Effective decision-making on climate change impacts and adaptation

The MEDIATION project

Stefan Hochrainer-Stigler

Reinhard Mechler, Keith Williges

ssessment of climate change impacts, vulnerability and adapta
quires a combination of generic and context-specific
nowledge.

urrently, the availability of such knowledge in Europe is
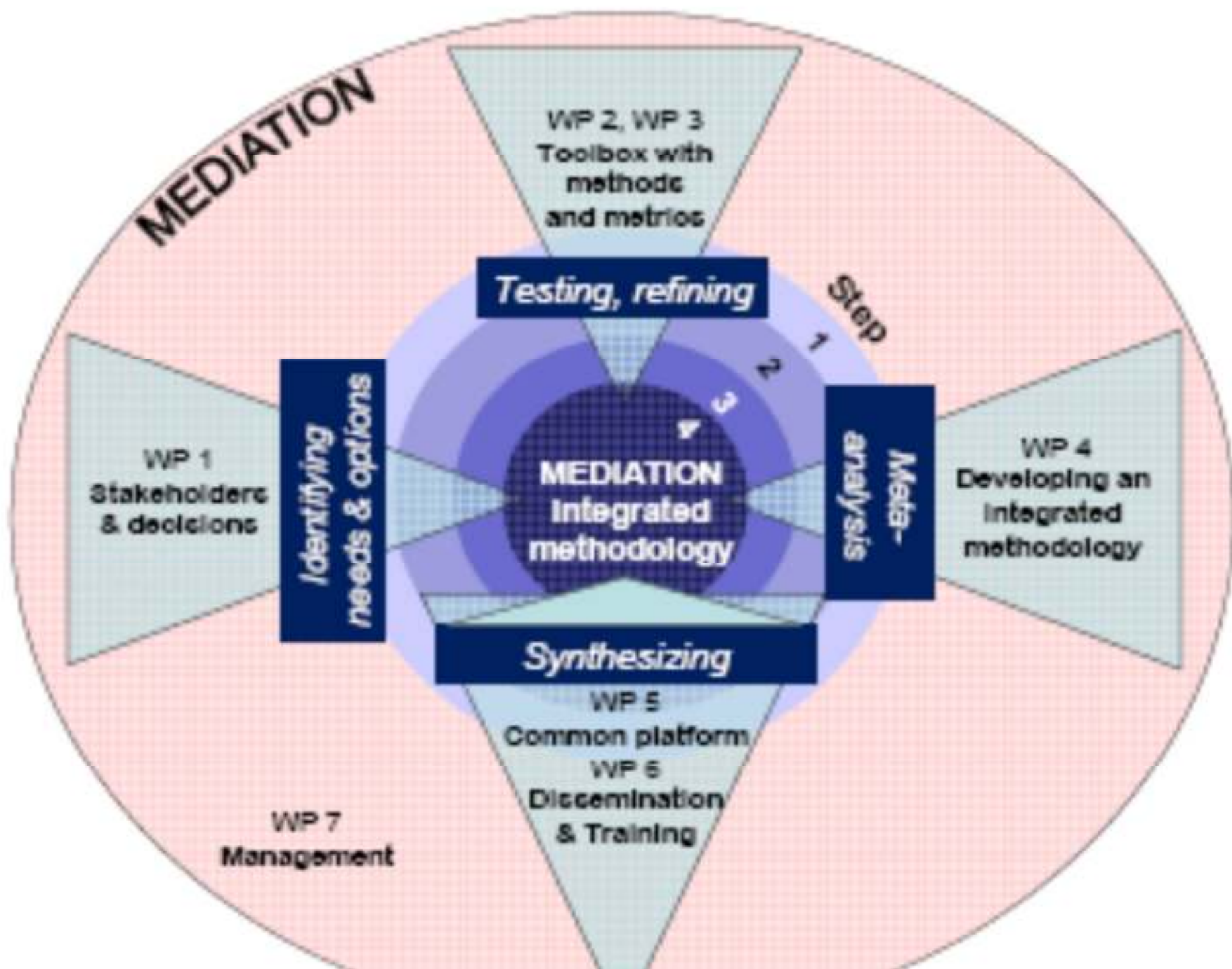agmented and incomplete

EDIATION addresses this challenge.

decision making context
methods and metrics for impacts and vulnerability analysis
costing of impacts and adaptation
ntegrated methodology
blatform for knowledge sharing

following case studies are included in MEDIATION:

ern Europe

Case NE1: Vulnerability of the elderly to Climate change in the Nordic region

Case NE2: Implications of biodiversity change for conservation policy in Finland

rn Europe

Case WE1: Implications of land use change for discharge dynamics and adaptation in river Rhir basin

Case WE2: Fresh water, salinization and coping with uncertainty in coastal areas (the Netherlar

Case WE3: Implications sea level rise for coastal areas and functioning of ecosystems

l Europe

Case CE1: Central/Eastern European case: hydropower and agriculture Albania

Case CE2: Central/Eastern European case: Droughts in Serbian agriculture

ern Europe

Case SE1: Southern European case: Tuscany – sorry, no more wine (lead UNIFI)

Case SE2: Southern European case: Tuscany – Tuscan people is hot (lead UNIFI)

Case SE3: The Guadiana river basin

Case SE4: Goudalquivir river basin

uropean (Lead EC-JRC)

Case EU3: Forest Fires

Case EU2: Flood risk

Identification of **research priorities**

Raising **awareness** of climate problems

Prioritisation of **action areas**

Determining the **effectiveness** of interventions

Exploring **trade-offs** between adaptation and mitigation policies

Identification of (most) **vulnerable** sectors and communities

Identification of **adaptation** measures

fragmentation of methods and tools,

ack of linkages to actual policy needs,

ack of understanding and communication of
ncertainties,

xpert-based nature and complexity of methods vs.
ser demands,

ack of consistent data, definitions and metrics.

oolbox: Set of models, methods and metrics f
e assessment of impacts and vulnerability an
daptation options.

esponding to stakeholder needs

pply the toolbox to salient adaptation problem
entified in the case studies

erative development in conjunction with
orkshops

ng an essential part of the integrated methodology and common platform

egration: **Assess the impact chain** as much as possible starting from direc
ohysical and monetary effects leading to indirect economic consequences;
lress aspects of efficiency, equity and sustainability, geographically explicit
dels feeding into aggregate or sectoral economic impact assessment mode

mporal and spatial scales. Study **future** adaptation based on **today's**
nerabilities, risks and key issues (the cases), use spatially explicit modelling

w vs. sudden onset hazards: assess **slow-onset climate change**
mperature increase etc.) based on certain outcomes or expected values vs.
lden-onset events (such as floods and windstorms) for which probabilistic
lysis is more appropriate

es of adaptation: account for **planned** and **autonomous**, **private** and **publ**
tor adaptation challenges

nslating information: translating scientific knowledge from observations or
deling into **policy-relevant** information

certainties: identify and assess **different types** of **uncertainties**. These ma
mprise, among others, epistemic (general scientific uncertainty), aleatoric
tural variability such as the occurrence of heavy rainfall), model and data

p-down:

ore associated with research-driven interests that use climate
cenarios derived from general circulation models (GCMs),
hich are used as inputs into impact

ttom-up approaches

ore often driven by stakeholder and policy needs and focus
nore on localised processes affecting vulnerability, adaptive
apacity and practical adaptation

