

Towards Climate-resilient Development Pathways for the People in the Hindu Kush Himalayan Region

A guidance document



Consortium members



About HI-AWARE Working Papers

This series is based on the work of the Himalayan Adaptation, Water and Resilience (HI-AWARE) consortium under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) with financial support from the UK Government's Department for International Development and the International Development Research Centre, Ottawa, Canada. CARIAA aims to build the resilience of vulnerable populations and their livelihoods in three climate change hot spots in Africa and Asia. The programme supports collaborative research to inform adaptation policy and practice.

HI-AWARE aims to enhance the adaptive capacities and climate resilience of the poor and vulnerable women, men, and children living in the mountains and flood plains of the Indus, Ganges, and Brahmaputra river basins. It seeks to do this through the development of robust evidence to inform people-centred and gender-inclusive climate change adaptation policies and practices for improving livelihoods.

The HI-AWARE consortium is led by the International Centre for Integrated Mountain Development (ICIMOD). The other consortium members are the Bangladesh Centre for Advanced Studies (BCAS), The Energy and Resources Institute (TERI), the Climate Change, Alternative Energy, and Water Resources Institute of the Pakistan Agricultural Research Council (CAEWRI-PARC) and Wageningen Environmental Research (Alterra). For more details see www.hi-aware.org.

Titles in this series are intended to share initial findings and lessons from research studies commissioned by HI-AWARE. Papers are intended to foster exchange and dialogue within science and policy circles concerned with climate change adaptation in vulnerability hotspots. As an interim output of the HI-AWARE consortium, they have only undergone an internal review process.

Feedback is welcomed as a means to strengthen these works: some may later be revised for peer-reviewed publication.

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Contents

Acronyms and Abbreviations	iv
1. Introduction	1
2. Definitions and Framing of the Concept	3
3. Case Studies from Literature and Case Comparison	7
3.1. Overview Existing Cases	7
3.2. Case Comparison: Context in Which Pathways are Developed	16
3.3. Case Comparison: Methodological Observations	17
4. HI-AWARE Approach	19
4.1. Adaptation Pathways in the Overall Structure of HI-AWARE	19
4.2. Key Research Questions and Sub-questions	20
4.3. Towards a Stepwise Approach for Adaptation Pathway Development	20
4.4. Example Methods for Use in HI-AWARE	22
4.4.1. Pathways Development, Following the Appraisal of Adaptation Measures	22
4.4.2. Pathways Development, Following Participatory Scenario Development	23
4.4.3. Pathways Development, Using Visioning and Backcasting	24
4.4.4. Pathways Development, Using Scenarios and Assessment of Drivers	27
4.4.5. Pathways Development, Using Scenarios and Turning Points	30
5. Discussion and Recommendation	33
6. References	35
7. Annexure	39

Acronyms and Abbreviations

BCAS	Bangladesh Centre for Advanced Studies
CAEWRI-PARC	Climate Change, Alternative Energy and Water Resources Institute of the Pakistan Agricultural Research Council
CARIAA	Collaborative Adaptation Research Initiative in Africa and Asia
FGD	Focus Group Discussion
HI-AWARE	Himalayan Adaptation, Water and Resilience Research
HKH	Hindu Kush Himalaya
HLO	High Level Option
ICIMOD	International Centre for Integrated Mountain Development
IDRC	International Development Research Centre
INGO	International Non-governmental Organisation
LAPA	Local Adaptation Plans of Action
MCA	Multi-criteria Analysis
NAP	National Adaptation Plan
NGO	Non-governmental Organisation
RC	Research Components
TERI	The Energy and Resources Institute
VDC	Village Development Committee

1. Introduction

Development is occurring against a backdrop of vulnerability to climate change. In order for development decisions to be sustainable in a changing climate they need to include choices and actions that modify climate change and its impacts and sustain development efforts over time. In the context of adaptation to climate change, adaptation pathways are proposed as a promising decision-focused approach to incorporate flexibility and account for future uncertainties (e.g. Haasnoot et al., 2013, Wise et al., 2014, Bosomworth et al., 2017). Adaptation pathways sequence measures over time and allow for progressive implementation depending on how the future unfolds, on the development of knowledge, and on stakeholder inputs and priorities. Other potentials are the ability to identify 'no or low regrets' interventions and to avoid lock-in, threshold effects, and maladaptive consequences. Thus, adaptation pathways may hold the promise to help plan and implement activities in an overall vision of development and climate change resilience.

HI-AWARE, as well as the other CARIAA consortia and other research groups, is responsive to these potentials and aims to experiment with the development of adaptation pathways. As yet, there has been no agreed method for pathways development. This document aims to analyse different approaches to adaptation pathway development in order to frame and support pathway development in HI-AWARE and for other interested parties.

