Climate Change and Impact Research: the Mediterranean Environment

Integrated Project

Climate Change and Impact Research: the Mediterranean Environment

D13.2.1- Foundation paper on adaptation options and screening

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1. Publishable Executive Summary

This interactive user guide is being developed to produce Circe deliverable D13.2.1 *Foundational paper on adaptation options and screening*. Instead of a conventional paper, this deliverable is produced as an interactive web site, www.wikiADAPT.org. Therefore, this document is the user guide of the wiki for the Circe project team as well as a snap-shot of the dynamic website. Circe project members are encouraged to use the discussion pages in this guide to comment on the content, and in particular its use for interacting with stakeholders.

After explaining the rationale of a 'living document' approach with wiki technology, the basic background and context of adaptation and the reviews of fundamental adaptation literature are presented. The further reading list is supplied for the fundamental information. Following that, two cutting edge concepts in climate adaptation are introduced. Adaptation as a socio-institutional learning process promotes Act-then-Learn-then-Act again model from decision science and is related closely to much of the work on Adaptive Resources Management, which focuses on dealing with high levels of uncertainty and possible thresholds in the system being managed. The document suggests ten general principles of adaptation distilled from our current thinking. These include the context specific characteristics of adaptation and linkages to vulnerability and risk concepts. Finally, some adaptation prototypes, which are currently developed in weADAPT/wikiADAPT, are briefly summarised.

2. Rationale

[edit]

This interactive user guide is being developed to produce Circe deliverable D13.2.1 *Foundational paper on adaptation options and screening*. The rationale is that by producing the paper as an interactive web site, www.wikiADAPT.org, it will become a 'living document' which can be updated as knowledge and experience progresses updated through the Circe project or even beyond the project. The "living document" function in the wikiADAPT is directory accessible from this document through "[edit]" hyperlinks under headings. Circe project members are encouraged to use the discussion pages in this guide to comment on the content, and in particular its use for interacting with stakeholders. We will reserve several person days in order to respond to these comments and to update these pages with the latest information on climate adaptation and modify the content so that the paper is as relevant as possible to the project teams.

This page[1] will act as an extended or annotated table of contents with some explanatory text, and there will be links to other pages which will act in the same way as the different sections of a conventional paper (a snap shot will be taken in the form of a conventional deliverable document available on the CIRCE website, but this wiki[2] will continue to be developed and updated beyond the creation of this document).

1 http://wikiadapt.org/index.php?title=Circe_foundation_paper
2 interactive website, e.g. http://wikipadia.org

3. Background/Context of adaptation

[edit]

Adaptation is an ongoing process inherent in natural and social systems. When faced by changing circumstances, particularly when they become uncomfortable or undesirable, people, like plants and other animals, tend to change the way they are and/or do things so as to survive or benefit from the new conditions. Adaptations generally can be structural, physiological or behavioural in nature, and in the case of human climate adaptation, we are interested in exploring the options for behavioural change, which in some cases may in turn manifest as structural changes in the things we produce.

It is now widely acknowledged that society will need to invest in adapting to inevitable climate change, while continuing mitigation efforts to reduce the extent of these human induced changes in the climatic system. Whether or not regions, countries, sectors and communities can successfully adapt to climate change will determine whether they are in a position to make the most of any opportunities created as a result of a changing climate, and reduce the extent of likely adverse impacts associate with these changes.

This process of adaptation needs to be encouraged, enabled, supported and facilitated by those individuals and organizations in positions to do so, particularly as people recognize the value of proactive (as opposed to reactive) adaptation, taking action now to avoid unnecessary losses and expenses in the future. In addition to this we recognize that capacity to adapt is not equal among all groups (and neither are the contributions to causing these human induced climate changes) and therefore targeted support is necessary.

Countries in the Mediterranean will, like others, need to adapt in order to successfully overcome the challenges they face from a changing climate. A brief overview of the climate trends and main predicted impacts for the Mediterranean is given below.

3.1. Climate trends

[edit]

According to the IPCC 4th assessment report, climate trends in the Mediterranean are more robust than in many regions – the different climate models vary in the detail, but agree that the Mediterranean basin will become hotter and drier over the next century (IPCC 2007a). The IPCC results for 2070-2099 for the A1b SRES scenario predict annual average warming of +2.2C-5.5C, with 1.7-4.6C winter warming and 2.7-6.5C of summer warming. Annual precipitation around the Mediterranean coast is likely to decrease 4-27% for the same period, and a reduction of 20% appears to be a typical response across models (IPCC 2007a)[3]. The frequency and duration of dry spells and heatwaves is also likely to increase.

