



27/11/2019

Climate Change seminar

Climate Change Adaptation

By

Irakli

Dorota

Anna Maria

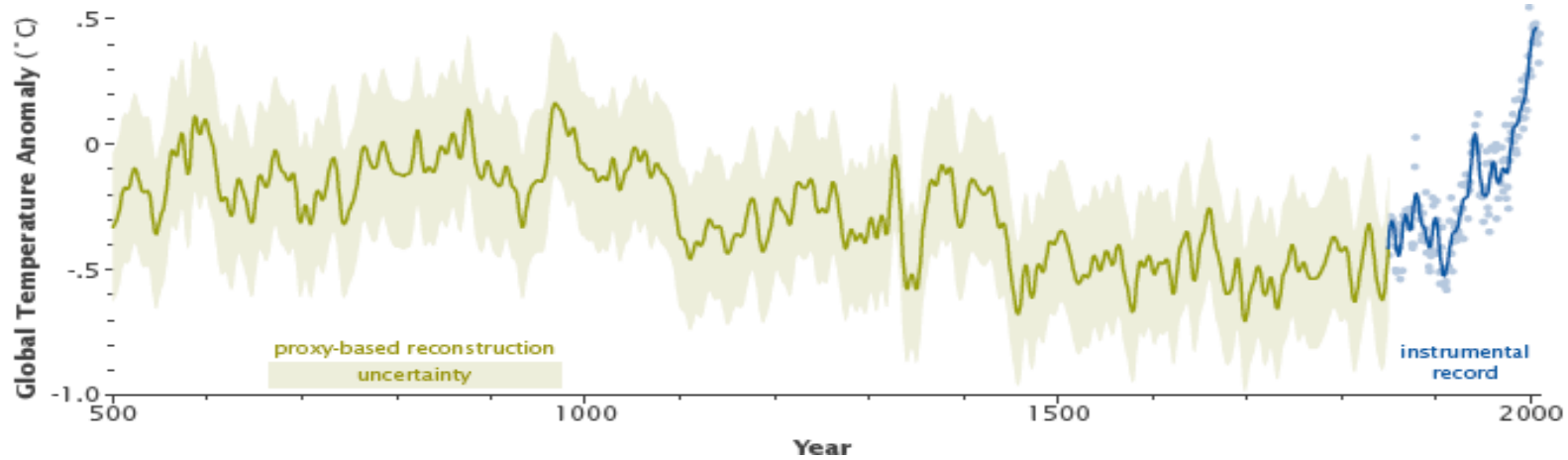
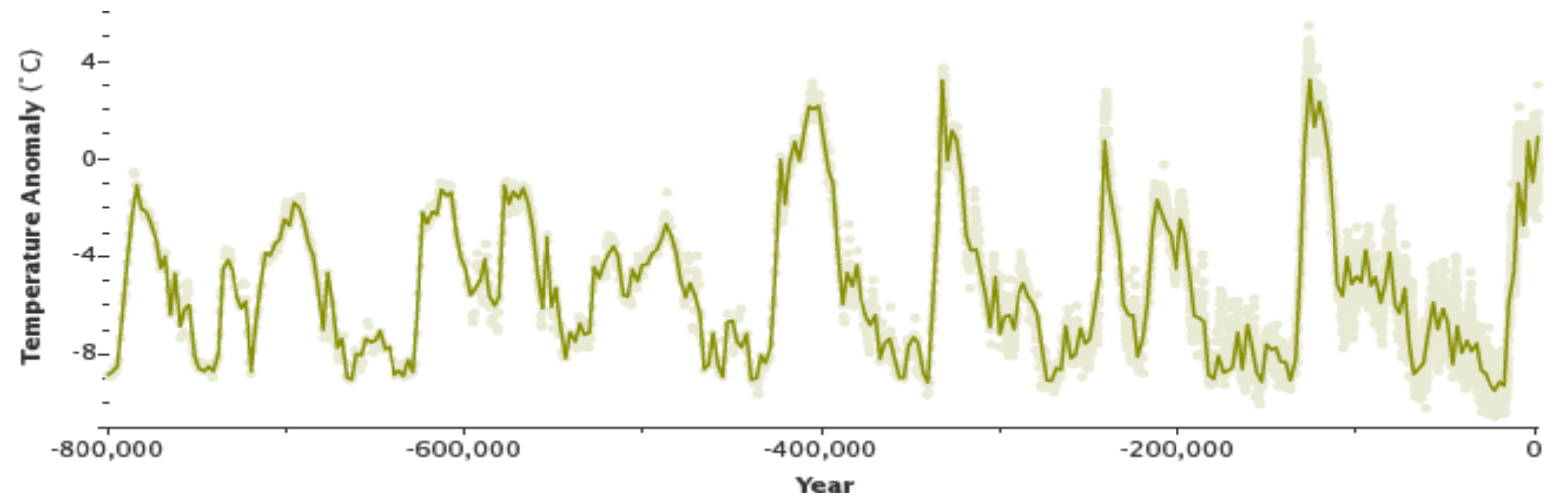
Michał

Juki

Climate Change Adaptation

- Global Warming
- Climate Change
- Climate Change Mitigation
- Climate Change Adaptation

Climate Change in Time



Adaptation needs - arise when the anticipated risks or experienced impacts of climate change require action to ensure the safety of populations and the security of assets, including ecosystems and their services.

They are the gap between what might happen as the climate changes and what we would desire to happen.

- **Biophysical and Environmental Needs**
- **Social Needs**
- **Institutional Needs**
- **Need for Engagement of the Private Sector**
- **Information, Capacity, and Resource Needs**

Adaptation options – Ways of adaptation that are based on needs identification that derive from climate risks and vulnerabilities.

Category		Examples of options*
Structural/ physical	Engineered and built environment	Sea walls and coastal protection structures (5.5.2 and 24.4.3.5; Figure 5-5); flood levees and culverts (26.3.3); water storage and pump storage (Section 23.3.4); sewage works (3.5.2.3); improved drainage (24.4.5.5); beach nourishment (5.4.2.1); flood and cyclone shelters (11.7); building codes (Section 8.1.5); storm and waste water management (8.2.4.1); transport and road infrastructure adaptation (8.3.3.6); floating houses (8.3.3.4); adjusting power plants and electricity grids (10.2.2; Table 10-2)
	Technological	New crop and animal varieties (7.5.1.1.1, 7.5.1.1.3, 7.5.1.3; Box 9-3; Table 9-7); genetic techniques (27.3.4.2); traditional technologies and methods (7.5.2, 27.3.4.2, 28.2.6.1, and 29.6.2.1); efficient irrigation (10.3.6 and 22.4.5.7; Box 20-4); water saving technologies (24.4.1.5 and 26.3.3) including rainwater harvesting (8.3.3.4); conservation agriculture (9.4.3.1 and 22.4.5.7); food storage and preservation facilities (22.4.5.7); hazard mapping and monitoring technology (15.3.2.3 and 28.4.1); early warning systems (7.5.1.1, 8.1.4.2, 8.3.3.3, 11.7.3, 15.4.3.2, 18.6.4, 22.2.2.1, 22.3.5.3, and 22.4.5.2); building insulation (8.3.3.3); mechanical and passive cooling (8.3.3.3); renewable energy technologies (29.7.2); second-generation biofuels (27.3.6.2)
	Ecosystem-based ^a	Cross Chapter Box CC-EA, Ecological restoration (5.5.2, 5.5.7, 9.4.3.3, and 27.3.2.2; Box 15-1) including wetland and floodplain conservation and restoration; increasing biological diversity (26.4.3); afforestation and reforestation (Box 22-2); conservation and replanting mangrove forest (15.3.4 and 29.7.2); bushfire reduction and prescribed fire (Section 24.4.2.5; Box 26-2); green infrastructure (e.g., shade trees, green roofs) (8.2.4.5, 8.3.3, 11.7.4, and 23.7.4); controlling overfishing (28.2.5.1 and 30.6.1); fisheries co-management (9.4.3.4 and 27.3.3.1); assisted migration or managed translocation (4.4.2.4, 24.4.2.5, 24.4.3.5, and 25.6.2.3); ecological corridors (4.4.2.4); ex situ conservation and seed banks (4.4.2.5); community-based natural resource management (CBNRM) (22.4.5.6); adaptive land use management (Section 23.6.2)
	Services	Social safety nets and social protection (Box 13-2; 8.3, 17.5.1, and 22.4.5.2); food banks and distribution of food surplus (29.6.2.1); municipal services including water and sanitation (3.5.2.3 and 8.3.3.4); vaccination programs (11.7.1), essential public health services (11.7.2) including reproductive health services (11.9.2) and enhanced emergency medical services (8.3.3.8); international trade (9.3, 9.4, and 23.9.2)
Social	Educational	Awareness raising and integrating into education (11.7, 15.2, and 22.4.5.5); gender equity in education (Box 9-2); extension services (9.4.4); sharing local and traditional knowledge (12.3.4 and 28.4.1) including integrating into adaptation planning (29.6.2.1); participatory action research and social learning (22.4.5.3); community surveys (Section 8.4.2.2); knowledge-sharing and learning platforms (8.3.2.2, 8.4.2.4, 15.2.4.2, and 22.4.5.4); international conferences and research networks (8.4.2.5); communication through media (22.4.5.5)
	Informational	Hazard and vulnerability mapping (11.7.2, 8.4.1.5); early warning and response systems (15.4.2.3 and 22.4.5.2) including health early warning systems (11.7.3, 23.5.1, 24.4.6.5, and 26.6.3); systematic monitoring and remote sensing (15.4.2.1 and 28.6); climate services (2.3.3) including improved forecasts (27.3.4.2); downscaling climate scenarios (8.4.1.5); longitudinal data sets (26.6.2); integrating indigenous climate observations (22.4.5.4, 25.8.2.1, and 28.2.6.1); community-based adaptation plans (5.5.1.4 and 24.4.6.5) including community-driven slum upgrading (8.3.2.2) and participatory scenario development (22.4.4.5)
	Behavioral	Accommodation (5.5.2); household preparation and evacuation planning (23.7.3); retreat (5.5.2) and migration (29.6.2.4), which has its own implications for human health (11.7.4) and human security (12.4.2); soil and water conservation (23.6.2 and 27.3.4.2); livelihood diversification (7.5.1.1, 7.5.2, and 22.4.5.2); changing livestock and aquaculture practices (7.5.1.1); crop-switching (22.3.4.1); changing cropping practices, patterns, and planting dates (7.5.1.1.1, 23.4.1, 26.5.4, and 27.3.4.2; Table 24-2); silvicultural options (25.7.1.2); reliance on social networks (Section 29.6.2.2)
Institutional	Economic	Financial incentives including taxes and subsidies (Box 8-4; 8.4.3 and 17.5.6); insurance (8.4.2.3, 13.3.2.2, 15.2.4.6, 17.5.1, 26.7.4.3, and 29.6.2.2; Box 25-7) including index-based weather insurance schemes (9.4.2 and 22.4.5.2); catastrophe bonds (8.4.2.3 and 10.7.5.1); revolving funds (8.4.3.1); payments for ecosystem services (9.4.3.3 and 27.6.2; Table 27-7); water tariffs (8.3.3.4.1 and 17.5.3); savings groups (8.4.2.3 and 11.7.4; Box 9-4); microfinance (Box 8-3; 22.4.5.2); disaster contingency funds (22.4.5.2 and 26.7.4.3); cash transfers (Box 13-2)
	Laws and regulations	Land zoning laws (22.4.4.2 and 23.7.4); building standards (8.3.2.2, 10.7.5, and 22.4.5.7); easements (27.3.3.2); water regulations and agreements (26.3.4 and 27.3.1.2); laws to support disaster risk reduction (8.3.2.2); laws to encourage insurance purchasing (10.7.6.2); defining property rights and land tenure security (22.4.6 and 24.4.6.5); protected areas (4.4.2.2); marine protected areas (Box CC-CR Chapter 6; 23.6.5 and 27.3.3.2); fishing quotas (23.9.2); patent pools and technology transfer (15.4.3 and 17.5.5)
	Government policies and programs	National and regional adaptation plans (15.2 and 22.4.4.2; Box 23-3) including mainstreaming climate change; sub-national and local adaptation plans (15.2.1.3 and 22.4.4.4; Box 23-3); urban upgrading programs (8.3.2.2); municipal water management programs (8.3.3.4; Box 25-2); disaster planning and preparedness (11.7); city-level plans (8.3.3.3 and 27.3.5.2; Boxes 26-3 and 27-1), district-level plans (26.3.3), sector plans (26.5.4), which may include integrated water resource management (3.6.1 and 23.7.2), landscape and watershed management (4.4.2.3), integrated coastal zone management (2.4.3, 5.5.4.1, and 23.7.1), adaptive management (2.2.1.3 and 5.5.1.4; Box 5-2), ecosystem-based management (6.4.2.1), sustainable forest management (2.3.4), fisheries management (7.5.1.1.3 and 30.6.2.1), and community-based adaptation (5.5.4.1, 8.4, 15.2.2, 21.3.2, 22.4.4.5, 24.5.2, 29.6.2.2, and 29.6.2.3; Tables 5-4 and 8-4; FAQ 15.1)