To this end the document offers definitions (Chapter 2) and different cases of pathway development from literature, plus an analysis of contextual and methodological similarities and differences between the cases (Chapter 3). Based on this, the document introduces generic activities and different methods to develop pathways, responsive to particular case settings and, for HI-AWARE, the work undertaken in the other Research Components (RC) (Chapter 4). The document closes with a discussion and recommendations (Chapter 5).



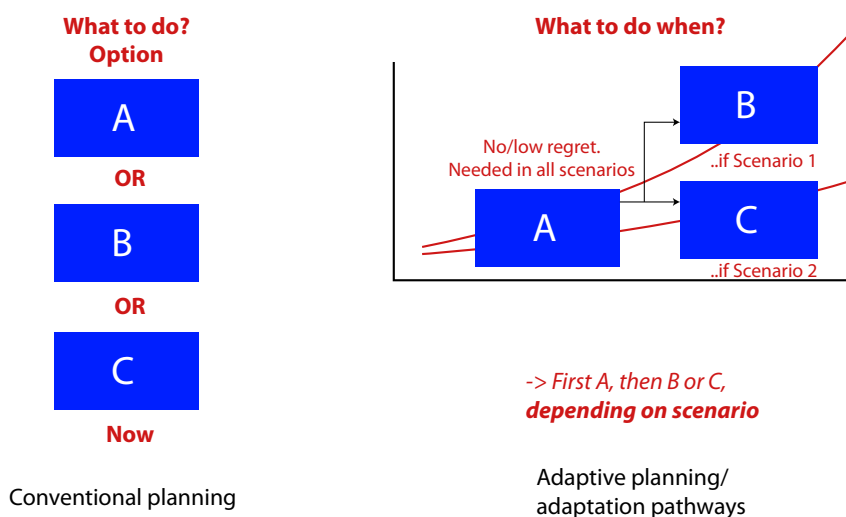
2. Definitions and Framing of the Concept

Adaptation Pathways are gaining attention as a planning response to an uncertain future. The approach emphasizes that uncertain changing conditions require a dynamic adaptation planning that allows for flexibility in decisions over time. Following this line of thought, adaptation pathways map the exploration of measures needed to achieve future objectives. The concept 'pathways' is used in adaptation research and planning as a metaphor for helping visualise a decision-centred approach to support and inform adaptation (Wise et al., 2014).

It is important to stress that pathway thinking itself is not new. The basic notion is that measures are sequenced in time for implementation towards a certain outcome. An example of pathways that you may be familiar with are Impact Pathways developed for a Theory of Change. Also, the Intergovernmental Panel on Climate Change (IPCC) in its fifth assessment report (AR5, <https://www.ipcc.ch/report/ar5/wg2/>) pursues pathways and calls for decisions and actions that take into account both short and long-term time horizons. Adaptation is not to be seen as an outcome, but rather as a process of incremental and transformational changes. Although payoffs from specific long-term pathways may be unknown, strategies and actions can be pursued now that will contribute to moving toward resilient pathways, while helping improve livelihoods, social and economic well-being, and responsible environmental management (IPCC, 2014, Section 20.6.2). For the AR6 a dedicated chapter is planned on 'climate-resilient development pathways'. Pathways may be broad directions in which actions could be taken; they could be qualitative in the form of narratives and storylines or definite in terms of actions and time line.

Figure 2.1 illustrates what pathway thinking adds to adaptation planning. Instead of selecting the measure(s) to best adapt to a certain situation now, in an adaptation pathways approach the measures are sequenced in time. Adaptation pathways are developed with measures, which can be implemented over time depending on how the future unfolds, on the development of knowledge, and / or on stakeholder inputs and priorities. In Figure 2.1 this is illustrated by the two metaphorical scenario lines (Scenario 1 and 2), which represent challenges to be addressed in adaptation planning. These challenges will differ per case. The figure illustrates conceptually that in an adaptive plan adaptation pathways capture the implementation process by specifying which measure(s) are to be taken now and which are planned for the future, to be implemented once certain scenario conditions occur. As such, adaptation pathways explicitly take into account uncertainty and highlight the importance of flexibility in adaptation planning. In sum, adaptation pathway planning prepares for an uncertain future by identifying sets of actions that may be taken to realise and sustain certain goals under different scenario conditions.

Figure 2.1: Stylised illustration of adaptation pathways planning compared to conventional planning



This said, different approaches and definitions of adaptation pathways exist in literature, as summarised in Box 1 (Wise and Capon, 2016). The three approaches in Box 1 also broadly capture the intellectual and empirical beginnings of a pathways approach in adaptation planning and research. Drawing on complexity theory and systems thinking, pathways approaches have gained prominence in recent years to deal with ‘wicked problems’ of sustainable development and climate adaptation (Gajjar et al., 2018). Initially, adaptation pathways were developed in a context where the goals were (considered) little contested, and planning was mostly centrally coordinated. Examples are for instance the Thames estuary flood risk management planning (Reeder and Ranger, 2011, Ranger et al., 2013) and the Dutch Delta Programme for water security and safety in the Netherlands (Haasnoot et al., 2013, Delta Commissioner, 2013). More recently, pathway planning is also applied to more dynamic environments, where multiple decision-makers are involved. Examples here are a dialogue about adaptive management in Indonesia (Butler et al., 2016) and the vulnerability in remote disadvantaged communities (Maru et al., 2014). These examples will be explored and compared in more detail in the Chapter 3. It is important to note here that all definitions in Box 1 concur with the general notion illustrated in Figure 2.1, which will also be the starting point for HI-AWARE.