3 The IPCC results are based on the average of 21 GCMs, so provide a good idea of the likely range of changes, however this does not show the extreme predictions which occur in some models. Given the

3.2. Impacts

[edit]

The changes in temperature and precipitation are expected to reduce run-off in the Mediterranean by up to 23% by the 2020s and 36% by the 2070s, and increase the frequency, intensity and duration of droughts and forest fires. Water scarcity will be a major problem, particularly in N. Africa, where even under present climatic conditions, it is estimated that water extraction would exceed renewable levels in most countries by 2025 (IPCC 2007b). Sea-level will rise 0.09-0.88m by the end of the century, but local factors such as subsidence due to groundwater extraction and local tectonics may increase this by as much as 50% (IPCC 2007c). This will have major impacts on coastal ecosystems and heavily populated low-lying areas such as the Nile delta. An increase is heat-related morbidity is predicted, as events such as the 2003 heatwave in Europe that killed an estimated 35,000 people become more common towards the end of the century. Climate change is expected to contract the range of many tree and plant species and increase the vulnerability of Mediterranean ecosystems, with local losses of up to 62% of plant species in fragile ecosystems. Heat stress and reduced soil moisture will reduce crop yield and may change the viability of crops in certain areas. For example in Algeria wheat is currently grown along the coastal strip but production is frequently disrupted due to lower than average rainfall. Downscaled climate data for Algeria indicate that rainfall could decrease by 20-30% during the important autumn months at the beginning of the growing season (Oct-Dec) for the period 2046-2065 (SEI CCE 2008) and as much of this land is marginal for rainfed wheat production (FAO 2008) wheat production may become unviable. An increase is heat-related morbidity is predicted, as events such as the 2003 heatwave in Europe that killed an estimated 35,000 people become more common towards the end of the century.

3.3. Adaptation

[edit]

A variety of adaptation measures are already in place in the Mediterranean to adapt either to current climate variability, or with a view to future climate change. These include, amongst others, water harvesting and conservation techniques, early warning systems for droughts and floods, improved seasonal forecasting, improved crop cultivars, strengthening and integrating regional management practices and improving conservation strategies (IPCC 2007b,c). There are a multitude of different adaptation options which exist, some of which are appropriate and will reduce vulnerability to future changes, and some of which may not be locally appropriate and may actually increase vulnerability of the system (Adger et al 2003). The purpose of this paper is to review the current literature on adaptation theory and where possible practice, although it must be noted that very little has been written on the actual practice, before outlining a framework for assessing vulnerability and screening adaptation options. The section on screening adaptation options will

uncertainty in current climate models we must accept that this is a likely range but that more extreme changes are possible.

support Circe deliverable 13.2.2 to *develop an open source core toolkit for identifying and evaluating adaptation options.* The aim is to provide a process which gives guidance and support to stakeholders and allows them to make decisions on adaptation which are robust against a wide range of future changes.

For more details on the projected climate trends and impacts for the Mediterranean region please refer to the following IPCC chapters, or the UNFCCC National Communications of the relevant countries.

IPCC 2007a: Working Group I - Chapter 11: Regional Climate Projections

IPCC 2007b: Working Group II - Chapter 9: Africa

IPCC 2007c: Working Group II - Chapter 12: Europe

4. Reviewing key adaptation literature

[edit]

People are writing on adaptation from a number of different strating points. Here we try to provide a brief overview to introduce these different themes within the adaptation literature in an easily digestable way and guide people to additional reading where interested, including more information that is available on the pages of wikiADAPT.

4.1. Conceptualising adaptation

[edit]

Adaptation can be defined as adjustments of a system to reduce vulnerability and to increase the resilience of system to change, in this case in the climate system (IPCC 2007d). Adaptation occurs at a range of inter-linking scales, and can either occur in anticipation of change (anticipatory adaptation), or be a response to those changes (reactive adaptation) (Adger et al 2005). Most adaptation being implemented at present is responding to current climate trends and variability, for example increased use of artificial snow-making in the European Alps. Some adaptation measures, however, are anticipating future climate change, such as the construction of the Confederation Bridge in Canada at a higher elevation to take into account the effect of future sea-level rise on ship clearance under the bridge (IPCC 2007d).

