from cross sectorial benefit. On a global scale, where results should be achieved by collaborative and concomitant actions, this becomes a very important issue.

Nowadays development of prediction methods, risk management and modelling floods integrates uncertainty trends of climate change. The need for defining new methodologies and indicators (De Smet, L; De Sutter, R 2008) requires development of case studies and exploration in their complex aspects on urban social and economic impacts.

Due to its systemic hydrology cycles approach, on whole river catchment area as well as on confined details, the benefit of flooding management methodology in urban development[8] is of a tremendous importance for achieving spatial approach in urban development, by importing paradigms such as the use, of structural, multi scale, patterns, etc.. [9]

3.2 Rethinking Water System and Redundancy Benefit for Social Spaces for Interaction and Qualitative development

Research questions: At what extent water system has the potential to become a spatial integrator of urbanization. What are the possible multiple functions to be achieved in the city at the level of parcel and public space?
What is the capacity to become a social blue and green connector? How it participate to a coherent vision of nature related to urban development, to ecological improvement of leaving conditions, in respect with air and water pollution, biodiversity?

[8] *From personal experience, workshops and presentations, beyond discourse, there is a very small comprehensiveness on scale shifting in urban planning (example Romnnia)*

[9] *Urban flood management has already import methods from spatial planning. But since de-phasing between different context, it is considered in the present proposal that urban flooding management has potential to re-transfer this knowledge in less developed planning practice societies., there are more sensitive to 'professions' traditionally linked to engineering, safety , etc., 'Master planning type' based on land use organisation, in between administrative borders, miss the potential of structural reading*

In a continuous crisis context with its contradictory, unbalanced effects, integrate reflection about adaptive solution in respect to hydrological cycles in cities has a transformative potential for urbanised decaying territories, making use of urban renewal strategies. It can enhance trust for collective actions, articulate public space, attract and encourage further investment, create an opportunity for water-linked industrial sites reconversion, create wealth, social development in cities seeking to reposition themselves within the ever-changing regional dynamic.

Lacking resources, cities should consider the capacity to achieve adaptive and redundant assets through re-evaluation of its structures: as resilient strategies to adapt and reduce as much as possible the building stock's energy consumption and footprint, manage open spaces and land resources in long term perspective, re-establishing networks to accommodate 'water 'flow / transfer by reactivating green and blue corridors with emphasis on public space. New development can find its logic in the green and blue mesh.

Political and economic changes, the era of motorised societies brought transformation between social relationships translated by an ignorance or privatisation of the public space pleading for the revival of spaces for society interaction. Perspective of a redundant water system intervention, make for a new culture of public awareness within the settlements, that might not be the traditional public space, but explore new kinds of receptacles for social activity and humankind relationship.(Dehaene and Cauter 2008).

3.3 Working towards societal and political engagement

Research questions: How a research project focused on a specific context should integrated local societal value for an effective societal benefit? What is the role of a research project to raise awareness and add value for future sustainable actions?
What is the capacity of the present study and what are the tools to be developed to achieve societal and political commitment?

The pillars of flood risk assessments framework: "the probability of flooding, the exposure of the elements-at-risk to a flood with certain characteristics, the value of these elements-at-risk and, and the vulnerability of these elements-at-risk" (De Smet, and De Sutter, 2008) – are evaluated by different means of maps, indicators, scenarios for uncertainty on where adaptive solution can be tested to reply to the degree of vulnerability.

Considered as a difficult element to measure, "value" is a key issue as far as can be evaluate by the degree of which the other flood risk assessments elements are present in a context. In short, if there is no recognised value of the element exposed to risk, there won't be any recognition of flooding exposure, and ignorance of vulnerability will prevail.
Therefore in a simple and reductive comparative overview, in different contexts, for example concerning the effects of flooding[10], it is consider that the 'value 'is linked to the global societal beliefs and therefore reflected in political value. Culturally, access to knowledge and education, accentuated by the de-phasing between societies, value is intimately linked to the attitude towards public and private property, share of responsibilities between individuals and collectiveness, individual empowerment; This are important key issues in assuring the effectiveness of planning (flooding prevention) process(Filotti, 2013).