Box 1: Approaches for adaptation pathway development (Wise and Capon, 2016)

The Route Map (Pathways) approach (Reeder and Ranger, 2011)

The route-map approach (or decision pathways approach) is a method of designing robustness to climate change uncertainties into the adaptation strategy itself. Rather than taking an irreversible decision now about the one or two ‘best’ adaptation options to cope with climate change (which can lead to maladaptation if the climate scenarios planned for do not emerge), it encourages a decision-maker to postulate ‘what if’ outcomes and take a more flexible approach, where decisions are made over time to continuously adapt while maintaining as much flexibility as is desirable about future options. This approach aims to ensure that whatever short- to medium-term plan is adopted, it is set in a framework that will not be maladaptive if climate change progresses at a rate that is different from what is predicted today.

Dynamic adaptive policy pathways (Haasnoot et al., 2013)

Adaptation Pathways provides an analytical approach for exploring and sequencing a set of possible actions based on alternative external developments over time. Adaptation Pathways provide insight into the sequencing of actions over time, potential lock-ins, and path dependencies. Central to adaptation pathways are adaptation tipping points: the conditions under which an action no longer meets the clearly specified objectives. The timing of the adaptation point for a given action, its sell-by date, is scenario dependent. After reaching a tipping point, additional actions are needed. As a result, a pathway emerges. The Adaptation Pathways approach presents a sequence of possible actions after a tipping point in the form of adaptation trees (e.g. like a decision tree or a roadmap). Any given route through the tree is an adaptation pathway.

Adaptation as part of pathways of change and response (Wise et al., 2014)

Wise et al. (2014) build upon these approaches to adaptation pathways and emphasise several core principles as key requirements of adaptation pathways approaches. First, climate change impacts and responses cannot be considered in isolation, but are components of dynamic, multi-scale, social-ecological systems. Second, adaptation involves multiple stakeholders with competing values, goals, and knowledge, which must be recognised and negotiated. Third, responses to change must be coordinated across spatial scales, jurisdictional levels, and sectors. Fourth, planning processes should design and implement incremental adaptation strategies to address proximate causes or symptoms of vulnerability, plus transformative strategies to tackle systemic causes, which in developing countries are often the institutional and political roots of disadvantage. And fifth, to avoid maladaptation, strategies should be ‘no regrets’ (i.e. yielding benefits under any future conditions of change (Hallegatte, 2009)) and decisions to implement them should be sequenced over time, informed by an understanding of interactions between changes and responses.

As much as there are different definitions and examples of pathways, there is little consolidated guidance about how to develop adaptation pathways. Four recent initiatives stand out:

- Adaptation Pathways: a playbook for developing options for climate change adaptation in Natural Resource Management (Bosomworth et al., 2015)
- A User's Guide to Applied Adaptation Pathways (Siebentritt and Stafford Smith, 2016)
- Adaptation Pathways wiki and Pathways Generator (publicwiki.deltares.nl/display/AP/Adaptation+Pathways)
- Developing Adaptation Pathways, Six generic activities to developing adaptation pathways (Wise and Capon, 2016) [unpublished]

The HI-AWARE work builds on the above work and on the case examples introduced in the next chapter.