Adaptive capacity and vulnerability are important concepts for understanding adaptation; vulnerability can be seen as the context in which adaptation takes place, and adaptive capacity is the ability or potential of a system to respond successfully to climate variability and change, in order to reduce adverse impacts and take advantage of new opportunities (IPCC 2007d). Those societies that can respond to change quickly and successfully have a high adaptive capacity (Smit and Wandel 2006). It is important to note however, that high adaptive capacity does not necessarily translate into successful adaptation. For example the adaptive capacity in W. Europe is high, and the risks of warmer winters increasing the range of livestock diseases was well documented, but many parts of Europe were still badly affected by outbreaks of the Bluetongue virus in livestock in 2007. Adaptive capacity is driven by factors operating at many different interlinked scales, and it is important to understand the ways in which the different drivers of adaptive capacity interact. Physical constraints on adaptive capacity are important, but in most cases it is social processes which increase or decrease adaptive capacity; it can be said that adaptive capacity is socially constructed (Smit and Wandel 2006). The social drivers of adaptive capacity are varied but may include broad structures such as economic and political processes, as well as processes which operate at a a very local scale, such as access to decision-making and the structure of social networks and relationships within a community (Smit and Wandel 2006). Adaptive capacity at a local scale is constrained by larger scale processes. For example a farmer's adaptive capacity will not only depend on access to resources (both physical and social) within the community which allow a crop to be grown successfully, but also the effect of macro-scale

economic processes on the price received for the crop (Adger et al. 2005). The perception of risk and of capacity to adapt to that risk has also been shown to be important in determining actual adaptive capacity, and can constrain it in some cases (IPCC 2007e). Gender is another factor which is important in determing adaptive capacity constrain adaptive capacity and vulnerability, for example women may have participation in decision-making, or be constrained by lower levels of education (IPCC 2007d).

The social construction of adaptive capacity is very important when thinking about the risks and impacts of a changing climate. It is not just the change in climate which will affect vulnerability and livelihoods, but the way that these changes are negotiated through complex social systems. A 10% decrease in rainfall may be acceptable and manageable to members of a community who have access to improved agricultural techniques, or whose livelihoods are in some way diversified, whereas marginalised members of the community may not be able to cope with these changes (Adger et al 2003, 2005).

The complex interplay of local and broader processes which determine adaptive capacity mean that it is very context specific, and as such national level indicators of adaptive capacity have a limited value in providing useful information on adaptive capacity at the scale required. In addition, there is little consensus of the indicators to take to measure adaptive capacity in different studies and different circumstances (IPCC 2007d). Similar to studies of vulnerability, it has been seen as increasingly important to involve individuals and communities in identifying indicators of adaptive capacity (Smit and Wandel 2006, IPCC 2007d).

Both temporal and spatial scales are very important in thinking about adaptation, as is the frame of reference taken for looking at adaptation. Much adaptation takes place in relation to short-term climate variability, however this may cause mal-adaptation to longer-term climatic trends. For example the expansion of irrigation in Egypt into the W. Sinai desert due to a period of higher river flows is a maladaptation when viewed in relation to the longerterm predictions of drying in the region.(Adger et al 2003). Adaptations at one scale can also create externalities at another by reducing the adaptive capacity of other actors. This is often the case when broad assessments of the costs and benefits of adaptation are examined at smaller scales and it is possible to see that whilst the adaptation may benefit some actors, it has a negative effect on others (Adger et al 2005). This highlights the point that it is important to design the process of adaptation to avoid the danger of elite capture, which would do very little to reduce the vulnerability of the poorest and most marginalised. This is a particular issue if decision-makers reflect the existing uneven social distribution of power and resources. Building coping capacity can increase equality by improving the ability of the most vulnerable to recover from hazards, thus stopping them getting knocked back into poverty. (Adger et al 2003, 2005).

It is clear from the literature that people have always adapted to a changing climate and that coping strategies already exist in many communities, for example changing sowing times or adopting new water saving techniques (Adger et al 2003). Traditional knowledge and coping strategies must be maintained and strengthened, otherwise adaptive capacity may be weakened as local knowledge of the environment is lost. Strengthening these indigenous techniques and building upon them also makes it more likely that adaptation strategies will be adopted, as it creates more community ownership and involvement in the process (IPCC 2007d). In some cases however this will be not be enough to adapt to new conditions which are outside the range of those previously experienced, and new techniques will be needed (Smit and Wandel 2006).

There may be physical limits to adaptation – change that is too rapid for ecosystems to be able to adapt to. These physical changes in ecosystems may place constraints on the adaptive capacity of social systems too, for example if a community is heavily dependent on natural resources (IPCC 2007d). The use of coping resources to respond to disasters and hazards can reduce the adaptive capacity of the system, and decrease the range of event it is able to recover from, thus placing a limit on adaptation (Smit and Wandel, Adger et al 2003). There are also technological limits to adaptation such as cost, social acceptability, and uncertainty over change rendering some technologies unsuitable in certain situations. Differential access to these new technologies may also increase the vulnerability of some groups and entrench existing inequalities.The perception of risk from climate, and also the perceived capacity to adapt to this risk, has also been shown to play a very real role in constraining the ability to adapt (IPCC 2007e)

4.1.1 Further reading

[edit]

Adger, N.W. et al (2003) Adaptation to Climate Change in the Developing World. Progress in Development Studies 3: 179-195.