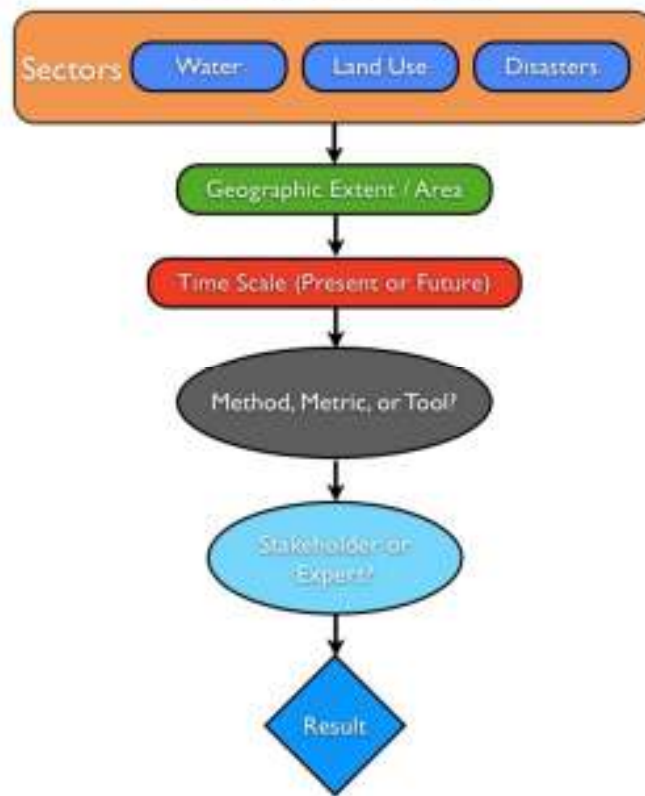|	Approach			
	Impact	**Vulnerability**	**Adaptation**	**Integrated**
s	Impacts and risks under future climate	Processes affecting vulnerability to climate change	Processes affecting adaptation and adaptive capacity	Interactions and feedbacks betv multiple drivers and impacts
	Actions to reduce risks	Actions to reduce vulnerability	Actions to improve adaptation	Global policy options and costs
	Standard approach to CCIAV Drivers-pressure-state-impact-response (DPSIR) methods Hazard-driven risk assessment	Vulnerability indicators and profiles Past and present climate risks Livelihood analysis Agent-based methods Narrative methods Risk perception including critical thresholds Development/sustainability policy performance Relationship of adaptive capacity to sustainable development		Integrated assessment modellin Cross-sectoral interactions Inte of climate with other drivers Stakeholder discussions Linking models across types and scale Combining assessment approaches/methods
	Top-down Global -> Local	Bottom-up Local -> Regional (macro-economic approaches are top-down)		Linking scales Commonly global/regional Often grid-based
	Exploratory scenarios of climate and other factors (e.g., SRES) Normative scenarios (e.g., stabilisation)	Socio-economic conditions Scenarios or inverse methods	Baseline adaptation Adaptation analogues from history, other locations, other activities	Exploratory scenarios: exogeno often endogenous (including feedbacks) Normative pathway
n	Research-driven	Research-/stakeholder-driven	Stakeholder-/research-driven	Research-/stakeholder-driven

Source: Carter et al., 2007

xamination of a number of toolboxes in different fields:

ere is no single pattern of construction;

verall design is based on a number of decisions, falling on
ntinuum between one extreme and another, which chang
epending on proposed users as well as the identified goa
e toolbox.
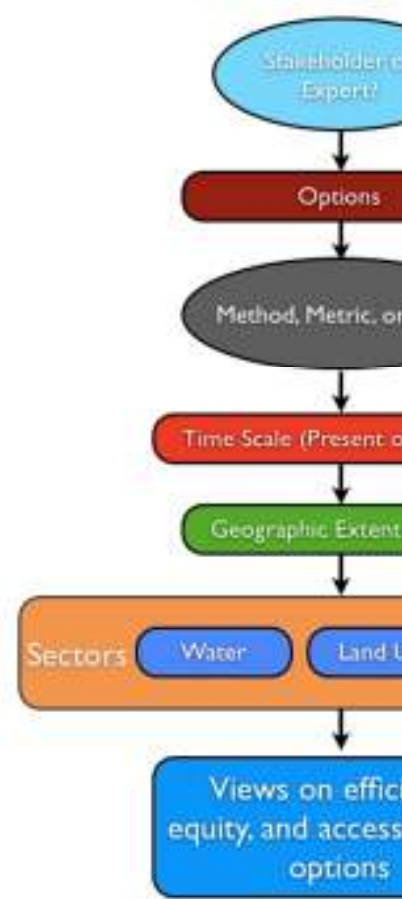
ach platform balances a choice between simple and
mplex, whether it be in verbose, in-depth descriptions of
ch component, or a simple, bullet point list overview, wit
ks to outside resources, or between a built in search too
owing for fast location of specific data and a structure tha
ads the user to the appropriate methods based on a linea
ebsite design.

roving users' experience

illing organization through
blogy

ndardizing the myriad of
hods and data

essing functionality of
vidual items

itively influencing the
grated methodology and
mon platform

Problem-Based
Organization

Stakeholder-C
Organiza

	Northern Europe, including the boreal and arctic region	Central and Eastern Europe, incl. mountain regions & Danube river basin	Southern Europe, covering the Mediterranean	Western Europe, covering the Atlantic countries	Europe-wide
Region					
Special emphasis on key sectors	Agriculture, forestry and biodiversity	Water management (floods) and agriculture	Water management (droughts), health (heat waves), cities, tourism	Riverbasin management	Flooding, agriculture, forest fires
Special emphasis on decision domain	Multilevel multisector resource management	Disaster management high cost, low probability events.	Multilevel multisector resource management	Disaster management, economic assessment	Identification of vulnerable hotspots, impacts and feedbacks
Decision problems	Stabilize agricultural livelihoods Maintaining biodiversity	Drought and floods on agriculture	How to help farmers against drought ? How to protect people against heat waves? How to help tourism against changing in tourist fluxes ?	Land use vs. riverbasin management	How to improve efficiency and equity in sharing extreme event risks over Europe, e.g. with EU Solidarity Fund**?**
Key partners (leader in bold)	**SYKE (Tim),** EC-JRC, WU	**REC (Zsuzsanna,** IIASA	**UNIFI (Marco),** UMP	**ALT (Saskia),** ECF, PIK	**EC-JRC (Alessandro),** IIASA
Models, tools and data possibly to be used	Land use models (IIASA)	Land use models (IIASA)	Land use models (IIASA) Crop models Data (see position paper)		JRC crop and flood risk models, CATSIM catastrophe simulation model (IIASA)
Possible gaps	…	… ..	Methodology to quantitative assessment of impact and adaptation in health and tourism sectors	….	Climate variability in climate projections

evelopment and improvement of a toolbox composed of methods and
etrics for assessing climate change impacts, vulnerability and adaptati
(A).

e interpret **improvement** as follows

Better linking methods and metrics to relevant adaptation policy need
voiced by stakeholders.

Better integration of tools for impacts, vulnerability and adaptation
assessment leading to a more consistent and systematic assessment
ntegration may occur by means of one integrated tool/model, often it
nean composing a set of IVA tools.

mprovement of individual tools and methods, which will however be le
he focus of this element of work.

studies as drivers for
elopment

rove:

ccess

nderstanding

vailability

ign iteratively

Name	Type	Class	Case
Cropsys	Model	Impact	CE4
Lisflood	Model	Impact	CE4
CATSIM	Model	Integrated	CE4
A1b NUTS2	Scenario	Scenario	CE4
A2	Scenario	Scenario	CE4
CLM (+ Fire module)	Model	Impact	EU F.F.
FP6 ENSEMBLES	Scenario	Scenario	EU F.F.
COSMO-CLM (Regional Climate)	Model	climate	EU F.F.
Grapevine growth model	Model	Impact	Tuscany Cas

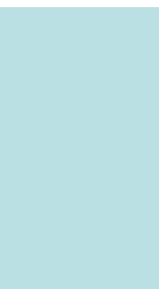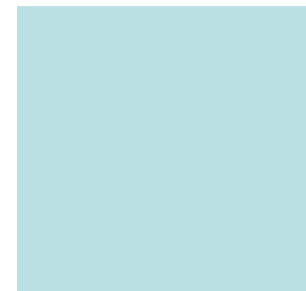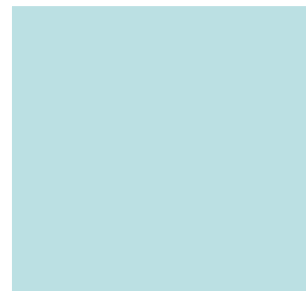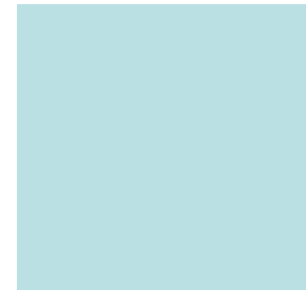| Field	Description
Description	Explains the type of framework or tool being presented, what type of information this tool helps the user to evaluate and provides a basic summary of how the tool works, including the type of data required and the processes used to evaluate these data.
Appropriate use	Describes where the framework or tool is (and is not) applicable. This gives the user an idea of the stage at which it is appropriate to use.
Scope	Covers the spatial scope in which the framework or tool is applicable
Key output	Describes the final product of the framework or tool (e.g., a model, a cost effectiveness evaluation, an organizing framework).
Key input	Explains the information or data required to use the framework or tool.
Ease of use	Describes the level of difficulty associated with implementing the framework or tool.
Background	A short summary and citations of any previous research
Training required	Describes the level of expertise and any specific skills required to use the framework or tool effectively.
Training available	Describes the training available to learn how to use the framework or tool effectively.
Computer requirements	Describes the computer hardware and software necessary to use the framework or tool.
Documentation	Provides the citations for sources describing in detail how to use the framework or tool. Generally this is a user's manual or similar document.
Applications	Briefly describes actual cases and projects where the framework or tool has been applied.
Contacts for framework/tools, documentation, technical assistance	Provides information on who to contact for further information, documentation, and technical assistance.