3. Case Studies from Literature and Case Comparison

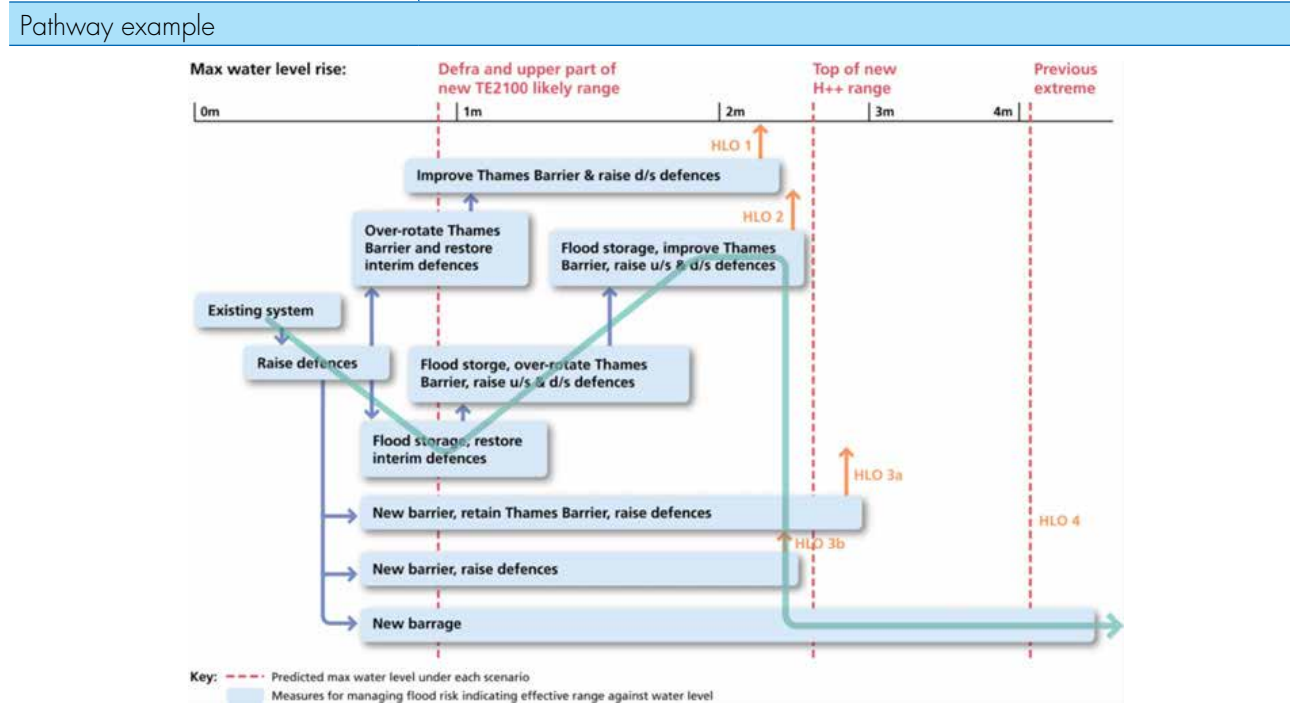
This chapter reviews cases from literature and reflects on the context and methods used for pathway development. It is provided as background for the HI-AWARE work introduced in Chapter 4.

3.1. Overview of Existing Cases

In literature, different examples of pathways have emerged. Table 1 offers fifteen examples of pathways: eleven from the context of adaptation to climate change, one from a socio-political transition, one from sustainability futures, and the last two from carbon transitions. After the examples we preliminary discuss observations on similarities and differences.

Table 1: Review of different examples of adaptation pathways (Source: Garcés (2017))

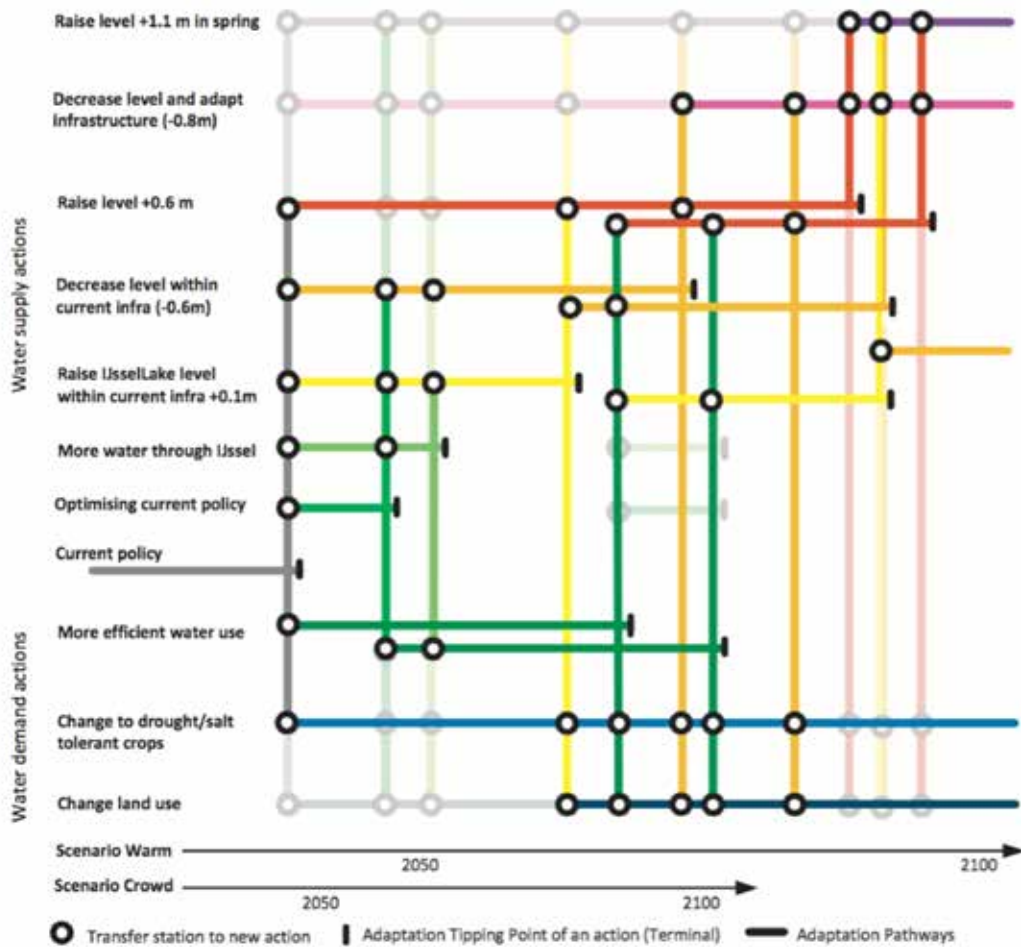
Name and author	Description
<p>1. Addressing ‘deep’ uncertainty over long-term climate major infrastructure projects: four innovations of the Thames Estuary 2100 Project.</p> <p>(Ranger et al., 2013)</p> <p>(Reeder and Ranger, 2011)</p>	<ul style="list-style-type: none"> • One of the first big infrastructure projects to recognize deep uncertainties of climate change in a planning process. • Developed with a ‘decision-centred’ approach. • The approach used ‘what if’ scenarios to encourage the decision- maker to consider conditions in which the current strategies are insufficient. • The ‘decision-pathway’ approach show different set of options for maintaining the risk in a lower level under different climate conditions. • The x-axis represents the different thresholds for the project in terms of water level.