Adger, N.W., Arnell, N.W. and Tompkins, E. (2005) Successful adaptation to climate change across scales. Global Environmental Change 15: 77-86

IPCC 2007d : IPCC WGII Chapter 17: Assessment of adaptation practices, options, constraints and capacity

IPCC 2007e: IPCC WGII Chapter 18: Inter-relationships between adaptation and Mitigation

Smit, B. and Wandel, J. (2006) Adaptation, adaptive capacity and vulnerability. Global Environmental Change 16: 282-292.

Climate risk management in Africa, Climate and society No1. If you wish to read more on this visit this page of wikiADAPT: Conceptualising adaptation

4.2. Adaptation and development links

[edit]

There remains much debate regarding the relationship between adaptation and development, particularly in relation to who will do the work on the ground and how it will be funded. The term climate proof development which has now largely given way to climate resilient development has been used extensively by the World Bank and other large development agencies as well as by some NGOs. This ties into the issue of mainstreaming, as some argue that policies and measures to address climate change should be integrated into existing development planning, implementation and evaluation to make better decisions that ensure long term sustainability. The idea is that adaptation will become a central part of all policies, rather than just being seen as an issue for the environment and that adaptation then is not only the remit of 'adaptation specialists' but becomes built into the work done within many sectors. One of the counter arguments however is that while mainstreaming is good for incremental costs (i.e. tweak development related activity to make it more robust to a changing climate) it doesn't encourage or support funding full cost, stand alone adaptation actions (i.e. completely new activities that need to be initiated due to climate considerations, but might not be on the development agenda otherwise). This in turn ties into discussions around adaptation to climate change specifically versus adaptation to multiple stressors, which might include environmental (bio-physical), socio-political and economic changes. The institutional level at which adaptation is being undertaken is an important consideration in the mainstreaming debate. At the national and sectoral funding and policy levels the arguments for and against mainstreaming are very different from the particalities of mainstreaming being discussed with regards local community level adaptation and development, where some people argue that the trade-offs between responding to different stressors are inherently integrated in complex decision making processes by those affected and therefor supporting climate adaptation has to be done in conjunction with development activities to reduce compound vulnerability.

The World Resources Institute has recently done an interesting study empirically looking at the relationship between adaptation and development by analyzing a large number of projects, policies, and other initiatives, placing them on a continuum from 'pure development' to 'pure climate adaptation' (see link to their report in the list of suggested further reading by McGray et al).

4.2.1 Further reading

[edit]

Schipper, L., 2007: Climate Change Adaptation and Development: Exploring the Linkages. Tyndall Centre Working Paper No.107, [1]

McEvoy, D., Lonsdale, K. and Matczak, P., 2008: Adaptation and Mainstreaming of EU Climate Change Policy: An Actor-Based Perspective. CEPS Policy Brief No.149, [2]

McGray, H., Bradley, R., Hammill, A. with Schipper, L. and Parry, J., 2007: Weathering the Storm: Options for Framing Adaptation and Development. World Resources Institute Report, [3]

DANIDA, 2005: Danish Climate and Development Action Programme: A toolkit for climate proofing Danish development cooperation, [4]

Klein, R., Eriksen, S., Naess, L., Hammill, A., Tanner, T., Robledo, C. and O'Brien, K., 2007: Portfolio screening to support the mainstreaming of adaptation to climate change into development assistence. Tyndall Centre Working Paper No.102, [5]

4.3. Community Based Adaptation

[edit]

Some people are starting from a bottom-up perspective on climate adaptation, working with local communities to identify and build on existing indigenous coping and adaptation strategies. This is particularly emerging from the development NGOs, such as Practical Action, Oxfam, ActionAid, etc. who are exploring their role in the adaptation field and how their existing development work on the ground can be extended / modified to incorporate climate change considerations. Key issues being explored include risk perception, mainstreaming, upscaling (and out-scaling) of local initiatives, South-South knowledge exchange and technology transfer. Various organisations are starting to build databases of examples of adaptation activities and projects at the local level (e.g. UNDP, WRI), documenting different adaptation options explored and implemented in various contexts, in the hope that lessons can be learnt across regions and some of the adaptation strategies that have proved successful in addressing a certain climate-related threat can be applied elsewhere. The idea behind this collaborative wiki is that this could provide a space for documenting and sharing these experiences, linking also to the databeses mentioned above.