...ASE   IMPACT   VULNERABILITY   ADAPTATION   INTEGRATED

TOOLS AND METHODS

P
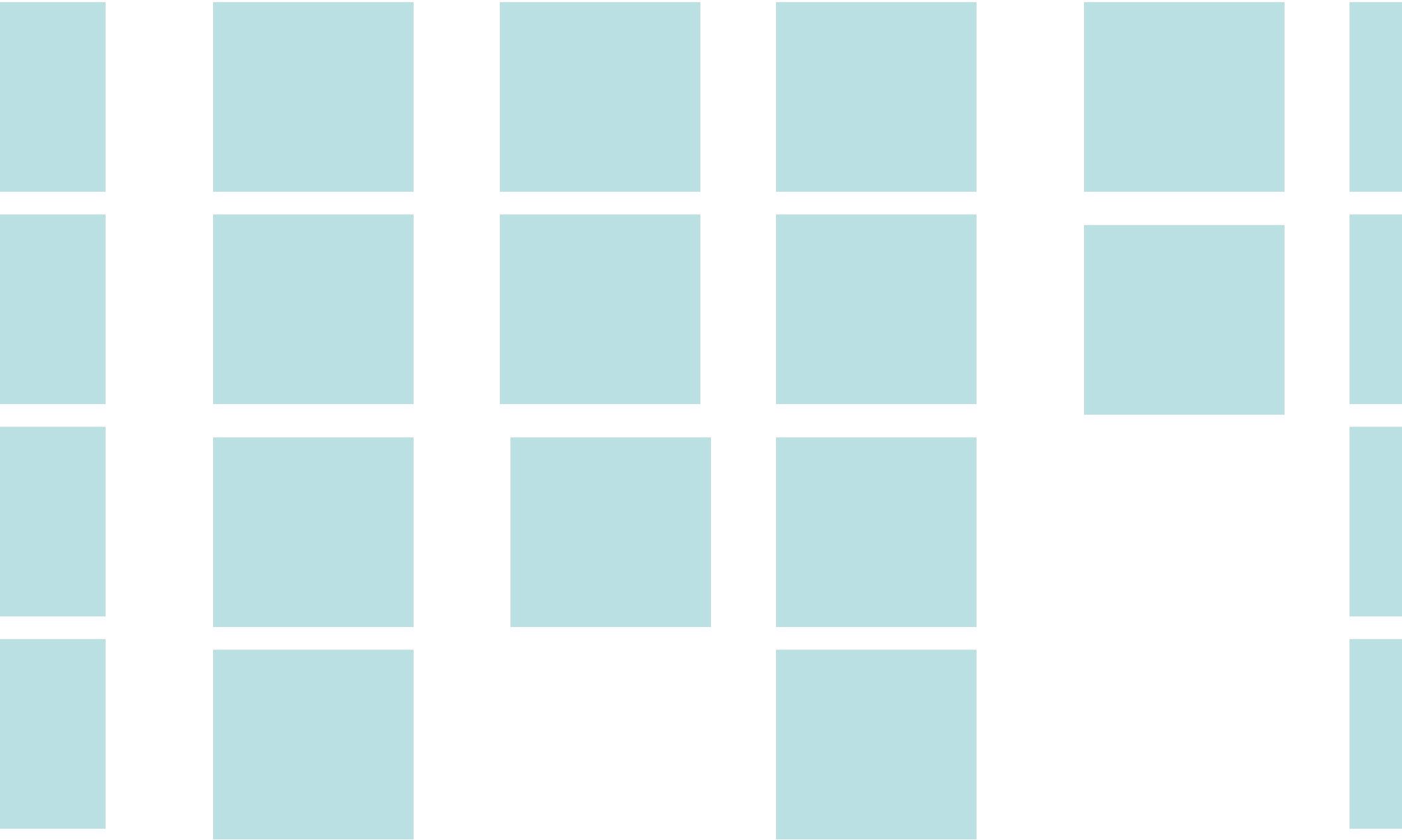
IMPACT   VULNERABILITY   ADAPTATION   INTEGRATED

arta: Increasing
of weather
infall) can lead
stress and
hock (profound
hat can

radual onset,
ints/thresholds
domains that
y undesirable

CROPSYST
LISFLOOD

Scoping of
options by
way of
Interviews

CATSIM: Risk
Management

Actors:
- Public,
•Land ow
•Actors
managen
policies i
•Actors
planning
•Nationa
conserva
of the En
•Local po
•Insuran
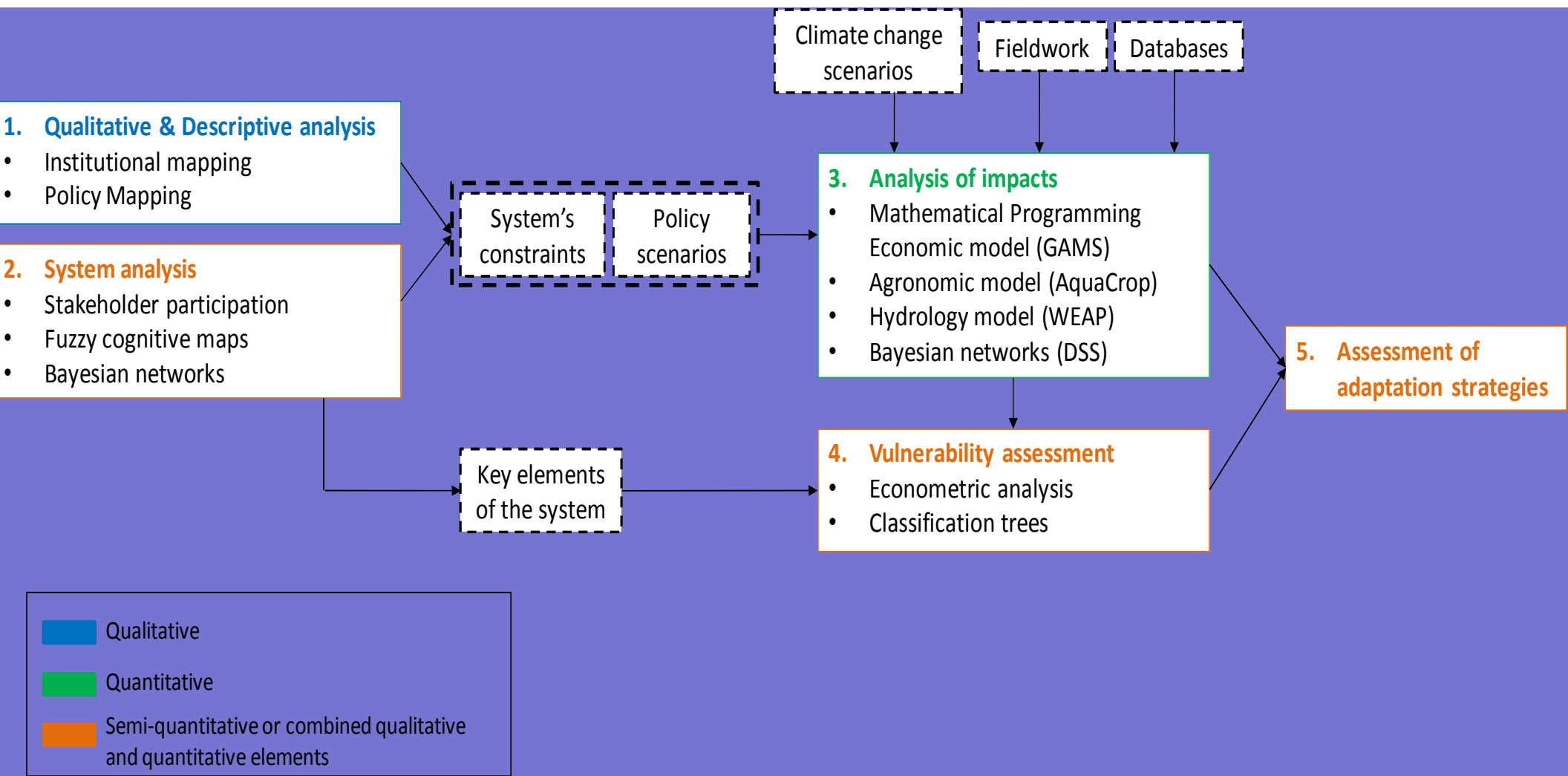
Climate change scenarios