2. Dynamic adaptive policy pathways. A method for crafting robust decisions for a deeply uncertain world. Case study: Rhine Delta in the Netherlands. (Haasnoot et al., 2013)

- Adaptation pathways approach as an ‘analytical tool for the exploration and sequencing of possible actions based on alternative external actions over time’.
- The approach enhances the exploration of different routes to achieve goals in the future under climate uncertainties. It connects short-term actions with long-term goals.
- Identify opportunities: no regret actions, lock-ins, and the timing of actions for supporting decision-making.
- Actions are considered steps that are triggered by thresholds and tipping points, which are represented in a route map.

Pathway example

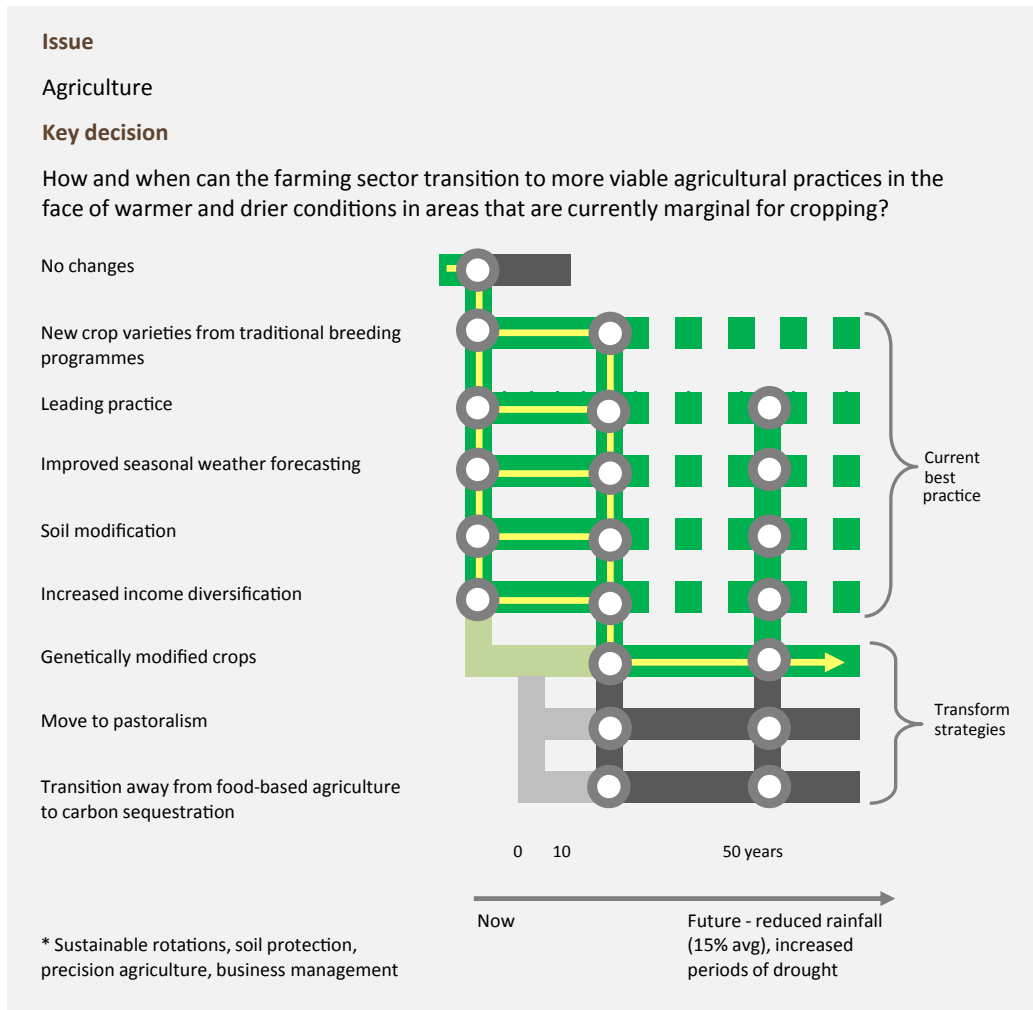


3. Regional Climate Change Adaptation Plan for the Eyre Peninsula, 2014.

(Siebentritt et al., 2014)

- The Eyre Peninsula is located in the western part of South Australia where climate change impacts have been recognized in policy planning and operationalized in an adaptation pathways approach.