4.3.1 Further reading

[edit]

Huq, S., 2007: Community-Based Adaptation: A vital approach to the threat climate change poses to the poor. IIED Briefing Paper, [6]

Warrick, O., 2007: Development, Forest Conservation and Adaptation to Climate Change: A Case for Integrated Community Based Sustainability in Rural Vanuatu. ANZSEE Conference Paper, Australia New Zealand Society for Ecological Economics, [7]

Blanco, R., 2006: Local initiatives and adaptation to climate change. Disasters, 30(1), pp. 140-147(8).

To see some examples of current community-based adaptation intiatives visit these pages of wikiADAPT: ENDA Community Adaptation Pilot Action Programme ; Advancing Capacity for Climate Change Adaptation (ACCCA)

4.4. Adaptation and disaster risk reduction links

[edit]

There has been an increasing recognition recently of the similarities between the approaches to climate adaptation and disaster risk reduction activities (DRR). This can be attributed to several important developments, notably a shift in the DRR community towards the prevention of disasters rather than recovery from them, and an increasing acknowledgement in the climate adaptation community of the need to address vulnerabilities to existing climate variability and extremes (Thomalla et al 2006).

At the heart of both fields is a risk management approach which seeks to reduce socio-economic vulnerability to natural hazards, and both have developed a range of tools to assess risk and identify opportunities for action (Thomalla et al 2006). In seeking to reduce vulnerability, both communities are focussed on building capacity and resilience to respond to natural hazards. Both approaches also recognise the need for poverty reduction and sustainable resource management in order to address the root causes of vulnerability (Thomalla et al 2006) Given the similarities in their core aims and approaches, and in light of increasing meteorological hazards, it has been recognised that there is a need to work together and share information and experiences (O Brien et al 2006).

The links between the climate adaptation and disaster risk reduction fields are as yet not very well developed, however there are some organisations that have begun looking at vulnerability in the context of both natural hazards and climate adaptation. These include the UN's International Strategy for Disaster Reduction (ISDR), and the Vulnerability and Adaptation Resources Group (VARG) (Schipper and Pelling 2006). This is a promising area for the sharing of information and experience, and has the potential to be a valuable way forward in reducing vulnerability.

Further Reading

DFID (2004b) Key Sheet 06. Adaptation to climate change: Making development disaster-proof. DFID, London

O'Brien, G. et al (2006) Climate Change and Disaster Management. Disasters 30(1): 39-48

Pelling, M. and J. Uitto (2001) 'Small Island Developing States: Natural Disaster Vulnerability and Global Change'. Environmental Hazards. 3(2). pp. 49–62.

Schipper, L. and Pelling, M. (2006) Disaster risk, climate change and international development: scope for, and challenges to, integration. Disasters 30(1): 39-48 Thomalla, F. et al (2006) Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation. Disasters 30(1): 39-48

Sperling, F. and F. Szekely (2005) Disaster Risk Management in a Changing Climate. Informal discussion paper prepared for the World Conference on Disaster Reduction in Kobe, Japan, 18–22 January 2005, on behalf of the Vulnerability and Adaptation Resource Group (VARG), Washington,

D.C. See also the special issue of disasters on disaster risk reduction and climate change: Disasters Volume 30, Issue 1.

See also the special issue of disasters on disaster risk reduction and climate change: Disasters Volume 30, Issue 1, and the Climate risk management in Africa volume, Climate and society No1

4.5. Adaptation Technologies and Technology Transfer

[edit]

The process of adaptation (to climate variability and change) involves a change in behaviour and consequently a shift in activities as a result of changing (environmental) conditions. To engage in these new better suited activities often requires the procurement and adoption of new technologies. The application of environmentally sound technologies (ESTs) in the field of adaptation to climate change is therefore increasingly being realised and explored. Technology transfer is noted in the United Nations Framework Convention on Climate Change as a key area of engagement and collaboration between so-called 'developed' countries (those contributing a large proportion of the GHG emissions responsible for anthropologically induced climate change) and 'developing' countries, where large populations experience high levels of vulnerability to climate stresses and shocks (UNFCCC Article 4.5). The process of technology transfer in the adaptation context is an opportunity to redress some of the global imbalances in access to certain resources and facilitate sustainable development. The transfer of technologies is however not confined to being from the 'north' to the 'south' but can often be 'south' – 'south' (both between and within countries) or maybe even 'south – 'north'.