Fieldwork

Databases

1. Qualitative & Descriptive analysis
- Institutional mapping
- Policy Mapping

2. System analysis
- Stakeholder participation
- Fuzzy cognitive maps
- Bayesian networks

System's constraints

Policy scenarios

3. Analysis of impacts
- Mathematical Programming Economic model (GAMS)
- Agronomic model (AquaCrop)
- Hydrology model (WEAP)
- Bayesian networks (DSS)

5. Assessment of adaptation strategies

Key elements of the system

4. Vulnerability assessment
- Econometric analysis
- Classification trees

Qualitative

Quantitative

Semi-quantitative or combined qualitative and quantitative elements

entification of research priorities

aising awareness of climate problems

rioritisation of action areas

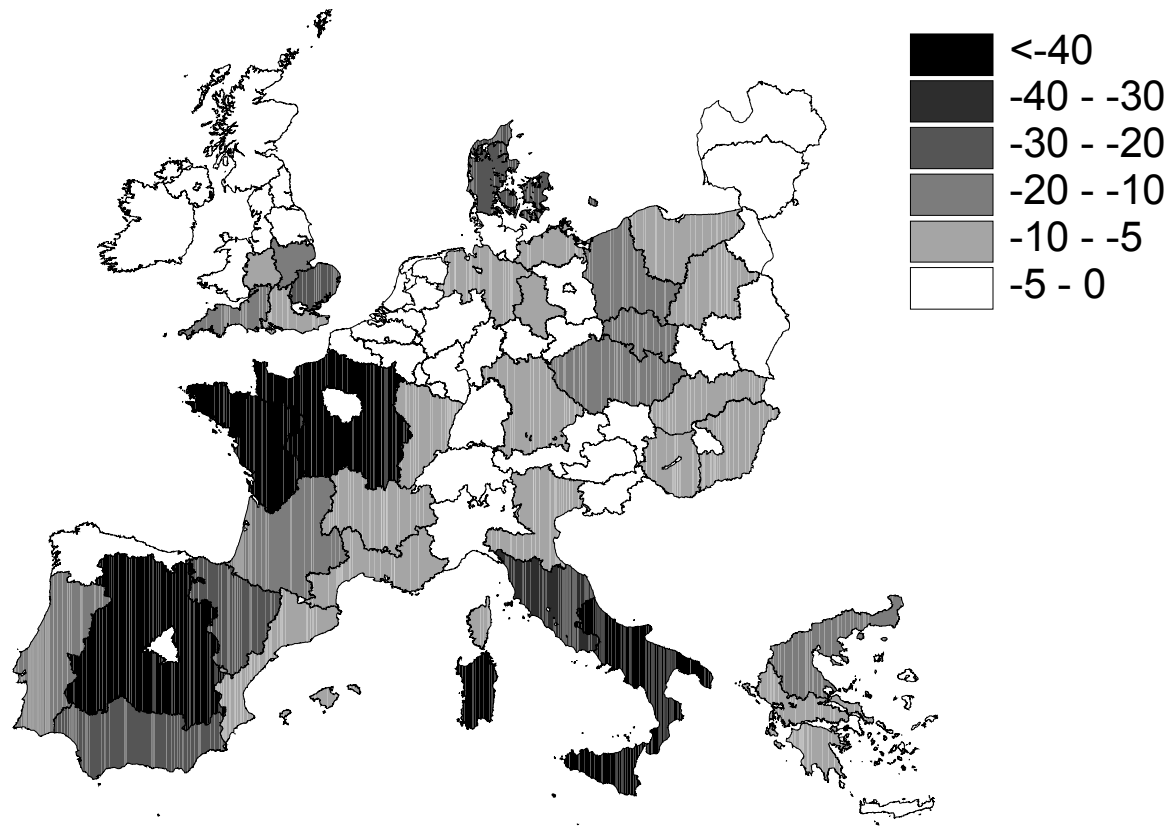etermining the effectiveness of interventions

xploring trade-offs between adaptation and mitigation policies

lentification of (most) vulnerable sectors and communities

lentification of adaptation measures

ainstreaming climate into wider policy agendas (e.g. sustainable
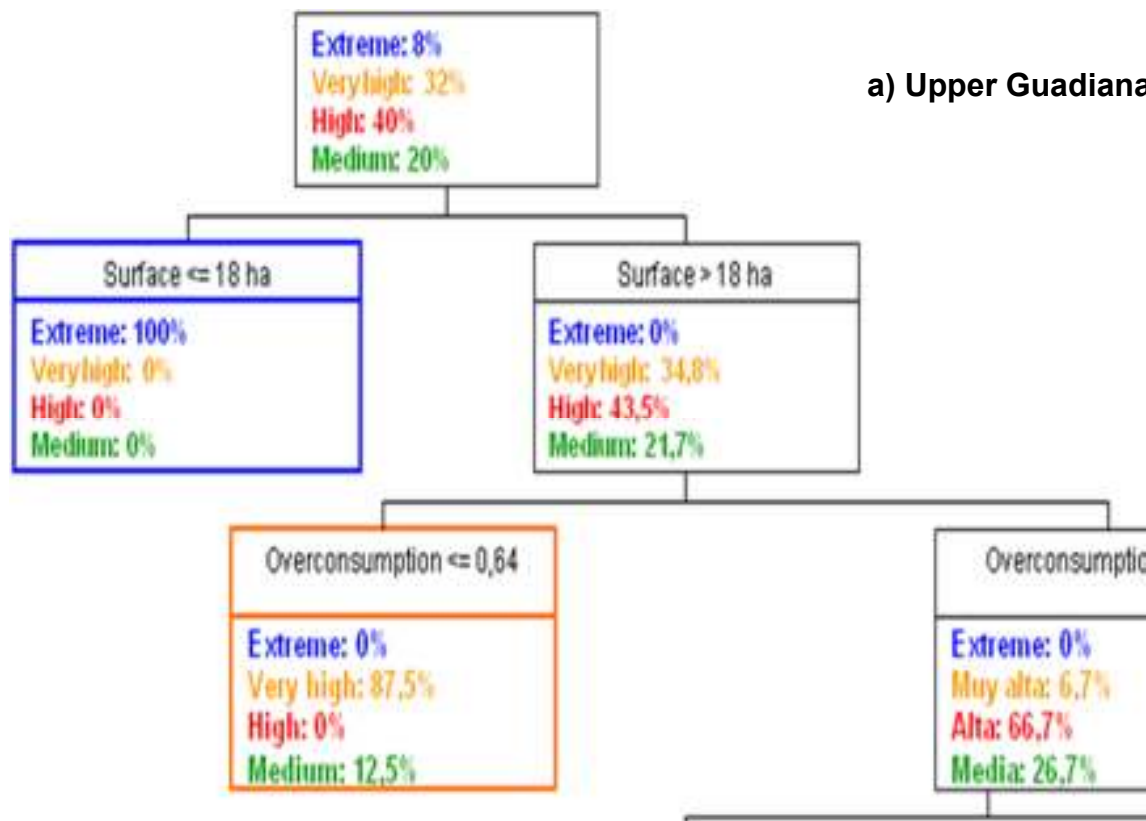**evelopment, regional and fiscal planning)**

Annualised monetary risk due to combined heatwave and drought stress for spring wheat calculated for the present period (1975-2005) on a NUTS 1 level (losses in € millions)