- Example of an adaptation pathways map that shows the transition of the agricultural sector towards operation under warmer conditions in the future. The pathways take into account decisive circles, where options will need to be evaluated, and tipping points, where actions are no longer an option.

Pathway example

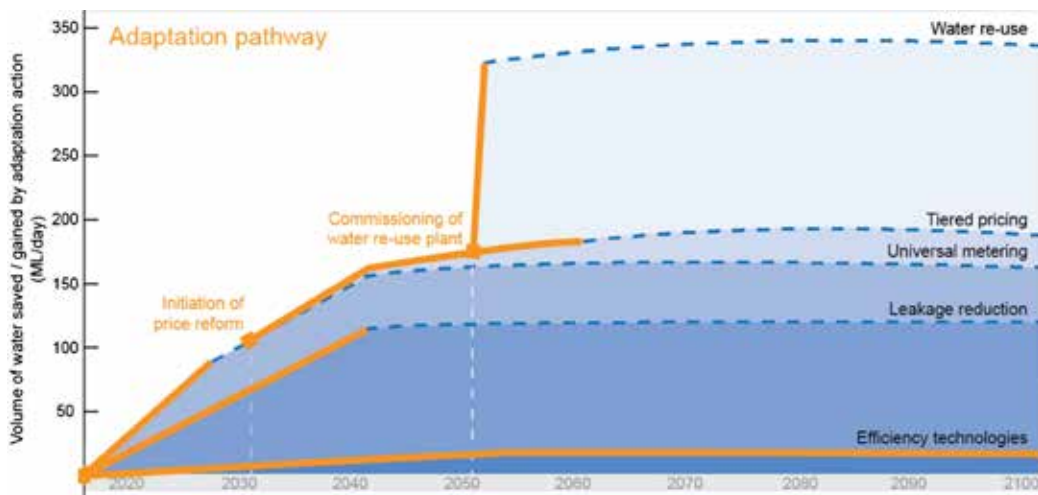


4. Adaptation pathways in practice: Mapping options and trade-offs for London’s water resources.

(Kingsborough, Borgomeo, and Hall, 2016)

- Adaptation planning in an urban water supply system that uses an adaptation pathways approach for linking current risk-based decision-making with the development of long-term pathways.
- Demonstrates how system could cope with future climate change impacts.
- Develops an adaptation plan that functions well under different climate, population, and investment scenarios.

Pathway example

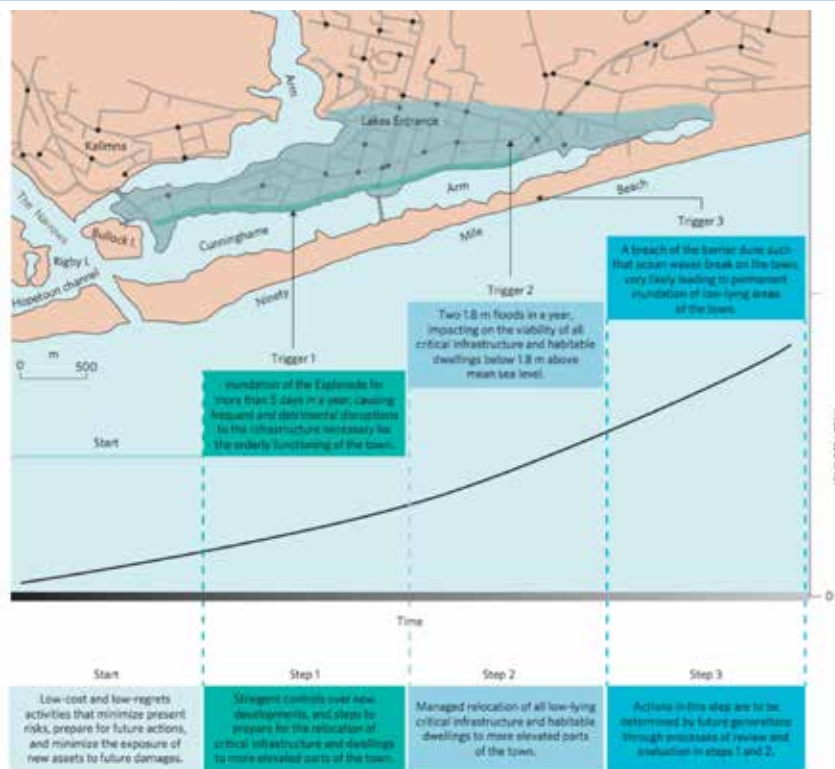


5. A local coastal adaptation pathways

(Barnett et al., 2014)