In the climate change mitigation context, technological interventions have tended to be hardware intensive, centralised and supply-side oriented. The focus of the IPCC Working Group 3 and the Expert Group on Technology Transfer, among others, has been on purporting the importance of creating enabling environments at the national level in terms of governments developing appropriate macro-economic conditions for technology transfer. The problem is that top-down processes do not necessarily engage with the project specific context, which is critical to the success of an adaptation project. In the case of technology transfer in the field of adaptation, emphasis therefore increasingly needs to be placed on the software (process) and orgware (institutional) elements of technology, focussing on receptivity and use of classes of technology that are decentralised in their application (i.e. spatially diffuse). The idea is to get bottom-up processes to engage with those that are more top-down to develop consistent enabling environments at the micro and the macro level in which local skills are fostered to innovate and endogenise ESTs relevant to their context.

4.5.1 Further reading

[edit]

Klein, R., Dougherty, W., Alam, M. and Rahman, A., 2005: Technology to Understand and Manage Climate Risks, Background Paper for the UNFCCC Seminar on the Development and Transfer of Environmentally Sound Technologies for Adaptation to Climate Change, [8]

Douthwaite, B., de Hann, N., Manyong, V. and Keatinge, D., 2001: Blending “Hard” and “Soft” Science: the “Follow-the-Technology” Approach to Catalyzing and Evaluating Technology Change, Conservation Ecology, 5 (2): 13.

Taylor, A., Thorne, S. and Mqadi, L., 2008 (forthcoming): Receiving Technology in Adaptaton Projects, Tiempo, [9]

5. Adaptation as a socio-institutional learning process

[edit]

As is evident in the literature review above, adaptation is being approached in a number of different ways. Climate change adaptation is often depicted as a one-off decision to reduce future vulnerability. This may be seen in studies that attempt to predict the impacts of climate change and then represent adaptation as an incremental reduction in future impacts. For example, the benefit of replacing one cultivar with another is shown as an adaptation scenario. In this view, the common indicators of adaptive capacity are related more directly to vulnerability (and indeed are often the same indicators). For example, GDP per capita is suggested as an indicator of the range of options available, the ability to assess risks and options, and the means to adopt expensive choices.

The alternative approach might be to depict adaptation as a series of decision nodes over time — a pathway of evaluation of risks, identifying options, choosing an option, monitoring the outcome and then iterating the process at the next decision node. This is the Act-then Learn-then Act again model from decision science, and is relates closely to much of the work on Adaptive Resources Management, which focuses on dealing with high levels of uncertainty and possible thresholds in the system being managed. Included in several chapters in the IPCC AR4, it is a more appropriate paradigm than approaches such as cost-benefit analysis that assume a high ability to predict future risks or outcomes of decisions.

The decision-pathway approach suggests several key features related to climate change. The adaptation baseline is the sequence and timing of decisions that would be made in the absence of climate change-specific policies or actions. For instance, projects proposed under the National Adaptation Programmes of Action (NAPAs) need to establish a baseline of development actions that are planned at present and then show how climate change adaptation alters that baseline.

Climate change adaptation pathways might bring forward a decision node for consideration at an earlier stage (e.g. plans to upgrade flood defenses), choose a different action from actions that are already identified (e.g. invest in demand management rather than new water supplies), or add new options that would not have been considered previously (e.g. building a constituency for green belts that are biodiversity migration corridors).

In some cases, the existing path may be inadequate. Early adaptation actions may create dead ends, nodes that have few practicable options and require a jump to an entirely different pathway. One example would be building codes that result in large numbers of buildings unable to be renovated because of the costs of the new standards. A new node might be created, as in the NAPA processes. It is possible to depict dead ends and new nodes as a jump to a new pathway, one based on fundamentally different values, socio-institutional regimes and decision frameworks.

This socio-institutional approach to adaptation decision making requires new approaches to indicators of the competence to carry out adaptation (which might be termed adaptive capacity). The indicators would focus on the process, from the drivers of policy to policy and strategy to actions, rather than the outcome in hypothetical reductions in future impacts or artificial

constructions of present vulnerability. A 'policy-action' matrix helps to organise an audit of competence in adaptation planning. The limits to adaptation are then barriers to progressing from one level of competence to another, in connecting policy to strategy to action, and in making decisions at specific nodes in a pathway.

5.1.1 Further reading

[edit]

For more on institutional policy assessment and the policy-action matrix mentioned above visit this page of wikiADAPT:Institutional policy assessment

Berkhout, F., Hertin, J. and Gann, D., 2004: Learning to Adapt: Organisational adaptation to climate change impacts. Tyndall Cantre Working Paper No.47, [10]

Pelling, M. and High, C., 2005: Social learning and adaptation to climate change. Disaster Studies Working Paper No.11, [11]

6. Principles of adaptation

[edit]

Here are 10 general principles of adaptation distilled from our current thinking, as outlined above, that form the basis for developing and implementing processes to support adaptation in practice.