Legend:
- <-40
- -40 - -30
- -30 - -20
- -20 - -10
- -10 - -5
- -5 - 0

B

C

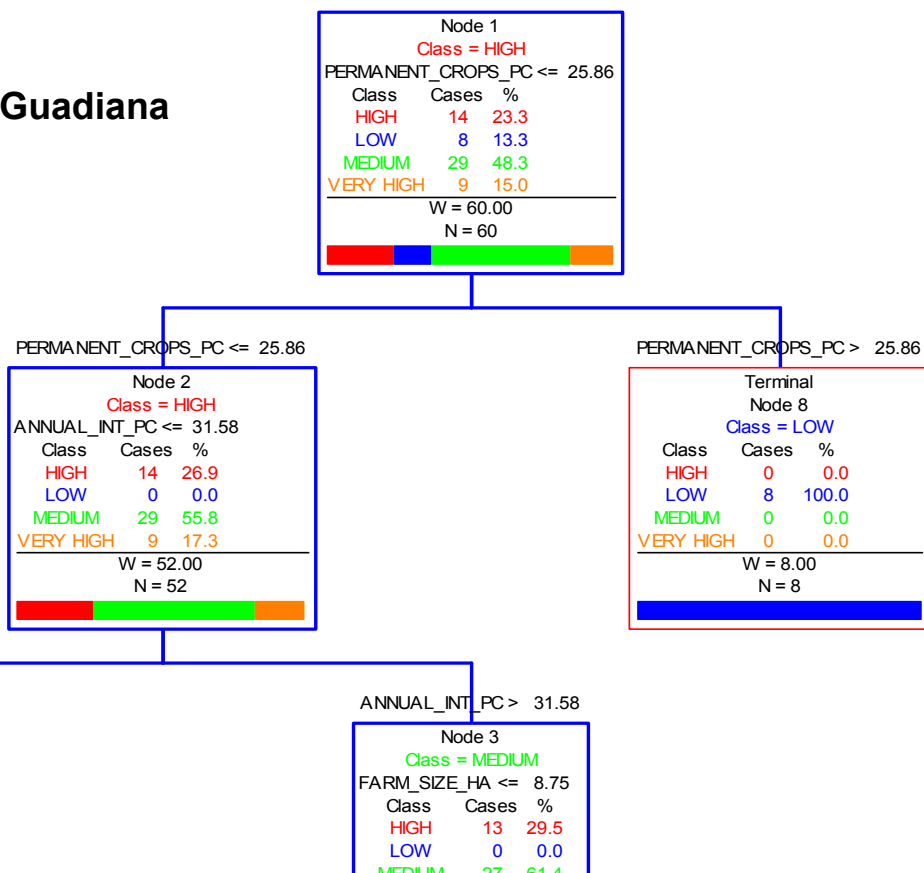|	
■	<-40
■	-40 - -30
■	-30 - -20
▓	-20 - -10
▓	-10 - -5
▒	-5 - 0
□	0 - 5
░	5 - 10
░	10 - 20
▒	20 - 30
▒	30 - 40
▒	>40
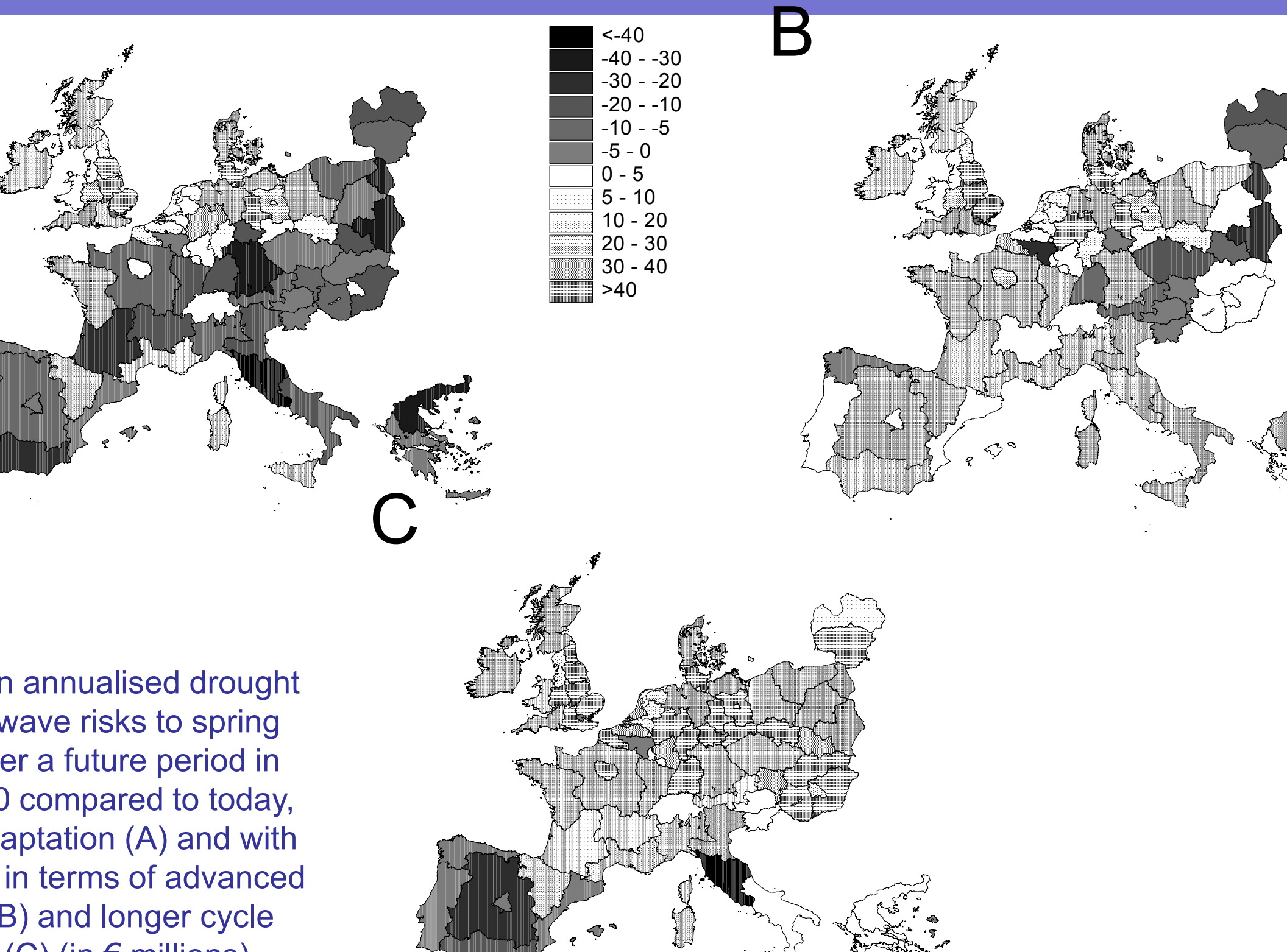
n annualised drought
wave risks to spring
er a future period in
0 compared to today,
aptation (A) and with
in terms of advanced
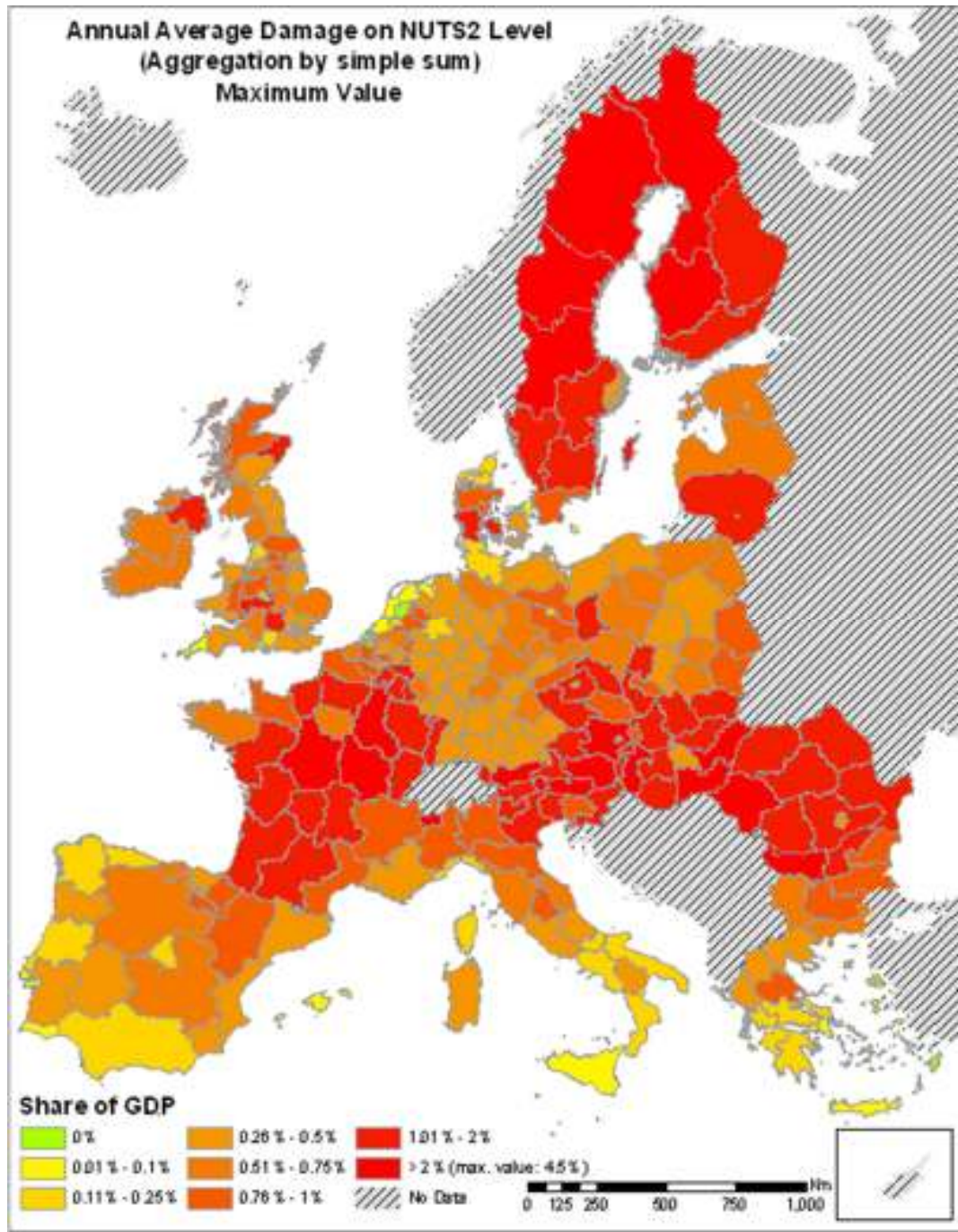B) and longer cycle
(C) (in 6 millions)