Adaptation assessments – is an assessment of the factors that determine the nature of, and vulnerability to, climate risks (climate change assessments, climate impacts and risk assessments, and vulnerability assessments) and that is needed to identify adaptation needs.

Assessment of adaptation options – is aimed at revealing possible ways of adaptations that are at hand to reduce risks (adaptation assessment).

Trends in assessments

- Impact-based
- Vulnerability-based
- Adaptation-based
- Standard scenario-driven, impact-based

Measuring adaptation

- No system for measurement
- What to be measured (vulnerability, resilience, risk management, increase in adaptative capacities)
- Measuring resource allocations
- Measuring monitoring and evaluation
- Problem of assessment validation

Maladaptation - actions, or inaction that may lead to increased risk of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future.

- Decision-making that ignores science, wider implications or likely consequences
- Actions favoring one interest group over another, laying ground for future conflict and damage
- Unwise trade-offs: short vs long term benefits, risk vs reward (moral hazard), too short vs too long consideration period
- Actions that determine path dependency and lock in or that eliminate choices for future generations
- Relocation that puts populations in even more threatening conditions

Adaptation throughout time

- Short range (10 years)
- Medium range (10-30 years)
- Long range (30-100 years)

Adaptation levels

- Individual/Group
- Community/Public
- National
- International/Global

Types of adaptation

- **Anticipatory** – that takes place before impacts of climate change are observed. Also referred as proactive adaptation.
- **Autonomous** – that does not constitute a conscious response to climate stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. Also referred as spontaneous adaptation.
- **Planned** – that is the result of a deliberate policy decision, based on and awareness that conditions have changed or are about to change and that action is required to return to, maintain or achieve a desired state.
- **Private** – that is initiated and implemented by individuals, households or private companies. Private adaptation is usually in the actor's rational self-interest.
- **Public** - - that is initiated and implemented by governments at all levels. Public adaptation is usually directed at collective needs.
- **Reactive** – that takes place after impacts of climate change have been observed.

Detailed planning and implementation steps (steps for planning and implementation of adaptation measures)

- **Step 1.** Analyze past observation data, review responses (including existing measures) to climate change and extreme weather events
- **Step 2.** Plan and implement monitoring of climate change and its impacts
- **Step 3.** Project future climate change and its impacts
- **Step 4.** Assess impacts, vulnerability, resilience, and risk
- **Step 5.** Determine need for adaptation measures, determine priority
- **Step 6.** Design and implement adaptation measures, Start with the most feasible initiatives
- **Step 7.** Track and assess progress and effects of adaptation policies and measures and revise regularly
- **Step 8.** Conduct integrated adaptation, basic capacity enhancement (These approaches include integration of measures planned on a sectoral basis to a unified and effective adaptation plan, and enhancement of basic capacities of localities and sectors such as technologies and human resources. These should be implemented with a systematic and long-term perspective.)
- **Step 9.** Communicate and share information with the public
- **Step 10.** Review and implement based on feedback and re-assessment

CHAPTER 15



ADAPTATION PLANNING AND IMPLEMENTATION

Venturing into E-Commerce

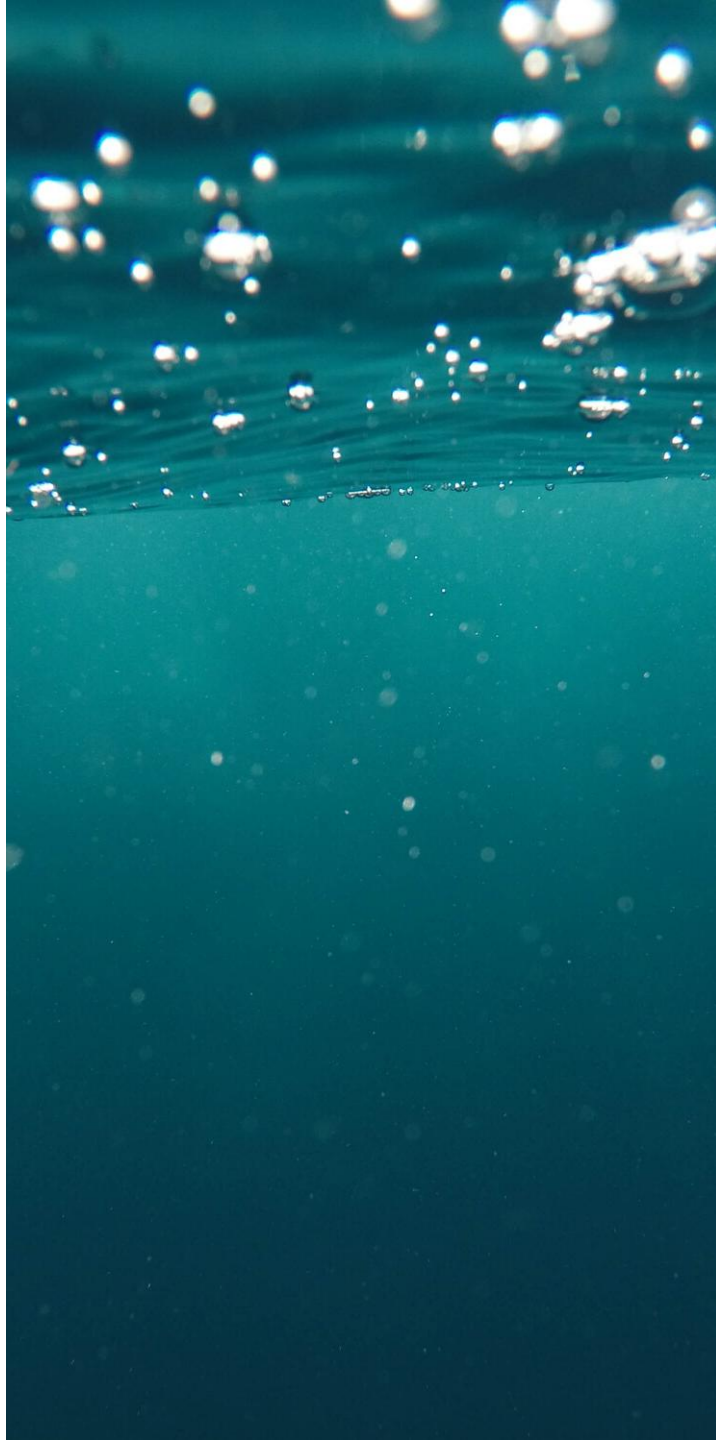




Adaptation to climate change is transitioning from a phase of awareness to the construction of actual strategies and plans in societies (robust evidence, high agreement).

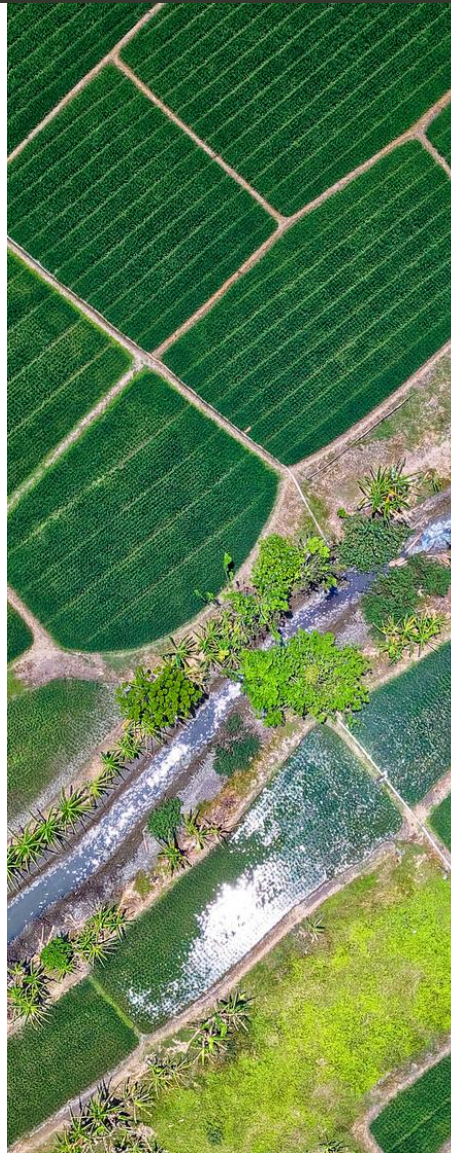
Heterogeneity

There is no single approach



to adaptation planning because of the complex, diverse, and context-dependent nature of adaptation to climate change. Although top-down and bottom-up approaches are widely recognized, the actions in practice are combinations of these approaches (medium evidence, high agreement).