A structural program of flooding defence based on urban sustainable development requires society and politicians to use common values. Legislative and administrative infrastructure is often considered as an obstacle towards strategic goals, but all in all, that reflects a lack of vision or consensus. Besides propitious context for building political consensus, time is necessary for preparing ground, with commitment, inform, collect and share information and argument,.

[10] *Information from media, non-academic or scientific , but factual*

The role of planers and academia in achieving consensus is based on an advocacy work of continuous dialogue exploring ways to implement sustainable societal projects: As Louis Albrechts explains the role of political decision making in adoption of Structural Plan of Flanders "as such a dialogue requires a certain degree of understanding values, goals, spatial concepts of the project and how to turn them in the workable instruments. It explored political feasibility and it resulted in an engagement, based on win-win solutions, where the different cabinets approved the plan. Building reciprocal trust and understanding was important. In this way the actors 'gained a deeper understanding of each other's perspective, of the different political, sectorial and regional interests and of the political sensitivity of certain issues'(Albrechts 2003)

As 'values' is not constant in society, trends are changing in centuries and decades and extreme events are influencing our believes (climate change is part of it), future values might definitely defer from today (Sachs et al. 1998), it is considered that working on different context requires an understanding of local values, and the way this values can be effectively integrated in a future sustainable development approach.

Therefore the outcome of this research project will be studies in respect with the need for a future political engagement and societal consensus in Romanian Context, where Water Framework Directive and the implementation of spatial planning meet an unprepared local context and often different values.

4. METHODOLOGY

The present proposal will use a mix of tools: spatial planning methodologies for sustainable development, hydrologic and hydraulic models tackling vulnerability and uncertainty, and more.
With the goal to stress the need of dynamic and process oriented approach, to relate academic as much as possible with practice's reality, the research will be guided and evaluated through a fourth track approach of project development on a time line from initiation/ starting/planning:

1. Looking forward long term vision
2. Daily policy / solving bottleneck action
3. Engaging different actors and population in the planning and decision process, dispute resolution.
4. Permanent action (on the time line) involving people

The outcome of this research project should result in the planning phase towards a frame an action plan, and policy agreements.

METHODOLOGY

1.IDENTIFY RESEARCH LINE

URBANISATION — CLMATE CHANGE

vulnerability | uncertainty | resilience

2.DATA AQUISITON

SITE OBSERVATION/ SATELITE/MAPS/ ARCHIVES/ INSTITUTIONS

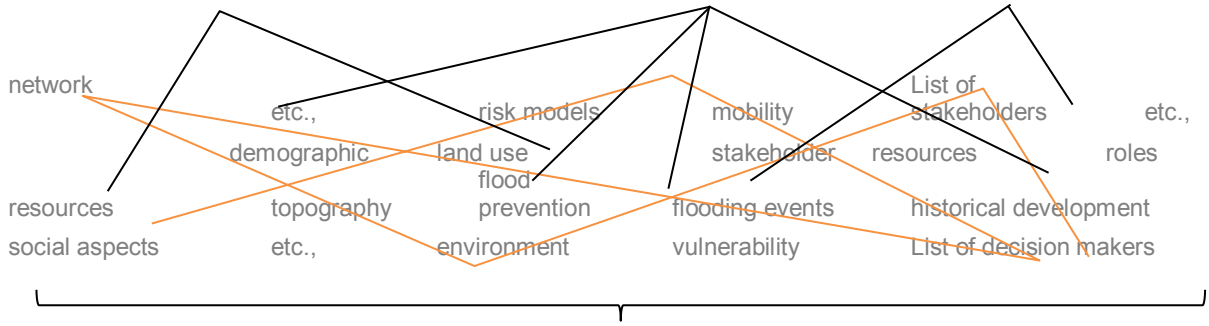
historical development	Identify vulnerability:	List of stakeholders
geology and water	vulnerability models	List of their roles
topography	risk models	List of decision makers
land use and demographic	flooding events	and political approach
urban fabric and typologies	meteorological data	Identify existent strategies
network and resources		Identify societal values
economic development	media records	
social aspects	insurance records	
environmental		