ART Classification trees

ddle Guadiana

Upper Guadiana tree (a):

Extreme: 8%
Very high: 32%
High: 40%
Medium: 20%

Surface <= 18 ha
Extreme: 100%
Very high: 0%
High: 0%
Medium: 0%

Surface > 18 ha
Extreme: 0%
Very high: 34,8%
High: 43,5%
Medium: 21,7%

Overconsumption <= 0,64
Extreme: 0%
Very high: 87,5%
High: 0%
Medium: 12,5%

Overconsumpti
Extreme: 0%
Muy alta: 6,7%
Alta: 66,7%
Media: 26,7%

Middle Guadiana tree (b):

Node 1
Class = HIGH
PERMANENT_CROPS_PC <= 25.86

Class	Cases	%
HIGH	14	23.3
LOW	8	13.3
MEDIUM	29	48.3
VERY HIGH	9	15.0

W = 60.00
N = 60

PERMANENT_CROPS_PC <= 25.86

Node 2
Class = HIGH
ANNUAL_INT_PC <= 31.58

Class	Cases	%
HIGH	14	26.9
LOW	0	0.0
MEDIUM	29	55.8
VERY HIGH	9	17.3

W = 52.00
N = 52

PERMANENT_CROPS_PC > 25.86

Terminal
Node 8
Class = LOW

Class	Cases	%
HIGH	0	0.0
LOW	8	100.0
MEDIUM	0	0.0
VERY HIGH	0	0.0

W = 8.00
N = 8

31.58

GH
%
12.5
0.0

ANNUAL_INT_PC > 31.58

Node 3
Class = MEDIUM
FARM_SIZE_HA <= 8.75

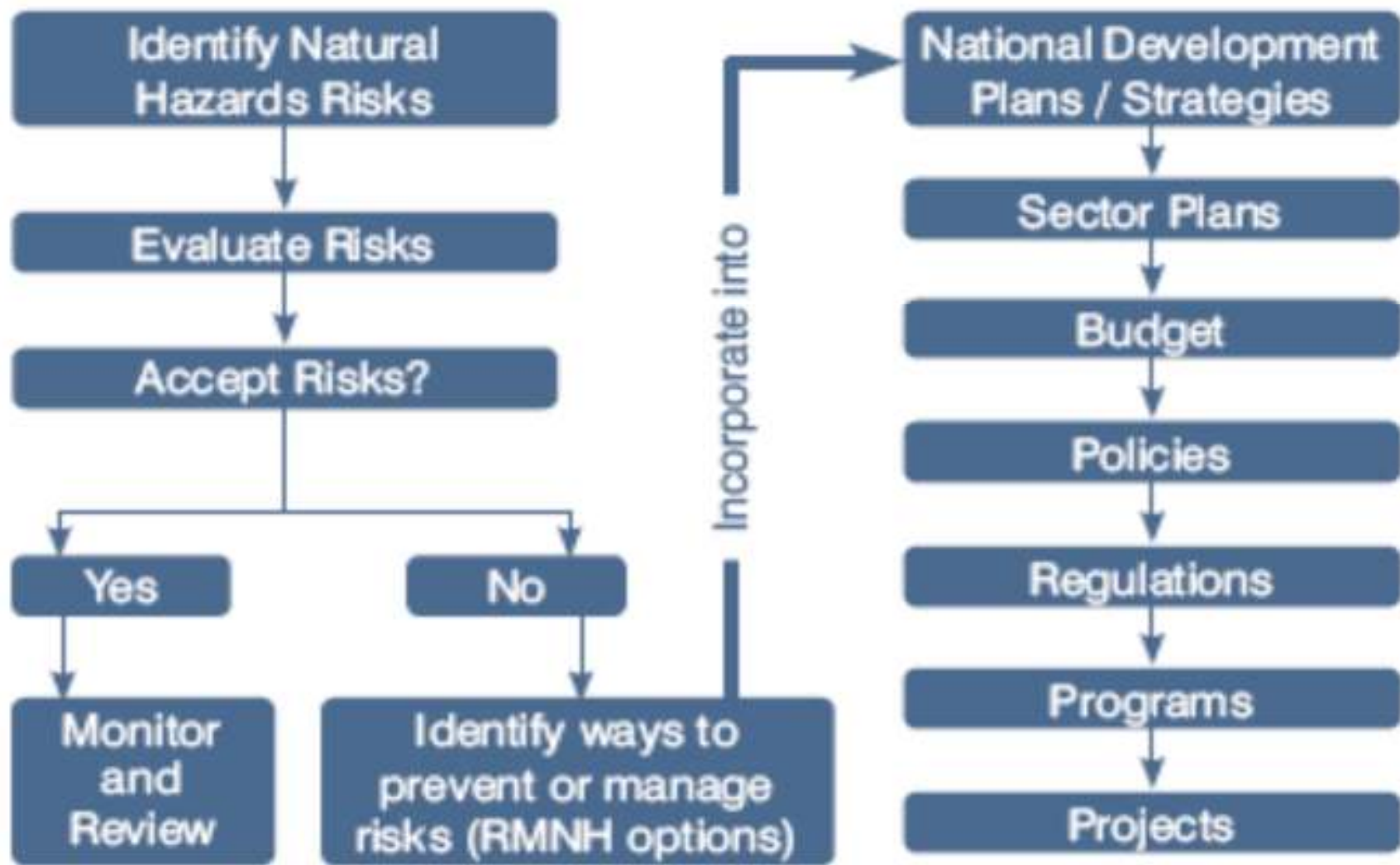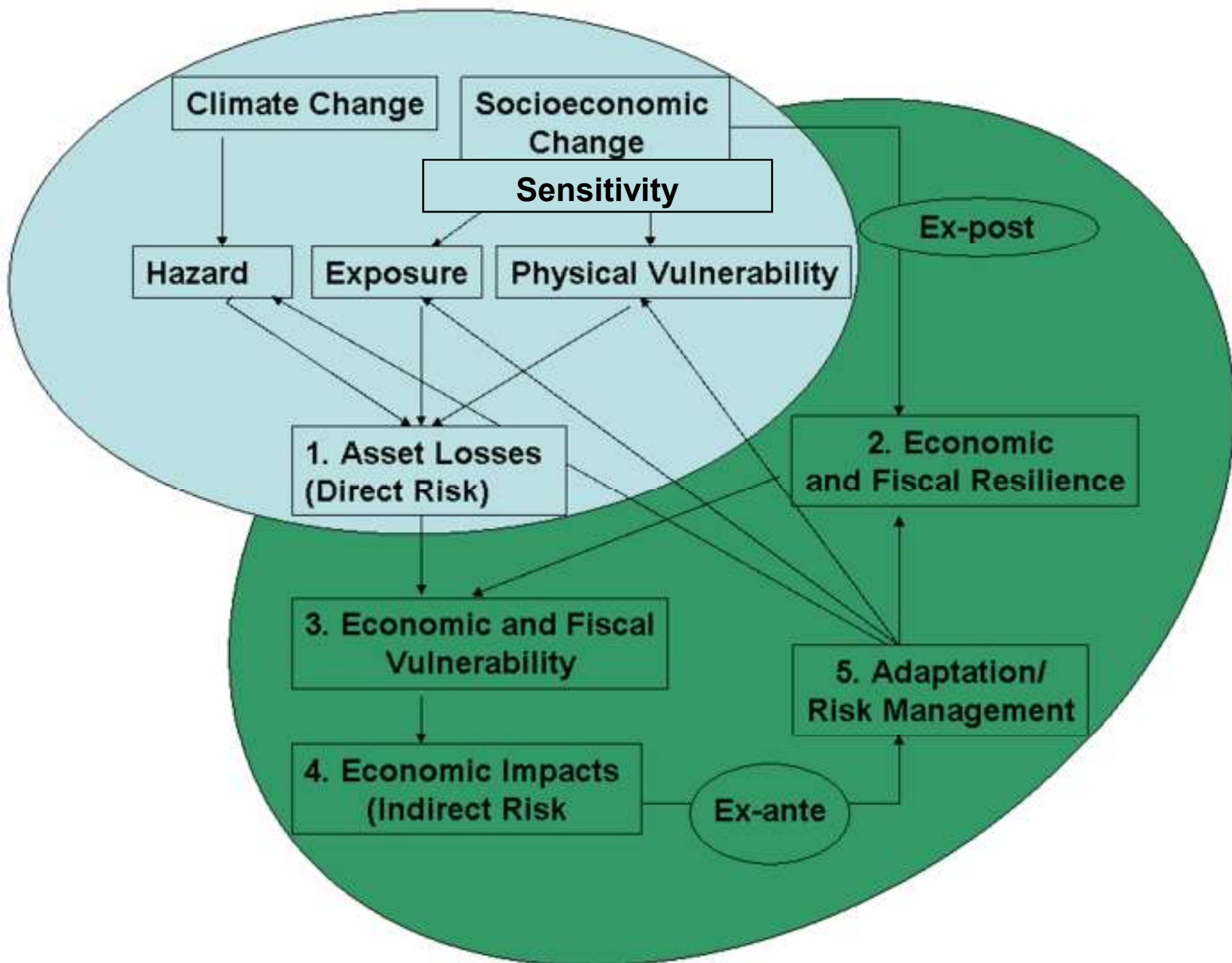| Class	Cases	%
HIGH	13	29.5
LOW	0	0.0