Institutional dimensions in adaptation governance play a key role .



in promoting the transition from planning to implementation of adaptation (robust evidence, high agreement)

Barriers

-
- (1) **multilevel institutional** coordination between different political and administrative levels in society;
 - (2) key actors, advocates, and champions initiating, mainstreaming, and sustaining momentum for climate adaptation;
 - (3) **horizontal interplay** between sectors, actors, and policies operating at similar administrative levels;
 - (4) **political dimensions** in planning and implementation;
 - (5) **coordination** between formal governmental, administrative agencies, and private sectors and stakeholders to increase efficiency, representation, and support for climate adaptation measures.





The **national level** plays a key role in adaptation planning and implementation, while adaptation responses have diverse processes and outcomes at the subnational and local levels (robust evidence, high agreement).



Adaptation planning and implementation are dynamic iterative learning processes recognizing the complementary role of adaptation strategies, plans, and actions at different levels (national, subnational, and local)

Learning

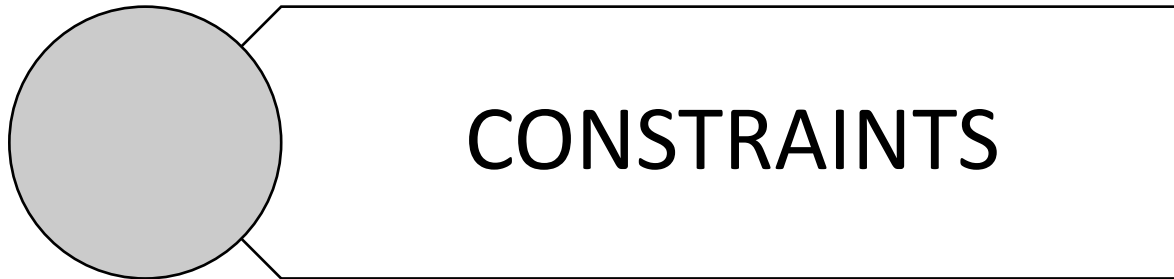
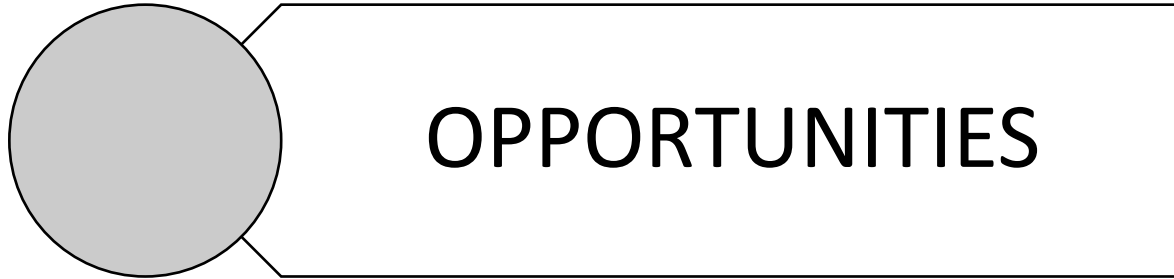


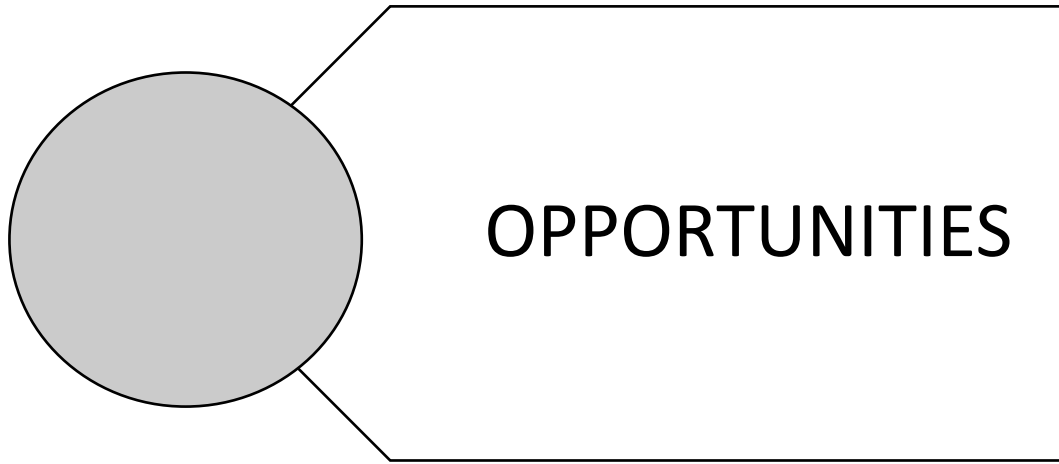


A variety of tools are being employed in adaptation planning and implementation depending on social and management context (robust evidence, high agreement).

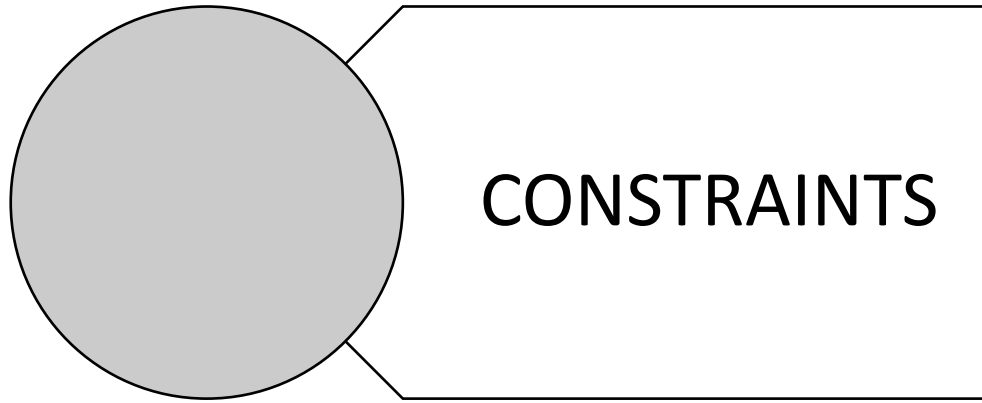
Tools

ADAPTATION

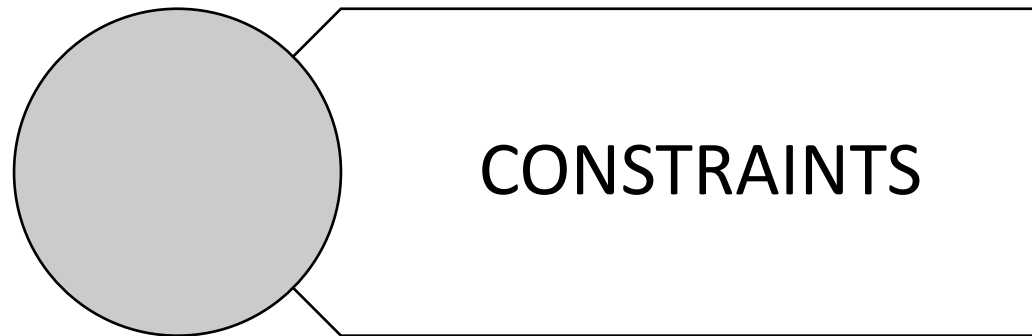
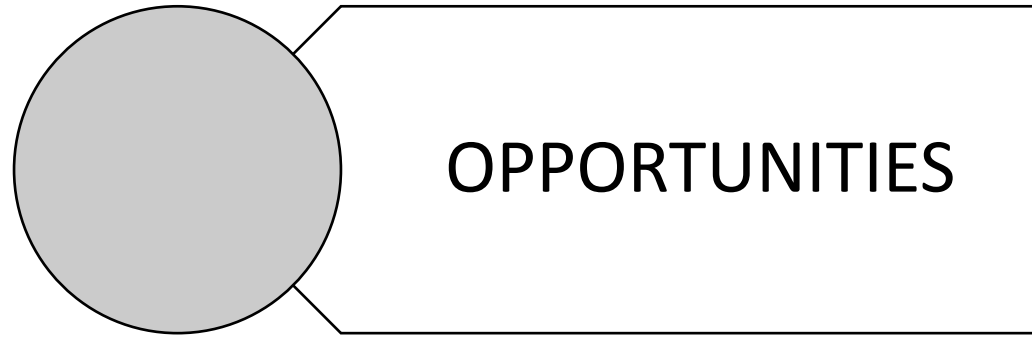




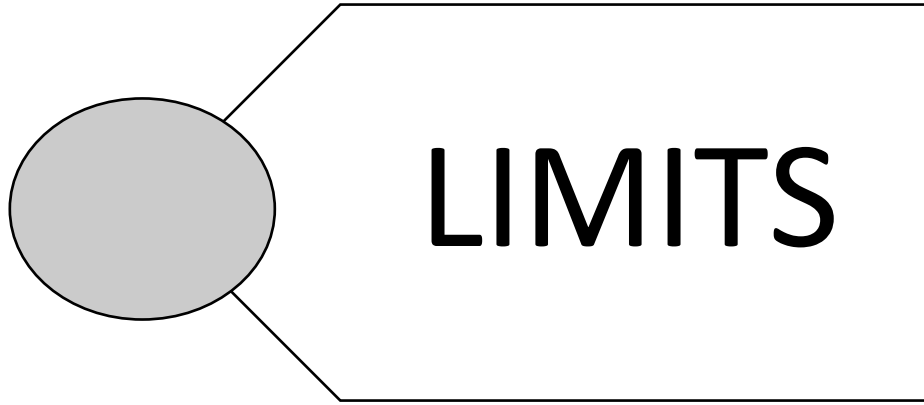
- Factors that make it easier to plan and implement adaptation actions, that expand adaptation options, or that provide ancillary co-benefits.
- They enhance the ability of an actors to secure their existing objectives, or for a natural system to retain productivity or functioning