3.DATA ANALYSES

POSSIBLE MODELLING

cross sectorial analyses

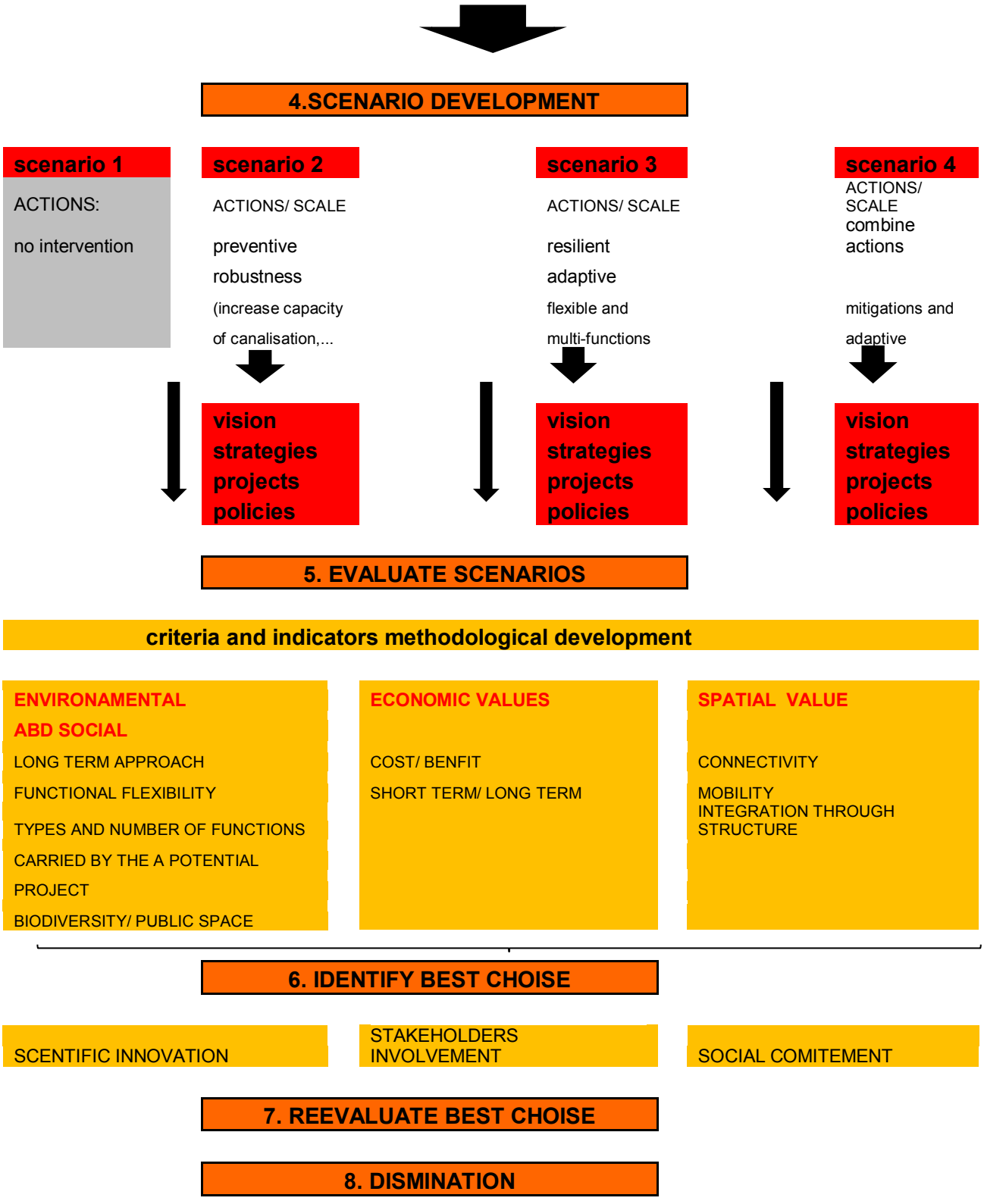
regional/ catchment area scale — city scale — neighbourhood/ local vulnerable