1. Adaptation is a process of social and institutional learning that recognises often competing stakeholder goals and processes and uses information at various levels and in many ways; rather than equating adaptation with a reduction in vulnerability as a scientific or technical forecast.

2. Adaptation strategies and actions should be robust against a wide variety of future conditions; rather than assuming we can predict future impacts and provide climate proofing measures. Think of climate change as a range of not-implausible futures for which current climate scenarios are an initial estimate. However, it is not possible to assign probabilities--the scenarios are plausible samples from an unknown population.

3. Adaptation is specific processes of stakeholder decision making, in specific contexts, related to specific threats and opportunities; rather than a unique process of climate change risk management or generic solutions that can be transplanted from other contexts.

4. We approach adaptation from the perspective of the use and value of information in making a decision; rather than risk assessment, scenario development and decision evaluation (such as multi-criteria analysis) as endpoints in their own right. The key is in using information to reduce the uncertainty surrounding a decision.

5. We seek to introduce information about vulnerability and climatic risks in ways that communicate robust conclusions and critical uncertainties that might influence a decision outcome; rather than leaving users to sift through the caveats and confidence ratings in scenarios and forecasts.

6. Effective adaptation equips people and institutions alike to cope with a wide range of contingencies. Learning is achieved through rolling re-assessments that account for changing conditions. Our aim is to integrate climate change and climate change adaptation in 'good enough' practice in risk management; rather than expecting decision makers to adopt new perspectives and analytical tools and to differentiate between decision making for current issues and long-term sustainable development.

7. Focus on screening adaptation options

8.The development of appropriate communication tools to encourage consensus among stakeholders on adaptation options requires shared information and participatory techniques focused on exploring synergies, conflicts and awareness raising around potential adaptation pathways.

9. There is a lot of uncertainty about future climate changes, but we do know enough to act.

10. Enduring partnerships, between experts and practitioners, multiple stakeholders and across scales, are essential for building adaptive capacity over the time scales required by climate change. Such partnerships rest on shared purpose, principles and vision, and fairness and trust in working together.

It is these principles that guide the process being developed within weADAPT to support adaptation. We expect that entry points and pathways through this process will vary between stakeholders and applications. This is illustrated by documenting prototypes of such adaptation processes for specific countries, as explained below.

7. Adaptation prototypes

[edit]

As examples of cases in which the information within wikiadapt can be used, prototypes have been developed for several countries which are at various stages in the development of their adaptation planning. This is an approach that can be used to address a problem in a specific region, country or a local area including those with multiple stresses as well as climate risks. There are several routes to access information on developing prototypes in the wiki. From the Main Page, click on wikiadapt and a table of contents comes into view.

The relevant sections are **Themes** [12] and **Prototypes and worked examples** [13]. The section on themes gives an overview of our approach. It is circular because different users will jump in at various stages of the process or may only need to address parts of the whole cycle. The information on the themes will help user to help to frame the question they wish to ask and to identify which areas need further information to be gathered.

Another route in the wiki to developing prototypes which goes from a vulnerability analysis, through to communicating risk to stakeholders and policy makers is through the Guides to wikiADAPT. These can be accessed from the left hand panel on the wikiADAPT screen under **Guides to wikiADAPT**. Particularly of use for national assessments in the **User Guide for NAPA teams** [14] and for more local, community based assessments **Community based Adaptation projects** see [15]. These give guidance for the various stages of an assessment including steps to identify climate vulnerability and exposure, how to link this to climate data and future scenarios using the CCE tool. Users may use Communication Tools to devise risk communication strategies according to the type of target audience they are dealing with.

Several prototypes are in development (Nepal and Mali are focused on the ACCCA projects mentioned above). The Mali example includes an assessment of social vulnerability at the study site locations, the climate hazards and the exposure of the sites to the hazard plus an assessment of trends in climate and its perceived impacts on identified sectors at the study sites. This uses the AWhere GIS software to map hazards and vulnerability indices [16]. An assessment of critical thresholds and timing of climate variables is included and for this prototype alone an analysis of climate scenario data has been made possible (via our **Climate Change Explorer Tool** [17]). Adaptation options have been identified through community participation at the project sites through the ACCCA process.

The following is a brief overview of the prototype approach. For more details please follow the links given in the above section.

Vulnerability is the foundation of the analysis of adaptive strategies and measures. The depth of vulnerability assessment required depends on existing material and the extent to which new research is required. The aim is to focus on high priority adaptation, and not to model vulnerability in detail. A widely used approach shows livelihoods as exposed to shocks and threats, with

livelihood strategies linking institutions and outcomes.