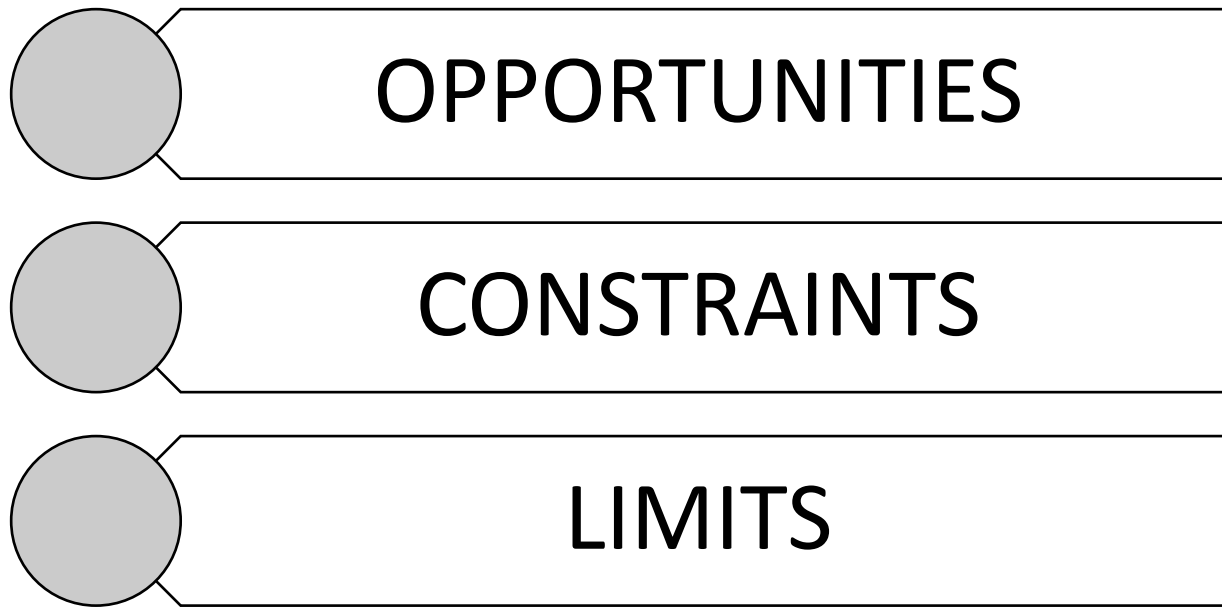
Factors that make it harder to plan and implement adaptation actions. Adaptation constraints restrict the variety and effectiveness of options for actors to secure their existing objectives, or for a natural system to change in ways that maintain productivity or functioning.



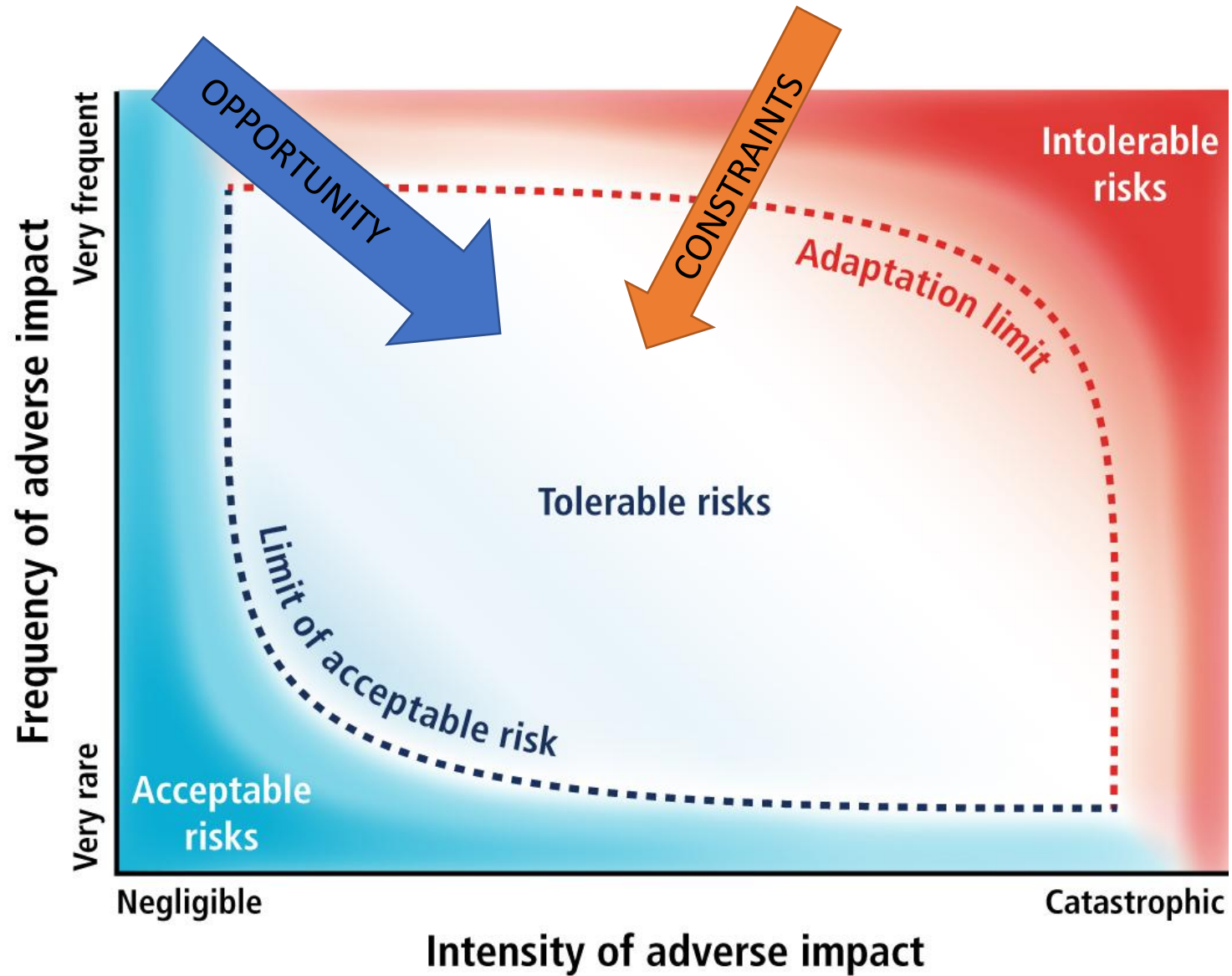
- constraints on adaptation are not limited to the developing world.
- Constraints can drive an actor or natural system to an adaptation limit.



- The point at which adaptive action won't save from intolerable risks.
- A limit to adaptation means that, for a particular actor, system, unacceptable measure of adaptive effort is required, or even no adaptation options exist to maintain societal objectives or the sustainability of a natural system.



- It is essential to evaluate opportunities, constraints, and limits with respect to both the rate and magnitude of climate change and the relevant time horizon for an actor, a species, or an ecosystem.
- seizing opportunities, overcoming constraints, and avoiding limits can involve complex governance challenges and may necessitate new institutions and institutional arrangements to effectively address multiscale risks.



Collective judgments about risk are also codified through mechanisms i.e.:

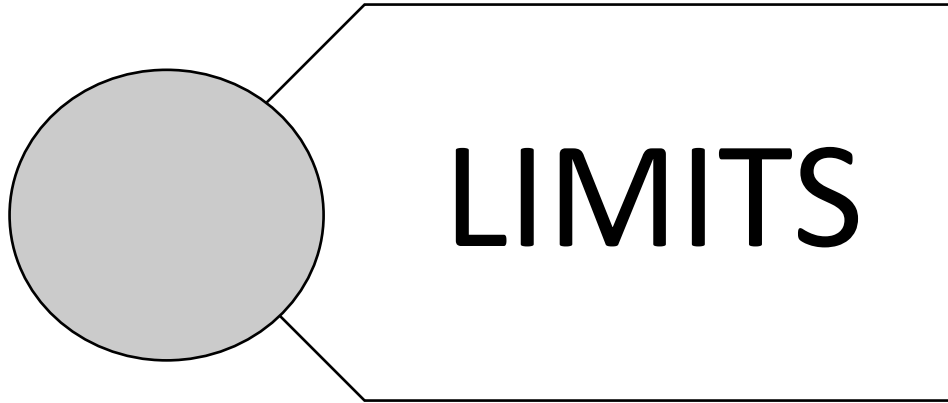
- engineering design standards,
- air and water quality standards
- legislation that establishes goals for regulatory action

Opportunity	Examples
Awareness raising	Positive stakeholder engagement
	Communication of risk and uncertainty
	Participatory research
Capacity building	Research, data, education, and training
	Extensions services for agriculture
	Resource provision
	Development of human capital
	Development of social capital
Tools	Risk analysis
	Vulnerability assessment
	Multi-criteria analysis
	Cost/benefit analysis
	Decision support systems
	Early warning systems
Policy	Integrated resource and infrastructure planning
	Spatial planning
	Design/planning standards
Learning	Experience with climate vulnerability and disaster risk
	Learning-by-doing
	Monitoring and evaluation
Innovation	Technological change
	Infrastructure efficiencies
	Digital/mobile telecommunications



OPPORTUNITIES

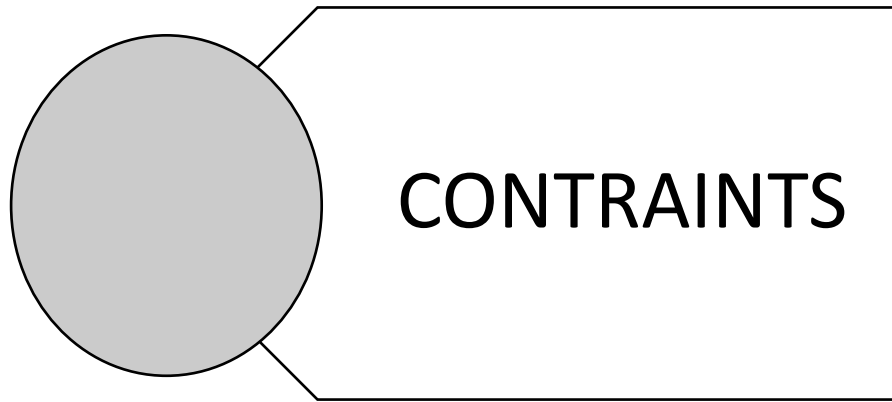
- Sustainable Economic Development – a critical foundation for adaptation opportunities as it has potential to build the capacity of individuals and organizations to adapt.
- i.e.:
 - increased public awareness and support for adaptation, availability of additional resources from actors at other levels of governance to overcome constraints and soft limits, private sector efforts in research and development that can improve affordability, ease of implementation



Hard Adaptation Limit: No adaptive actions are possible to avoid intolerable risks. no adaptation options are foreseeable, even in future.

Soft Adaptation Limit: options are currently not available to avoid intolerable risks through adaptive action. Adaptation options could become available in the future owing to changing attitudes or values or as a result of innovation or other resources becoming available. Investments in research and development, changes in regulatory rules or funding arrangements, or by changing social or political attitudes may change to availability

Strongly influenced by relationships among public and private sectors.