Source: a) Varela-Ortega et al. (2007) and b) E

Annual average flood damage for European provinces and regions (NUTS 2 level) as a

Source: Bettencourt e

Fiscal vulnerability

Legend:
- ■ Government flood risk liability
- ▨ Projected fiscal deficit 2009

Y-axis: Per cent of GDP (0% to 6%)

Countries: Austria, Hungary, Romania, Czech Republic, Latvia, Poland, Bulgaria, Slovakia, Lithuania
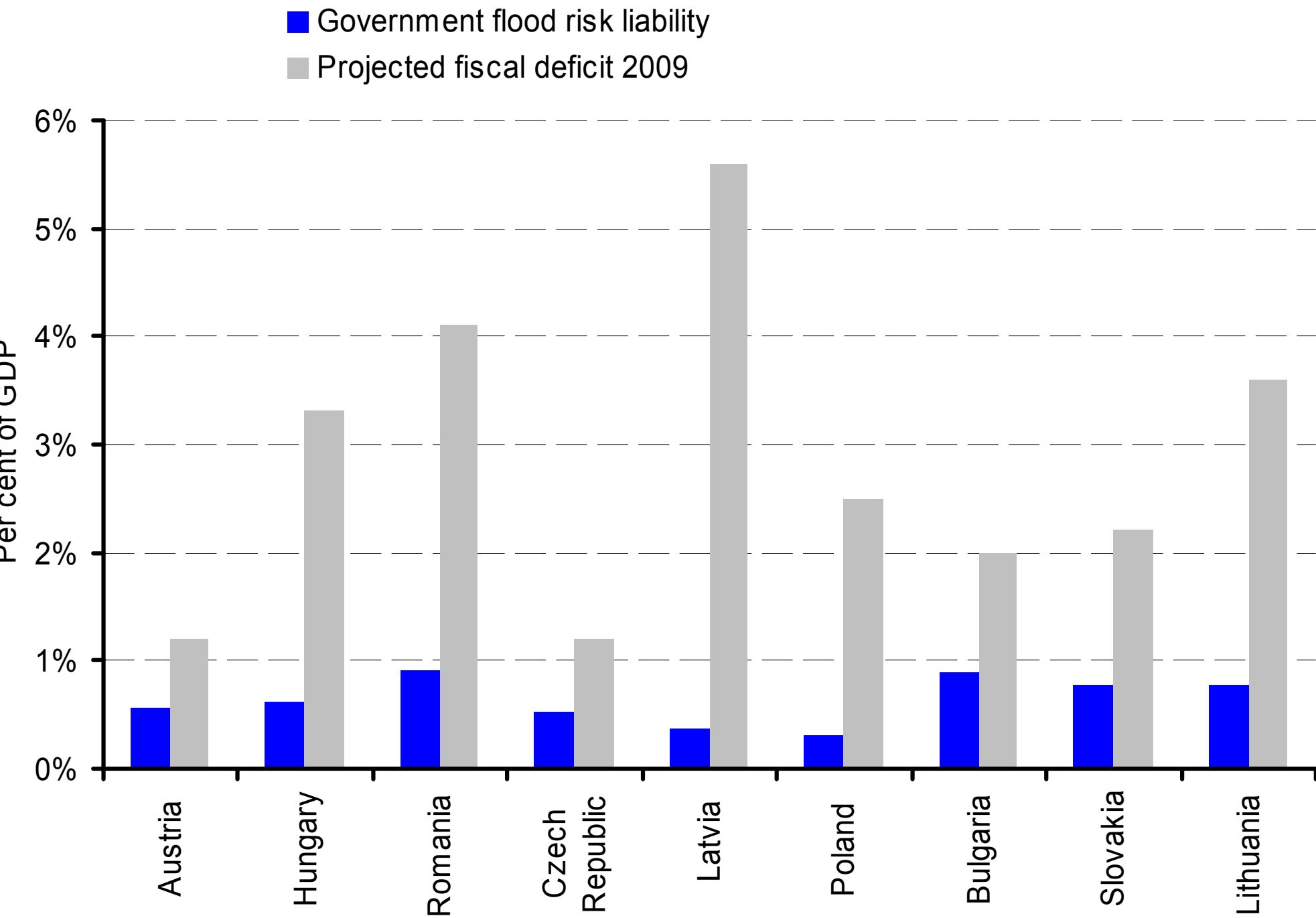
e fund

s capitalized at €1 billion

covers public expenses for restoring public infrastruct
providing services for relief and clean up, and protecti
cultural heritage