identify spatial structure

\+ **opportunities** + **potentials** + **bottleneck problems**

identify key issues


4.SCENARIO DEVELOPMENT
scenario 1
ACTIONS:
no intervention
scenario 2
ACTIONS/ SCALE
preventive
robustness
(increase capacity
of canalisation,...
scenario 3
ACTIONS/ SCALE
resilient
adaptive
flexible and
multi-functions
scenario 4
ACTIONS/
SCALE
combine
actions
mitigations and
adaptive
vision
strategies
projects
policies
vision
strategies
projects
policies
vision
strategies
projects
policies
5. EVALUATE SCENARIOS
criteria and indicators methodological development
ENVIRONAMENTAL
ABD SOCIAL
LONG TERM APPROACH
FUNCTIONAL FLEXIBILITY
TYPES AND NUMBER OF FUNCTIONS
CARRIED BY THE A POTENTIAL
PROJECT
BIODIVERSITY/ PUBLIC SPACE
ECONOMIC VALUES
COST/ BENFIT
SHORT TERM/ LONG TERM
SPATIAL VALUE
CONNECTIVITY
MOBILITY
INTEGRATION THROUGH
STRUCTURE
6. IDENTIFY BEST CHOISE
SCENTIFIC INNOVATION
STAKEHOLDERS
INVOLVEMENT
SOCIAL COMITEMENT
7. REEVALUATE BEST CHOISE
8. DISMINATION

4.1 Where sustainable spatial urban development meets urban flood management in a sustainable productive potential (in work)

Vulnerability: identification
Integrate hydrologic analyses: models for surface runoff, modelling runoff, GIS integrated models, model flood risks. Identification of existing models in Romania context will determine case studies. (From local to catchment areas, empiric, complex, GIS) In lack of information, empirical and simple models (with few indicators: meteorological, surface sealing rate, soil characteristic, topography) can be used as far as it can reply to the scope and objectives of the proposal.

Mix methodologies and analyses:
- Use a scale approach- local, city, catchment area

4.2. Rethinking Water System and Redundancy Benefit for Social Spaces for Interaction and Qualitative development (in work)

Integration of hydrologic models in wider spatial analyses and strategies at different scale; identify key issues. Issues linked to infiltration, storage (wide and local), and reducing runoff velocity. List of non-exhausted elements to be analysed in function of the structure:

- Land use diagnostic
- Urban renewal, quality of leaving
- Densification and impervious surface issues
- Vegetation and multi-functional and cultural potential
- Mobility and slow mobility
- Economic networks, potentials and benefits/ crises dynamic (formal and Informal)
- Resources
- Agriculture including irrigation in respect with land potential, existent and intended policies,
- Environment and pollution
- Integration of the informal economic dynamic
- Industrial impact
- Potential in restructuring existent urban fabric, integrated and articulate suburban, disfavoured areas, empowerment with impact on public space awareness and maintenance
- Dealing with edges and urban sprawl
- Cultural and philosophical knowledge.
- Building energy efficiency and sustainable strategies and policies
  Social realities

Tools to develop- resilient multifunctional intervention in existent fabric/ structural resilient intervention to manage urban growth
Blue green strategy:

- Green corridors
- Water storage – green water storage/ grey water storage/ storm water
- Green water discharge tools
- Filter channels/ build wetlands/ artificial flood plains
-

Multifunctional intervention/ evaluation criteria:

- Ecological input
  - Biodiversity

- Air / pollution
- Water quality improvement
- Temperature balance
- Health input

- Economic aspects
  - Increase spatial value - attractiveness for investment
  - Economic alternative to strong engineering intervention
  - Job creation