- An adaptation constraint represents a factor or process that makes adaptation planning and implementation more difficult.
- The existence of a constraint alone does not mean that adaptation is not possible or that one's objectives cannot be achieved.
- No consistent Framework for assessment
- Examples:
 - reductions in the range of adaptation options that can be implemented,
 - increases in the costs of implementation
 - reduced efficacy of selected options with respect to achieving adaptation objectives.

Economics of adaptation

Miguelito Kulpinski

Some economic aspects of adaptation

- Different roles of public and private actors
- The consequences of adaptation decisions cannot be expressed comprehensively through standard economic accounting of costs and revenues (-> externalities).
- Challenges with relation to measurements and monetization
- Types of benefits and costs of adaptation
- Decision making barriers in adaptation process
- balance in spending between mitigation, adaptation and development policies
- distribution of responsibilities for financing adaptation

Economic impact of adaptation policies



MACROECONOMIC
PERFORMANCE



INCOME DISTRIBUTION AND
POVERTY



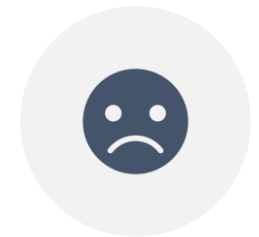
WELFARE OF CURRENT AND
FUTURE GENERATIONS



RISK DISTRIBUTION



ALLOCATION OF FUNDS
WITH CONSEQUENCES FOR
FUTURE ECONOMIC
GROWTH



ANCILLARY EFFECT (POSITIVE
OR NEGATIVE)

Cost of climate change vs Cost of adaptation

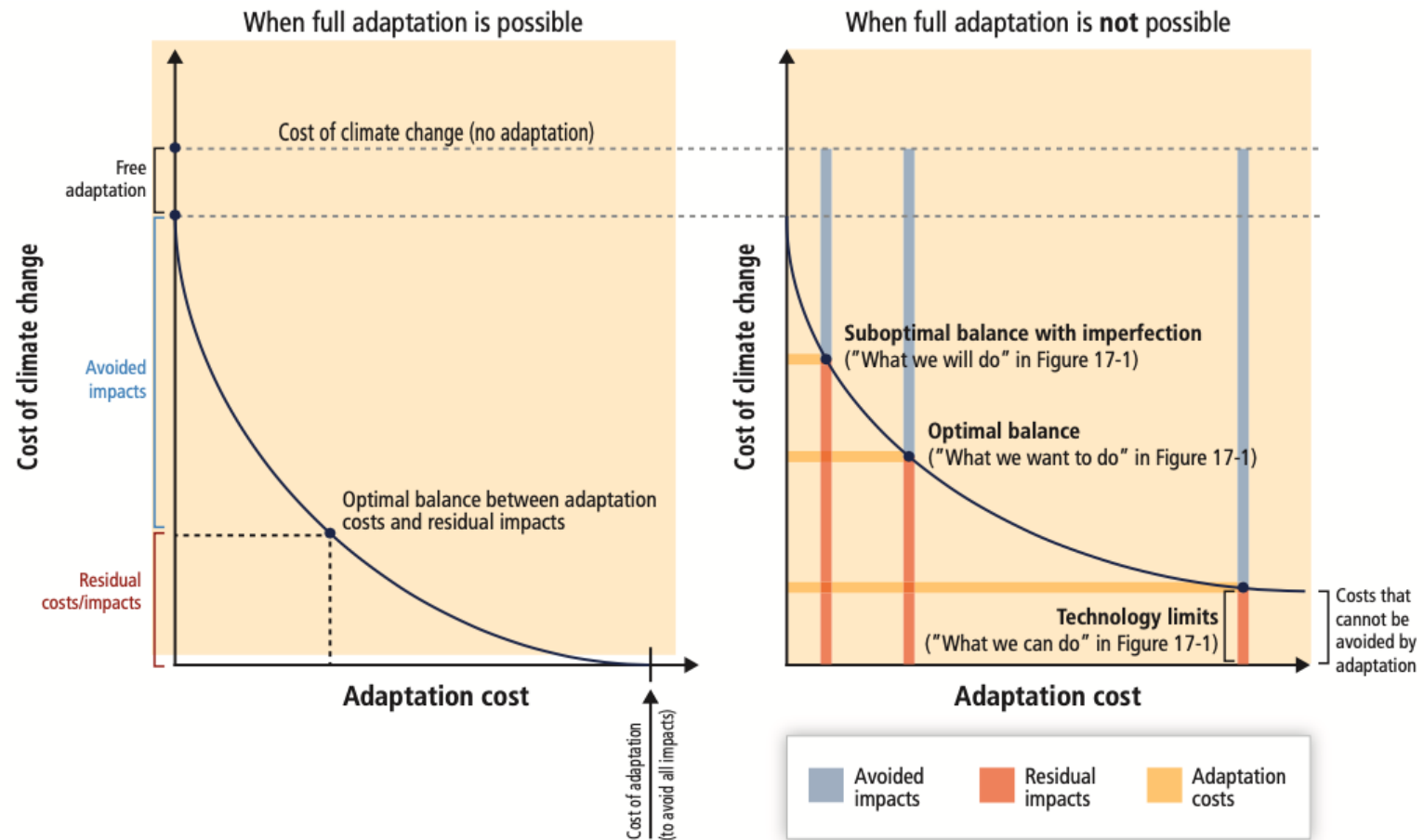


Figure 17-2 | Graphical representation of link between the cost of adaptation (on the x-axis) and the residual cost of climate change (on the y-axis). The left panel represents a case where full adaptation is possible, while the right panel represents a case in which there are unavoidable residual costs.

Can adaptation overcome all climate change effects?

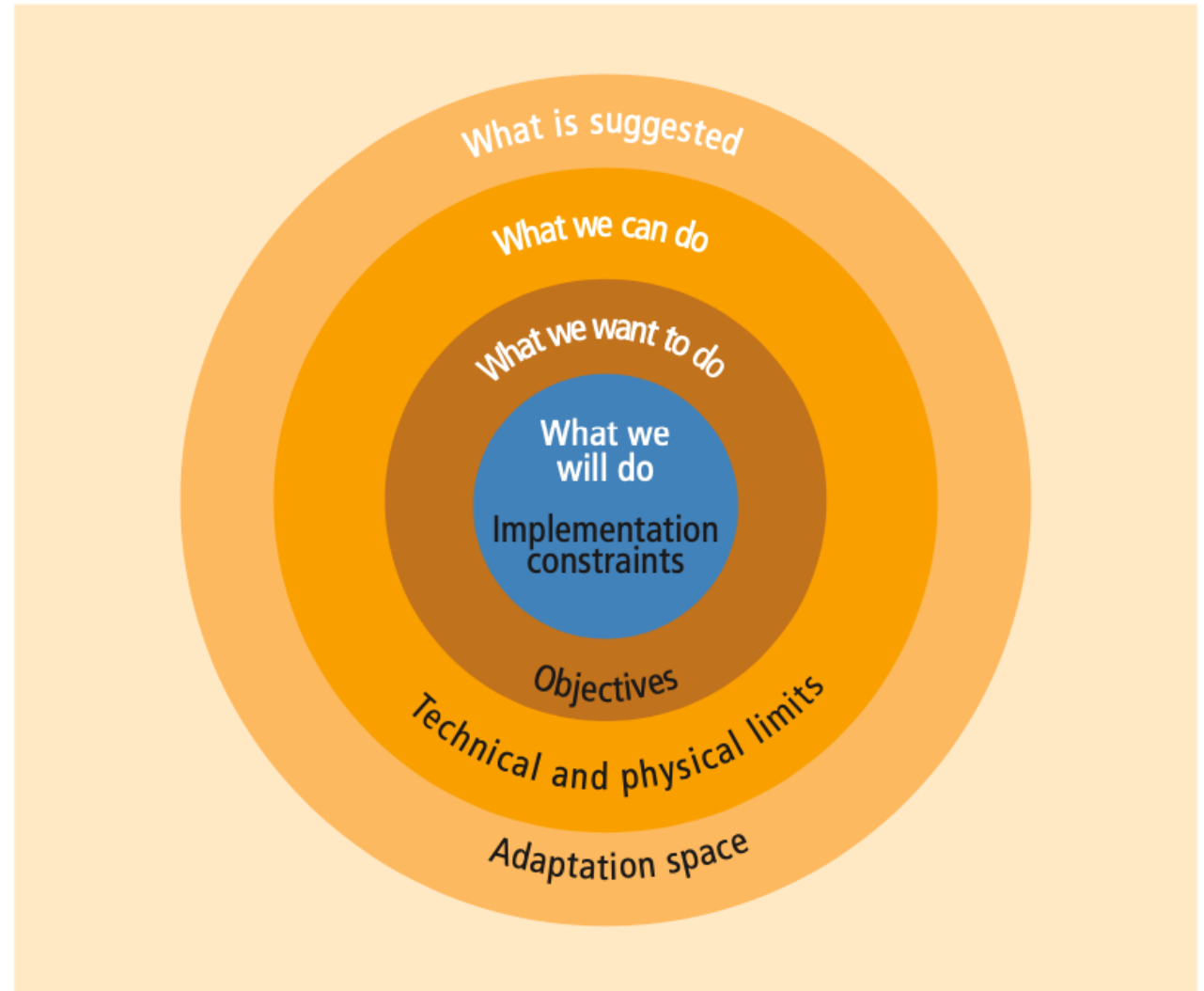


Figure 17-1 | The narrowing of adaptation from the space of all possible adaptations to what will be done. Forces causing the narrowing are listed in black.