The first step is to identify vulnerable socio-economic groups. A livelihoods approach is proposed that is compatible with a poverty alleviation focus. Livelihoods are related to economic sectors, public infrastructure and ecosystem services that they are dependent on. The aim of this step is to identify the relevant vulnerable stakeholders, the nature of their interest in and support for climate change adaptation, and their links to the vulnerable livelihoods identified above. This is not to say that the most vulnerable stakeholders will necessarily always be the poorest groups in society.

Vulnerable groups are exposed to a range of present climatic hazards, trends in climatic resources that may become significant in the near future, and other environmental, economic, and socio-political stresses. Identifying the location, vulnerable groups, livelihoods, climate hazards, other stressors and climate variables is a key first step in the process of risk assessment and mapping. It may be useful to add other stresses and shocks that exacerbate the effects of climatic hazards. For instance, AIDS/HIV infection, economic recession and civil strife would alter the range of coping strategies that different livelihoods might employ in order to cope with droughts or floods. These become important if they directly affect the adaptive capacity of livelihoods and the ability to implement proposed adaptation strategies.

The next step is to ask what the major climate hazards and where do these occur? Highlighting the location of specific hotspots in the country where climate-related hazards are experienced or likely to be felt is a key step in identifying intervention areas. The initial screening process begins with this question, which allows the user to reframe the climate change problem in the context of local conditions/constraints and opportunities. This includes identifying with stakeholders what the main climatic hazards they encounter are, and how frequently they occur. This can show whether climate change impacts are likely to be material for a particular development function, activity or service. Moreover, isolating these locations for further examination is a critical starting point. Further analysis of the trends and impacts of these hazards, when combined with key vulnerability indicators will help to narrow down priority zones for specific project targets.

These hazards can also be examined to look for key thresholds in the system, for example the length of the growing season for a specific crop, or the temperature at which tourists will begin to go elsewhere. The identification of thresholds can then be used with information on trends in hazards, and projections of future climate, to identify areas particularly vulnerable to future impacts.

A first step in assessing the potential impacts of these hazards in the future is to highlight or estimate the major current and expected trends (direction, magnitude, and extent) of climate-related hazards.If the trends observed above are consistent with the range of scenarios for future

climate change, then the rationale for urgent action is much stronger. It is important to evaluate:

- *Trend in Likelihood* => Coupled with predicted patterns, are the occurrences of these events likely to increase/decrease or otherwise change?
- *Trend in Magnitude* => Are these events likely to become more or severe in their impacts?
- *Trend in location* => Are the events likely to expand into areas currently not impacted, or are they likely to become more localized?
- *Other trend descriptions* => Could include a variety of conditions exhibited by these events, such as their temporal variation (are they likely to be more severe during specific months? Are they likely to be more severe when coupled with other events, such as famines, etc.?)

The next step is to the examine the climate projections for the location from a range of different climate models in order to capture the range of future projections. Ideally data downscaled to station level would be used to examine predictions of future climate variables at meteorological stations relevant to the project (downscaled data for Africa, including the Mediterranean coast, is available through the weADAPT CCE tool). If this is not available then GCM data, or RCM data if available, can be used, but due to the uncertainty of projections, it is important that a range of futures from different models is used.

These projections can be examined to see whether the key thresholds or sensitivities in the system which were previously identified will be affected. For example the range of future precipitation predicted for N. Algeria might show the possibility of a shorter rainy season, thus meaning that traditional varieties of wheat would no longer be able to be grown.

The analysis of the long-term trends in climate will ensure that adaptations to current trends in climate are not maladaptations which actually increase the vulnerability of the system to future change. It is important to note that the way information on climatic trends and future projections of climate is used must be context specific. In some cases the most important information will be current trends in climate hazards and climate variability, however in others, such as large infrastructure projetcs, future projections of climate will be the most important factor.

Based on the above analysis suitable adaptation options can be identified, and these can be screened using various decision support tools such as multi-criteria analysis to choose the most suitable and robust option. SEI is currently developing a Decision Explorer ([18]) to support this process of decision-making in adaptation. This will be available to Circe partners as deliverable

13.2, for more details please see the ongoing work on wikiADAPT

The full prototype approach is still is a process of development. Areas which we hope to improve on include:

- Making impact models available to make using of future climate scenario envelopes.
- Consider the role of socio-economic scenarios of the future when adaptation planning.

8. Conclusion

[edit]

From this it is clear that while many people are working on issues of adaptation from different stand points, we are suggesting a particular approach that views adaptation as a socio-institutional process of learning and change that needs to be supported in innovative ways. Many of these ideas, together with methods and tools for addressing them, are further discussed in other sections of weADAPT, which is itself an expanding resource. As mentioned at the start this is intended to be a living document that can grow further in response to identified need, interest and new developments in the thinking.