- Adaptation Pathways case, which tests if principles of Adaptation Pathways could be applied locally in Australia.
- Previous cases (Rhine and Thames) may not be appropriate for small cities or communities due to the lack of technical skills and finance of cities for big projects, absence of competence for big projects, which are a mandate of the central government, and reliance of local population on local decisions.
- Uses triggers for tipping points that are relevant to local people rather than those that represent environmental change.
- Adaptation is discussed among people as the management of a long-term risk for important local places.

Pathway example

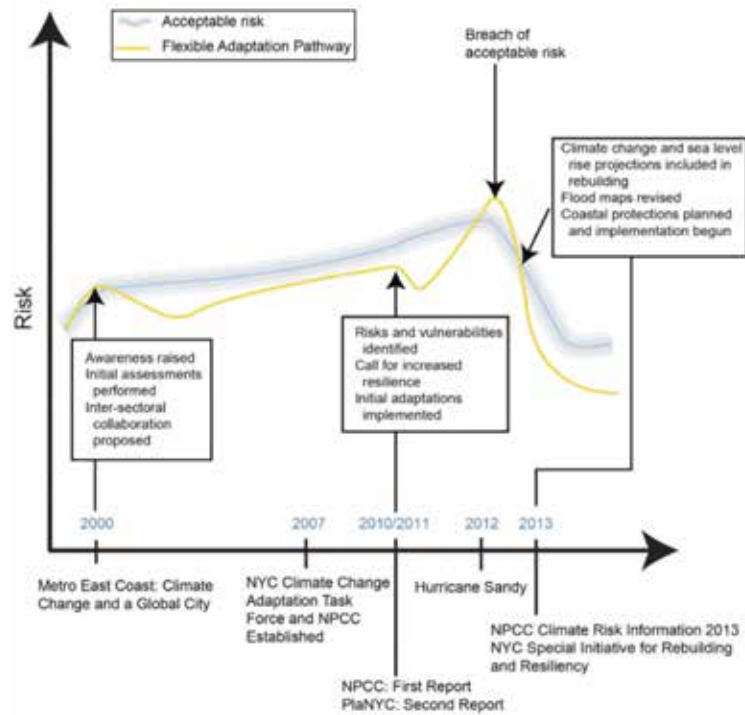


6. Hurricane Sandy and adaptation pathways in New York: Lessons from a first-responder city.

(Rosenzweig and Solecki, 2014)

- Integration of Adaptation Pathways in the municipality of New York City Climate Action Strategy.
- Hurricane Sandy served as a 'tipping point' that led to transformative adaptation and the inclusion of climate-risk criteria in rebuilding programmes.
- Flexible adaptation pathways represent the 'acceptable level of risk'. They comprise successive measures that are not static but are defined in terms of acceptable risk levels and evaluated over time.
- After hurricane Sandy transformational adaptation is required on full regional scale.
- Monitoring includes climate change data, impact, adaptations, and socio-ecological factors.
- States that societal processes are necessary for successful and transformative adaptation.