Economic Barriers to Adaptation Decision Making



Transaction Costs, Information, and Adjustment Costs



Market Failures and Missing Markets



Ethics and Distributional Issues



Coordination, Government Failures, and Political Economy



Uncertainty

Economic decision making

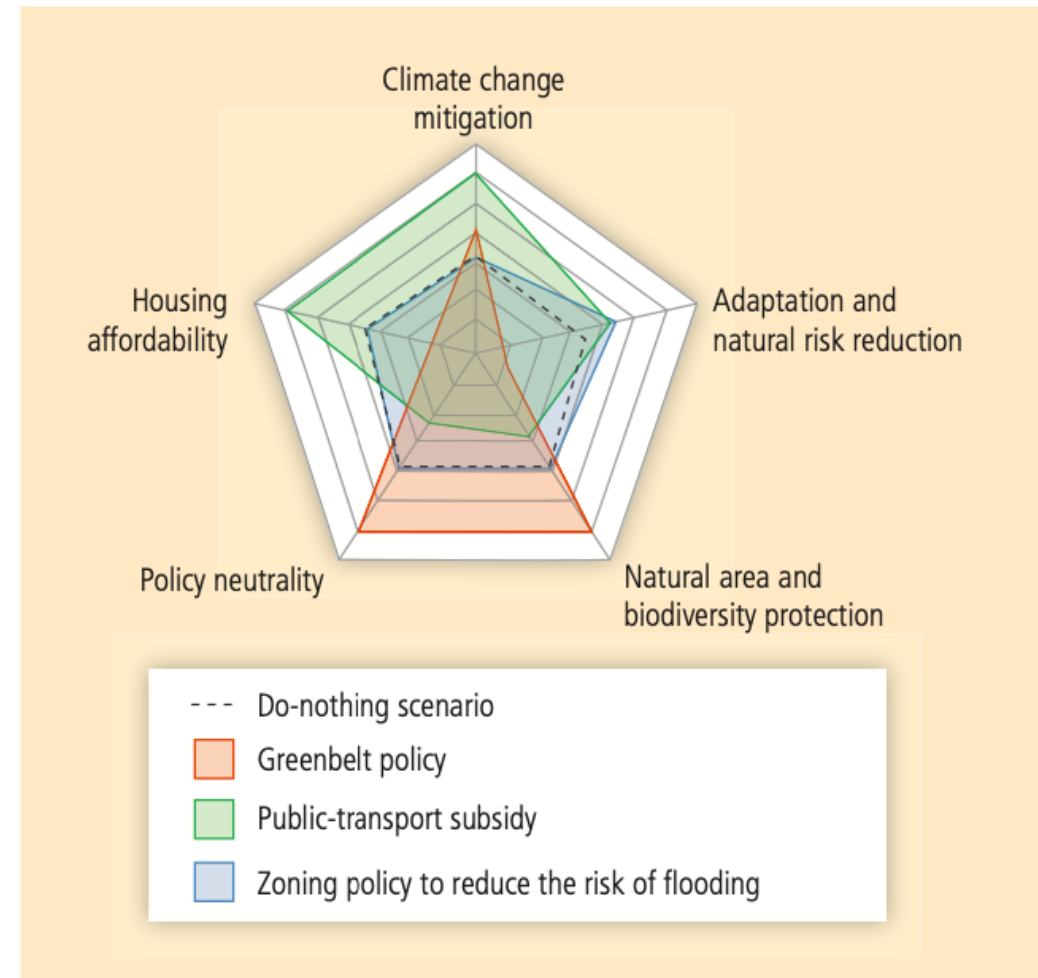


Figure 17-3 | Consequences of three policies in the Paris agglomeration: a greenbelt policy, a public transport subsidy, and a zoning policy to reduce the risk of flooding, measured using five different metrics representing five policy objectives. Axes orientation is such that directions toward the exterior of the radar plot represent positive outcomes (Viguié and Hallegatte, 2012).

Costs of adaptation

Table 17-3 | Coverage of adaptation costs and benefits.

Sector	Analytical coverage	Cost estimates	Benefit estimates
Coastal zones	Comprehensive	✓✓✓	✓✓✓
Agriculture	Comprehensive	—	✓✓✓
Water	Isolated case studies	✓	✓
Energy	North America, Europe	✓✓	✓✓
Infrastructure	Cross-cutting, partly covered in other sectors	✓✓	—
Health	Selected impacts	✓	—
Tourism	Winter tourism	✓	—

Note: Three checks indicates good to excellent coverage of the topic in the literature; two checks indicates medium coverage; one check indicates limited coverage; the absence of a check indicates extremely limited or no coverage. Note that indicators reflect literature review through publication of source in 2008.

Source: Agrawala and Fankhauser (2008).

Economic and Related Instruments to Provide Incentives



Risk sharing/Risk transfer



Payments for environmental services



Improved resource pricing



Charges, Subsidies, and Taxes



Intellectual Property Rights



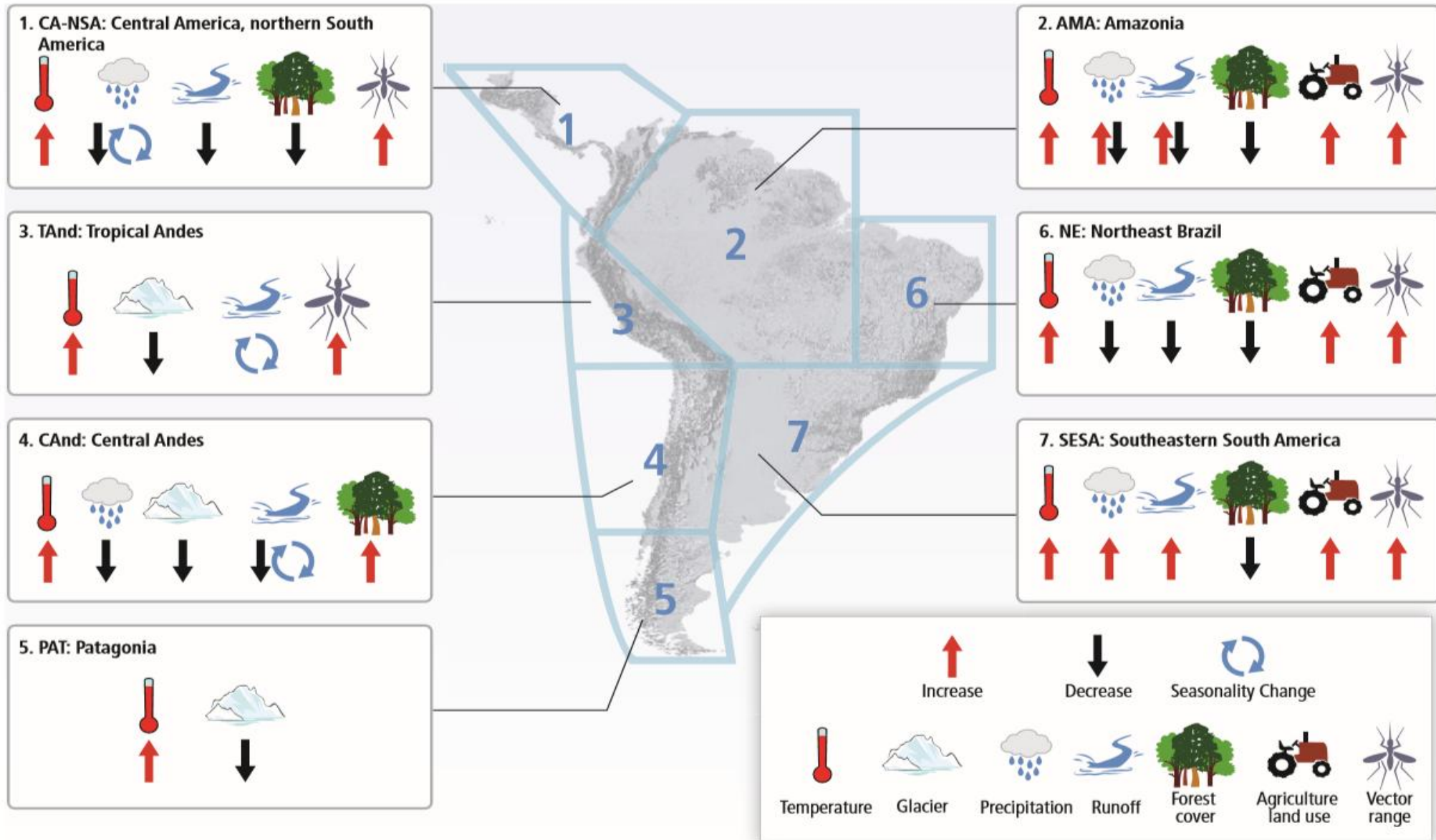
Innovation and Research & Development Subsidies

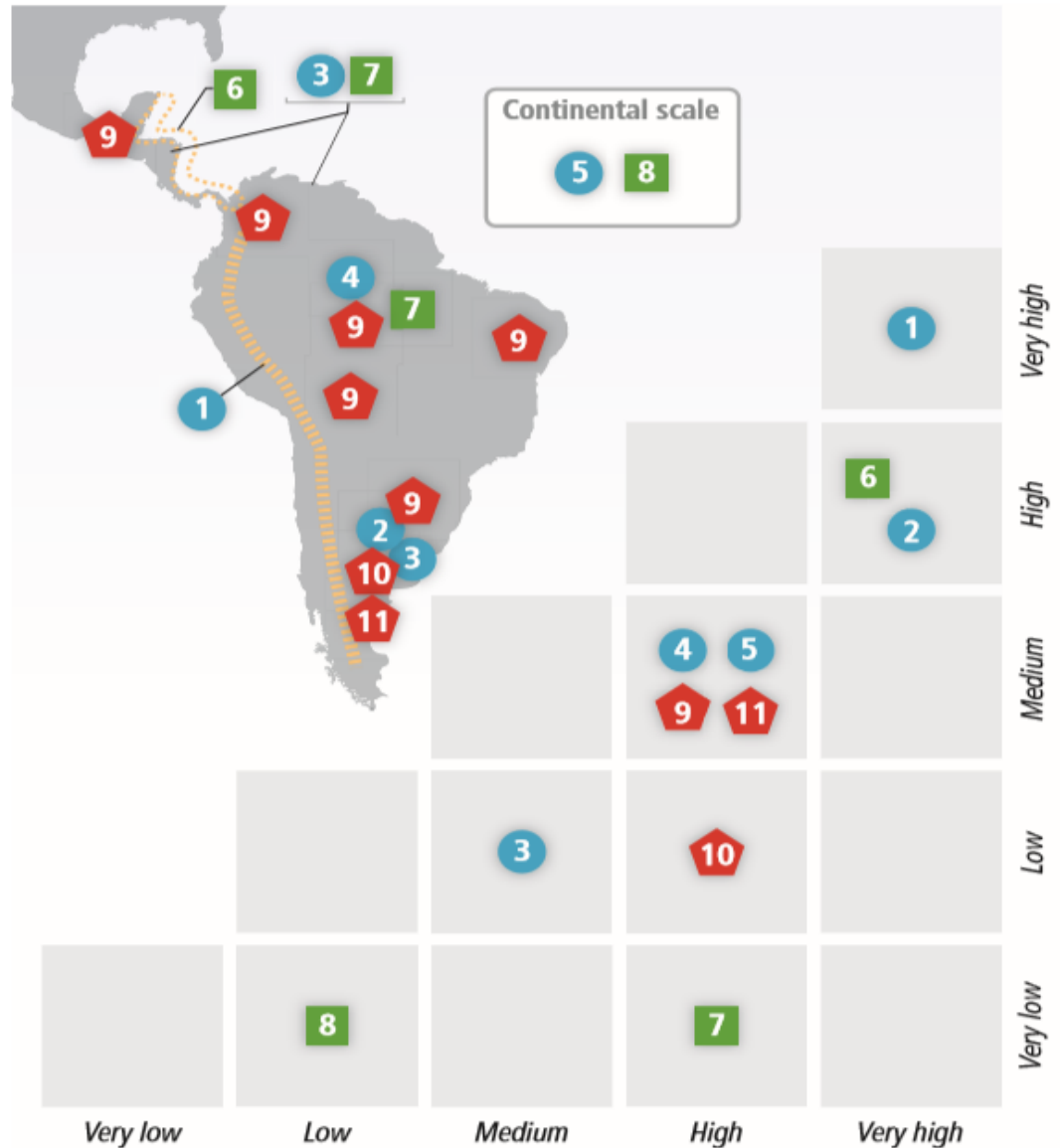


The Role of Behaviour

Adaptation Plans - Regional Context

Summary of observed changes in climate and other environmental factors in representative regions of Central and South America.