- Social aspects
  - Accessibility for all/ mix of functions
  - Qualitative public space
  - Spatial connectivity
  - Sustainable mobility

Etc.,

4.3. Working towards societal and political engagement

- Analyses on political administrative awareness at different scale of decisional making scale, site observation, interviews studies and best practices
- Stakeholders awareness
- Public and private sphere, in order to understand the existent dynamic
- Existent and potential role of stakeholders
- Input from scenarios and proposed project
- Reintegrate input into the initiation process
- Understanding societies' approach and comportment facing challenges, crises but also opportunities, would provide with tools to raise the sense of responsibility

4.4. Explorative design

Due to the nature of the research project (focus in combining methodologies and merging disciplines) the project would like to develop a "research by design" approach, issued by well-articulated theoretical and operational knowledge and insights.

Urban design will be used as a way to test the scenarios and reintegrate information as far as this is tested by the proposed projects.

Design is seen as a qualitative quantifier of the urban projects, and planning process, to evaluate the proper application of vision and theories in real cases. It should be able to explore innovative solutions and open up stakeholders' imagination about the importance of a co-productive approach in achieving sustainable development.

5.1 Budget Estimate

Budget estimate	**All Years**			
Expenses	**Unit**	**# of units**	**Unit rate (in EUR)**	**Costs (in EUR)[3]**
Tuition fee	Per year	3.5	11,250.00	39,375.00
Data acquisition	Per diem	1	3,000.00	3,000.00

Direct study related cost books (see also equipment)	Per diem	1	2,500.00	2,500.00
Field work (Romania)	Per diem	1	2,000.00	2,000.00
Insurance (?)	Per month	42	40.00	1,680.00
Subtotal Human Resources				**39,375.00**
1. Human Resources				
1.1 Monthly allowence (gross amounts)[1]	Per month	42	1,500.00	63,000.00
1.3 Per diems for missions/travel[2]				
1.3.3 Seminar/conference participantion	Per diem	1	7,000.00	7,000.00
Subtotal Human Resources				**70,000.00**
2. Travel[6]				
2.1. International travel	Per flight			0.00
2.1.1 Belgium - Romania- Belgium	Per flight	9	360.00	3,240.00
2.1.2 Bxl - Delft (information to be added for an annual card)	By train	75	74.00	5,550.00
2.2 Local transportation				0.00
2.2.2 (no information available at this moment)	Per day			0.00
Subtotal Travel				**8,790.00**
3. Equipment and supplies[7]				
3.1 Purchase or rent of vehicles	Per vehicle			0.00
3.2 Furniture, computer equipment				0.00
3.2.1 Hire or purchase of computer and software	Per item	1	9,000.00	9,000.00
3.3 Spare parts/equipment for machines, tools				0.00
3.3.1 Scanner	Per item	1	400.00	400.00
3.3.2 Printer	Per item	1	600.00	600.00
3.4 Other (please specify)				0.00
Subtotal Equipment and supplies				**10,000.00**
4. Local office/Action costs				
4.1 Vehicle costs	Per month	0	0.00	0.00
4.2 Consumables - office supplies	Per month	42	10.00	420.00
4.3 Other services (tel/fax)- Romania	Per month			0.00
Subtotal Local office/Action costs				**420.00**
5. Other costs, services	Provision			**3,000.00**
5.1 Publications	Provision			0.00
5.2 Studies, research	Provision			0.00
5.7 Costs of conferences/seminars				
5.7.1 Participation to meeting/ Workshops	Provision		0.00	0.00
5.8 Visibility actions	Provision		0.00	0.00
Subtotal Other costs, services				**3,000.00**
	All Years			
Expenses	**Unit**	**# of**	**Unit rate**	**Costs (in**

		units	(in EUR)	EUR)
6. Other				0.00
Subtotal Other				**0.00**
7. Total				**131,585.00**

1. Probably no application in this case
2. To be define and eventually subject for different funding application

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