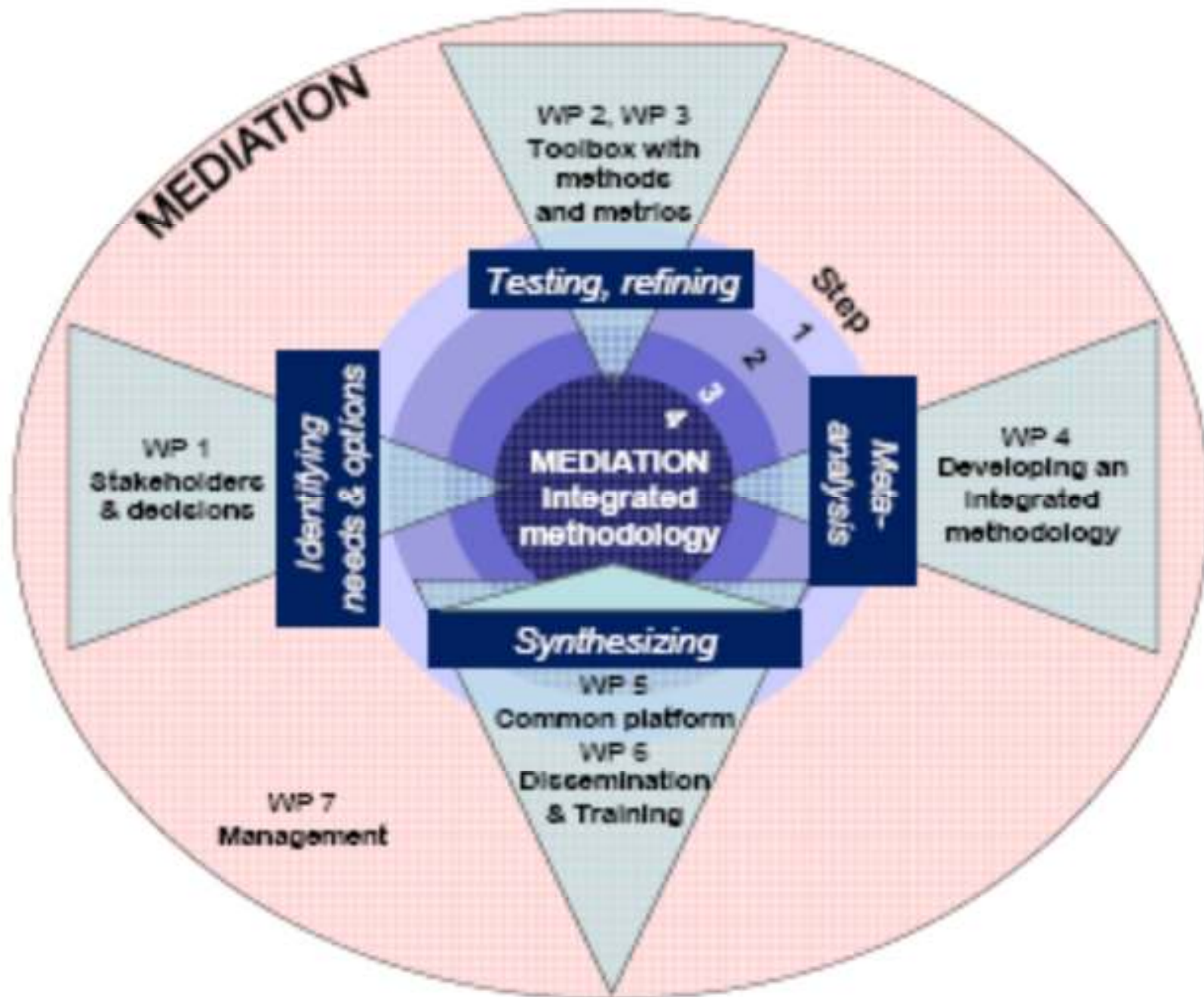can be called upon if natural disaster exceeds €3 billi
or 0.6% of gross national income

n exceptional cases, can be mobilized for regional
disasters that do not reach this threshold

Payment distribution for the EUSF
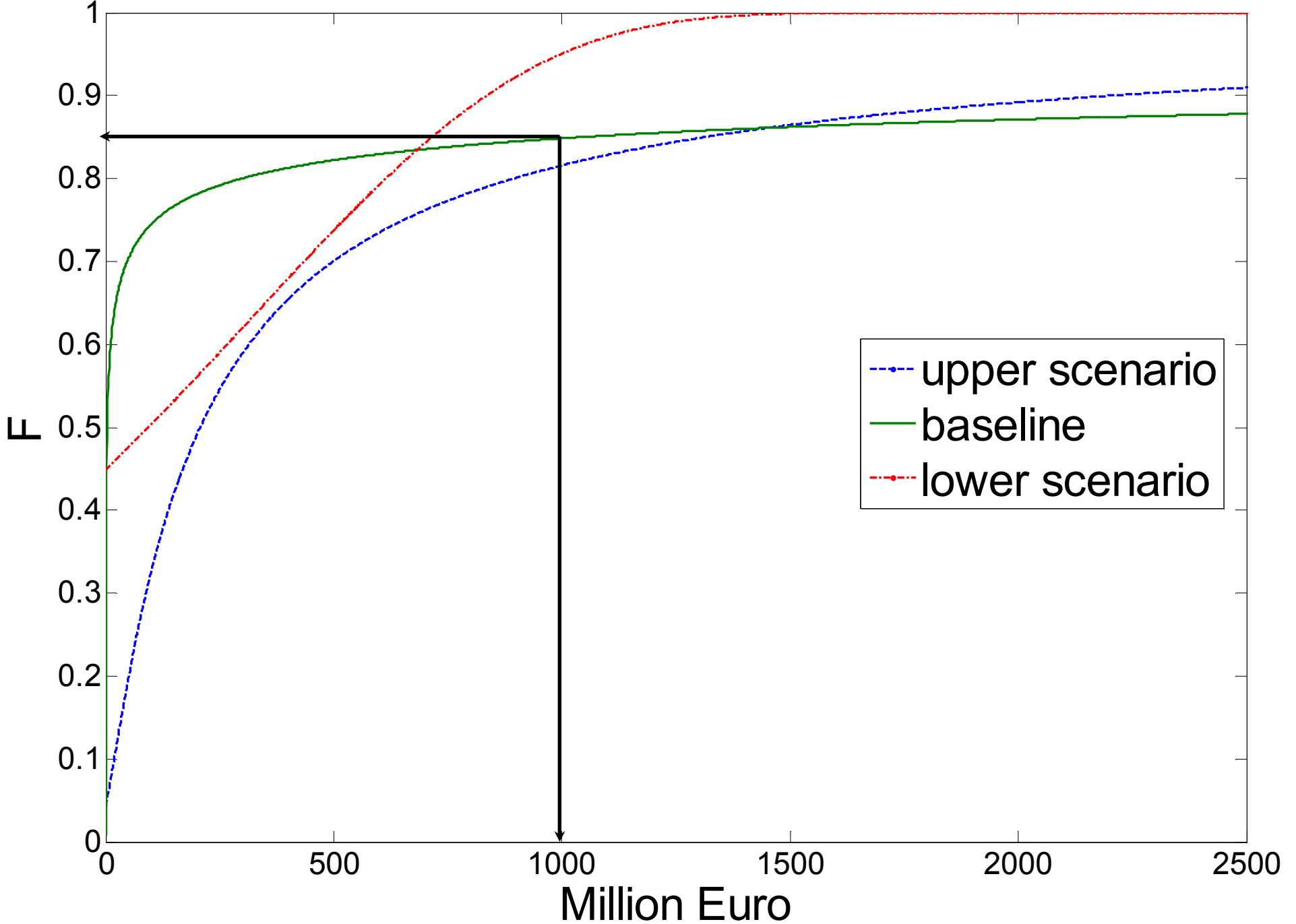
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MEDIATION

Methodology for Effective Decision-making on Impacts and AdaptaTION

Until recently, climate change policy in Europe focused on reduction of greenhouse gases. After the turn of the century, decision makers at the international, national, regional and local level in Europe increasingly recognized their own vulnerability to climate change impacts. To reduce this vulnerability in the most cost-effective way, they need scientific and technical information about climate change impacts, vulnerability and adaptation options. Currently, the availability of such information in Europe is fragmented and incomplete.

MEDIATION addresses this challenge through six activities:

- analysis of the decision-making context;
- inventory, review and further development of methods and metrics for impacts and vulnerability analysis;
- inventory, review and further development of methods and metrics for costing of impacts and adaptation options;
- the development of an overarching integrated methodology;
- the development of a flexible, interactive common platform for knowledge sharing;
- disseminating this knowledge through a dedicated outreach and training programme.

The components of the project will be connected in an iterative fashion, making use of a number of diverse case studies in different regions in Europe which combine selected regional, sectoral and cross-sectoral characteristics and policy questions. The projects aims at supporting the implementation of the EU White Paper on Climate Change Adaptation.

▶ partners

ALTERRA
WAGENINGEN UR

IIASA
Science for
Global Insight

ECF
European
Climate Forum

JRC
EUROPEAN COMMISSION

PIK

THE REGIONAL
ENVIRONMENTAL CENTER

SEI STOCKHOLM
ENVIRONMENT
INSTITUTE
BRIDGING SCIENCE AND POLICY SINCE 1989

SYKE

WAGENINGEN UR
for quality of life