Degree of confidence in detection of a trend in climate-sensitive systems



Physical systems

1. Glacier retreat in the Andes in South America (Section 27.3.1.1)
2. Streamflow increase La Plata Basin (Section 27.3.1.1)
3. Increase in heavy precipitation and in risk of land slides and flooding in southeastern South America, and in Central America and northern South America (Section 27.3.1.1)
4. Changes in extreme flows in Amazon River (Section 27.3.1.1)
5. Coastal erosion and other physical sea level impacts (Section 27.3.2.1)



Biological systems

6. Bleaching of coral reefs in western Caribbean and coast of Central America (Section 27.3.2.1)
7. Degrading and receding rainforest in Amazonia and in Central America and northern South America (Section 27.3.2.1)
8. Reduction in fisheries stock (Section 27.3.4.1)



Human and managed systems

9. Increase in frequency and extension of dengue fever and malaria (Section 27.3.7.1)
10. Increases in agricultural yield in southeastern South America (Section 27.3.4.1)
11. Shifting in agricultural zoning (Section 27.3.4.1)

PACC- Program of adaptation to climate change. Southern Andes-Peru.

- **GOALS :**

Providing scientific baseline data as a basis to develop and implement appropriate adaptation measures:

- water resources (glaciology, hydrology, climatology), food security (agriculture, climatology), disaster risk reduction (glaciology, climatology), including human dimension (local perception).

Initiative supported by Swiss Intercooperation and Peruvian government.

Over the next decades Andean inter-tropical glaciers are very likely to disappear, affecting water availability and hydropower generation (high confidence; IPCC, 2007)

Apurimac
Area: 20 895.8 km²
418 882 inh.
20 hab/km²
Poverty rate: 69.5%



Cusco
Area: 71986 km²
1'171 503 inh.
16.3 hab/km²
Poverty rate: 75.3%



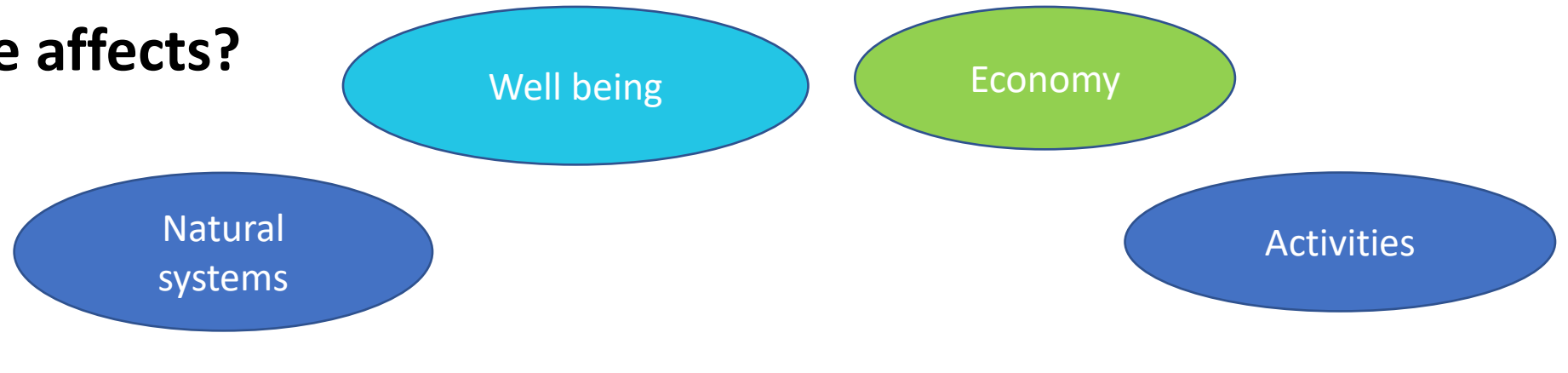
- Elevation: 2800- 4900 m.a.s.l.
- Risks from: drought, cold spells/snow, landslides, floods

- Elevation : 3800- 5200 m.a.s.l.
- Risks from: drought, cold spells/snow, hail

Methodology:

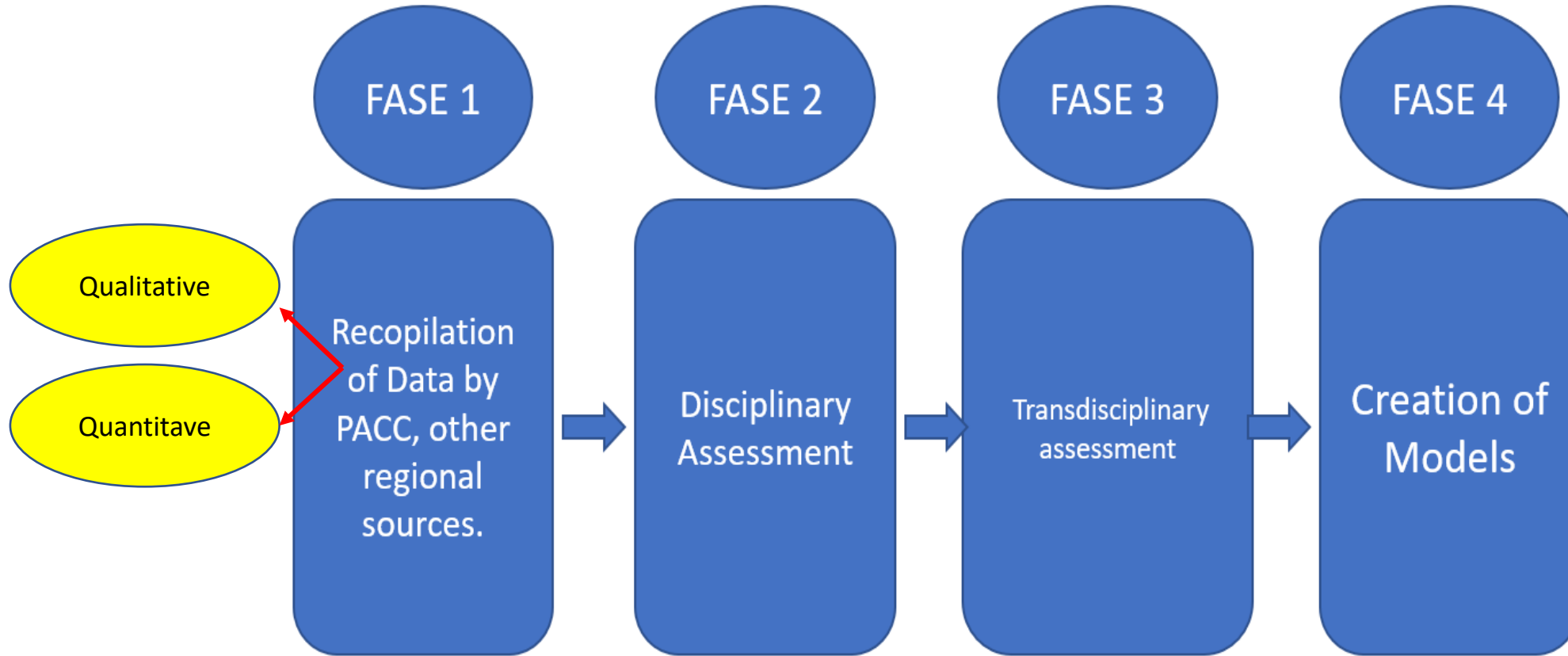
Climate impact Assessment:

How climate affects?



Help to identify the range of possible options for adapting to
Help to assess the cost associated.
Help to assist with policies.
GAPs in climate research

Methodology:

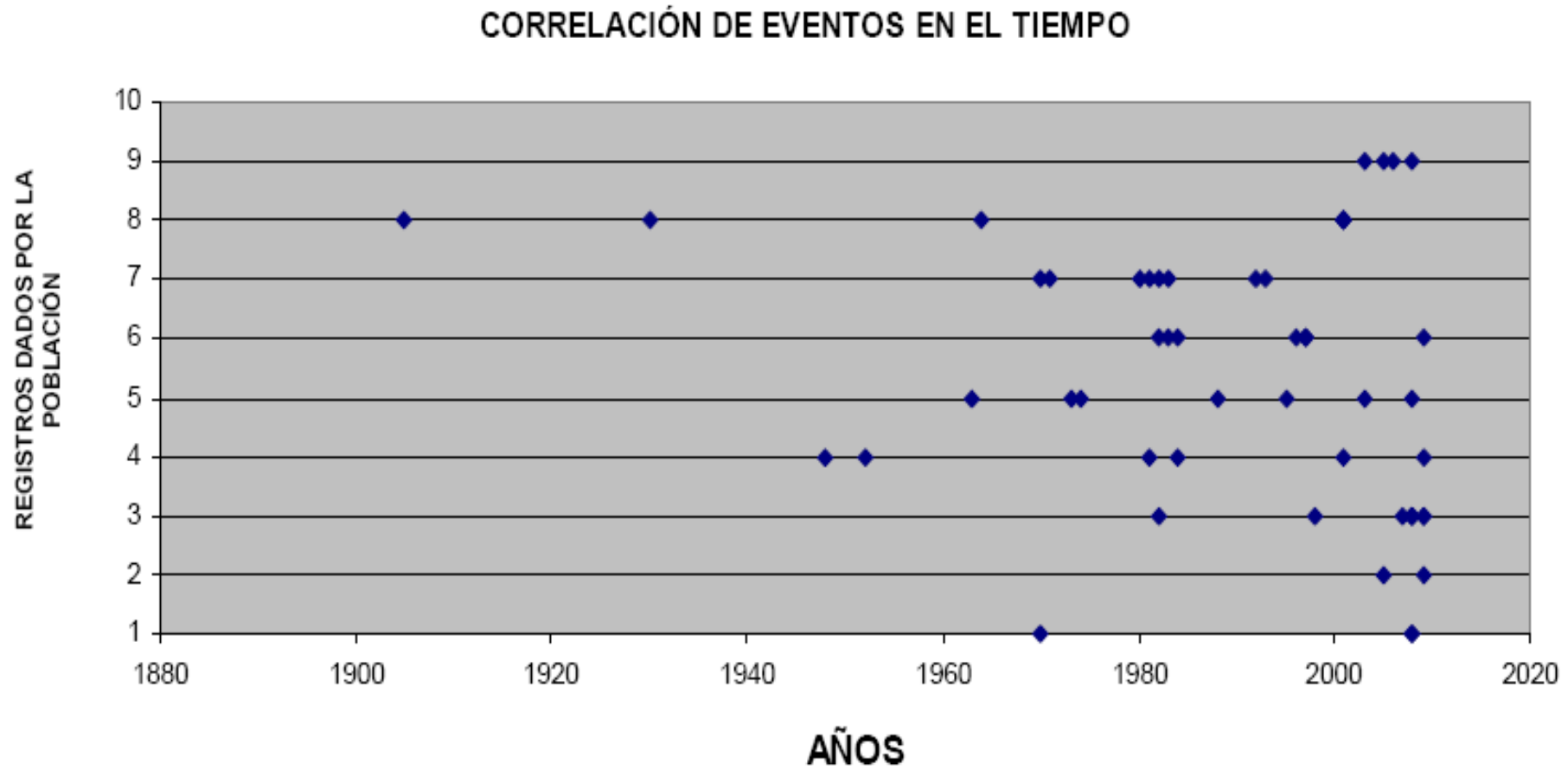


Quantitative data

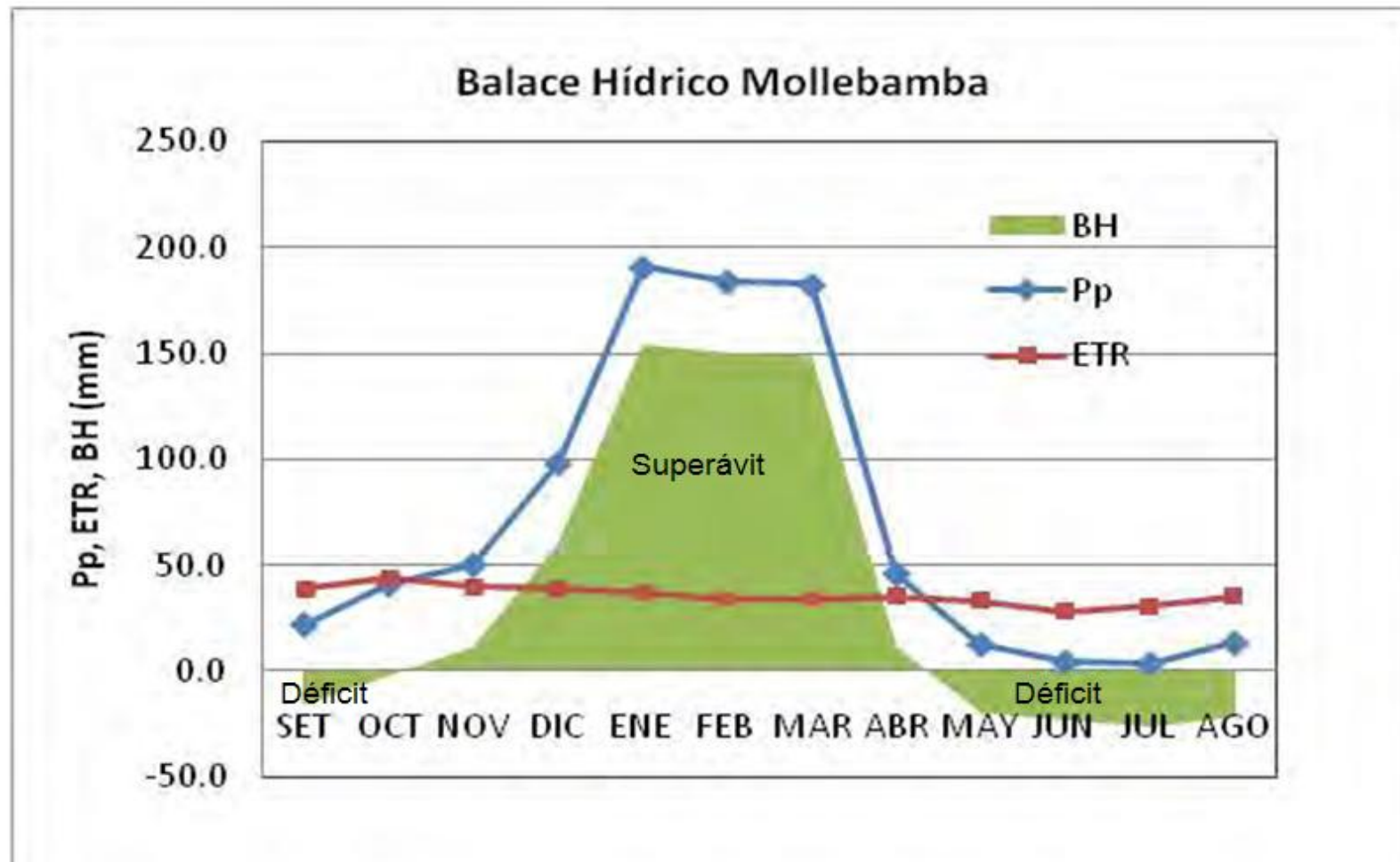
DECADA	PROMEDIO (mm)												
	SET	OCT	NOV	DIC	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	anual
1970-79	49	39	52	94	196	191	173	52	11	9	7	22	895
1980-89	27	46	48	72	172	140	136	54	12	7	6	25	746
1990-99	40	40	53	105	200	194	152	60	9	3	4	28	886
2000-09	30	52	49	103	191	200	185	51	9	6	19	16	909
1970-2009	36	44	50	93	188	180	160	54	10	6	9	22	851

Variations of precipitation, average in millimetres (mm).Source SENAMHI 2007

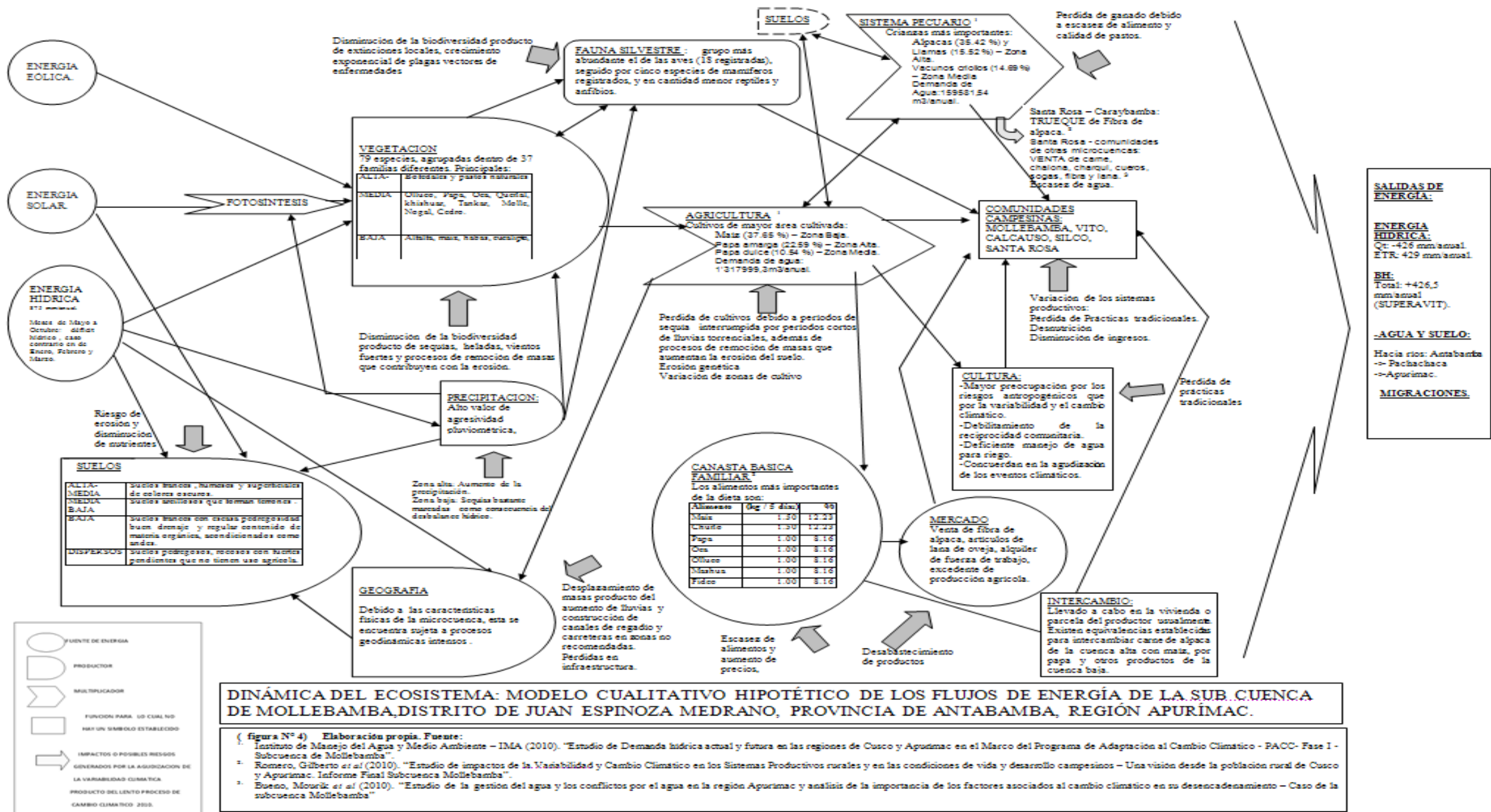
Correlation of disasters in time. Information obtained in communal workshops.
Source : SENAMHI.



Hydrologic Balance



Qualitative data- transdisciplinary
assessment



Results

PACC's result statistics

1



a **US\$56 million** national program in water sowing and harvesting is projected to be implemented between 2018 and 2023.

6



urban-rural municipalities have **incorporated climate change** in their local development plans.

48



public and private organizations are fully engaged in the **promotion, implementation and monitoring of climate change strategies.**

54



"yachachiq" (rural promoters) [41 men and 13 women] have been **trained to transfer adaptive technologies** to families.

532



families participated in water sowing and harvesting projects.

1,294



families have benefited from **productive technologies enhanced** by PACC II through the antipoverty program Haku Wiñay of the Ministry of the Development and Social Inclusion.

2,880



professionals and technicians of local, regional and national institutions, as well as community leaders **strengthened knowledge, methods, and use of tools for the management** of adaptation to climate change.