Pathway example

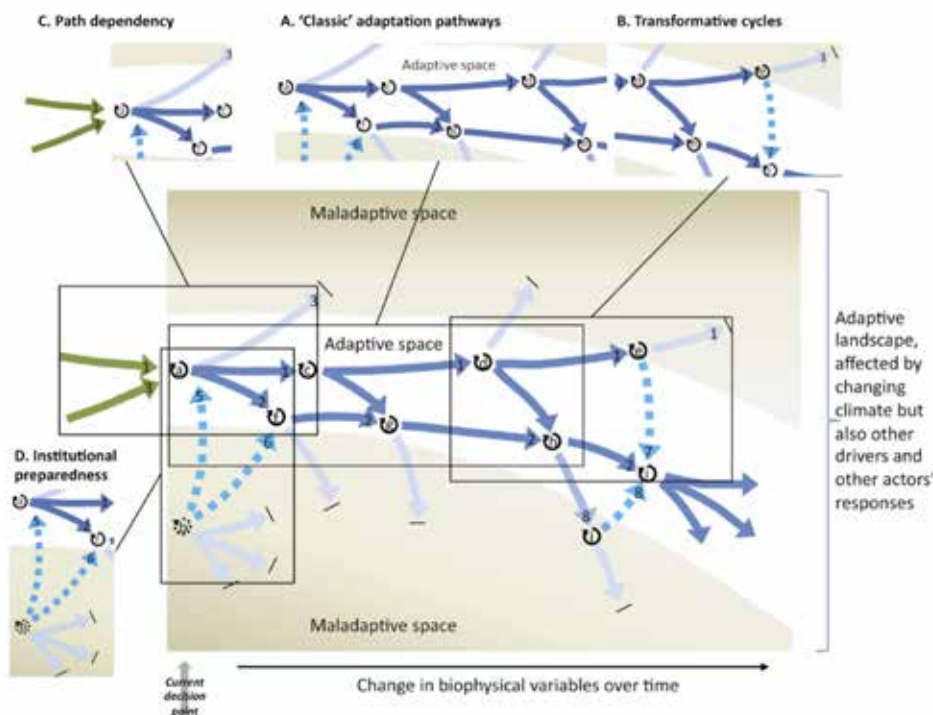


7. Reconceptualising adaptation to climate change as part of pathways of change and response.

(Wise et al., 2014)

- 'Reconceptualization of pathways that aim to inform decision-makers about incremental actions with transformative aspect of societal change'.
- Pathways explore the need of societal transitions and transformations.
- Pathways give attention to the social and ecological conditions that bring about systemic causes of vulnerability.
- Pathways need to reflect the challenge that implies dealing with the complex dynamics of social and ecological processes.

Pathway example



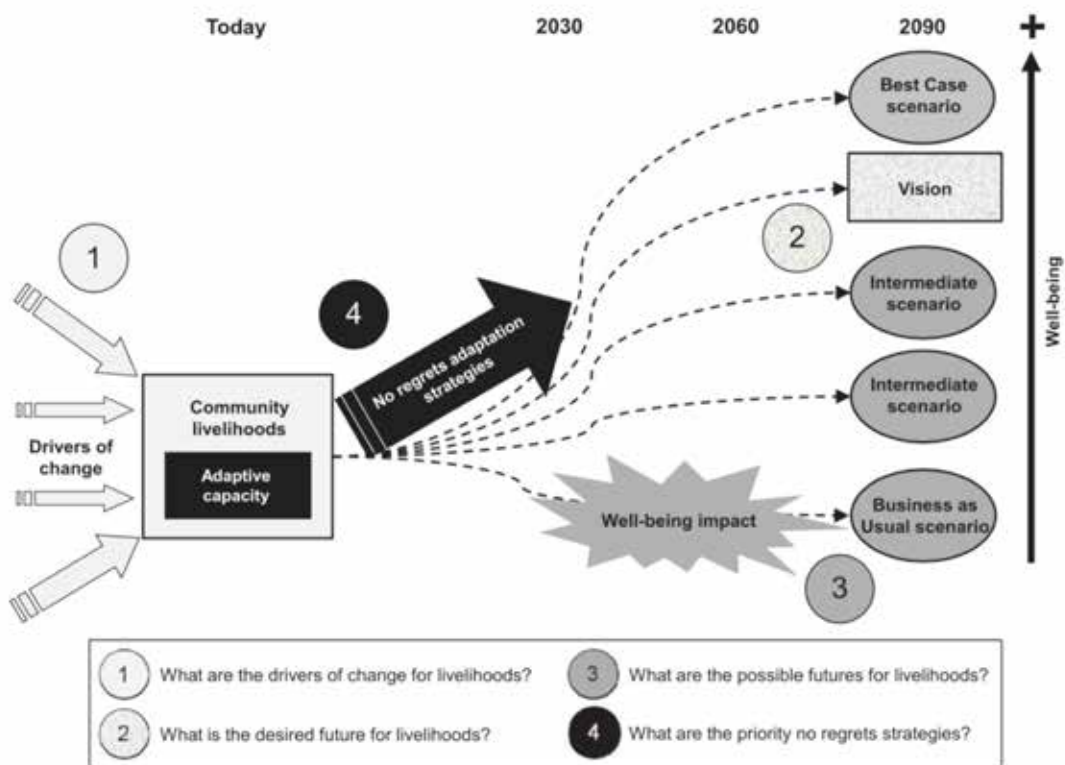
8. Scenario planning to leapfrog the Sustainable Development Goals

Goals: An adaptation pathways approach.

(Butler et al., 2016)

- Study that focuses on climate change uncertainty in the decision-making process for poverty alleviation in developing countries.
- Operationalizes adaptation pathways into a scenario planning process.
- Looks for planning tools to enable rural communities to 'leapfrog' the Sustainable Development Goals through building adaptive capacity.
- Pathways were constructed with different stakeholders by identification of drivers of change, an aspirational future vision, and explorative scenarios for livelihoods in 2090.
- Uses a normative backcasting process to define no regrets strategies to achieve that future vision.

Pathway example

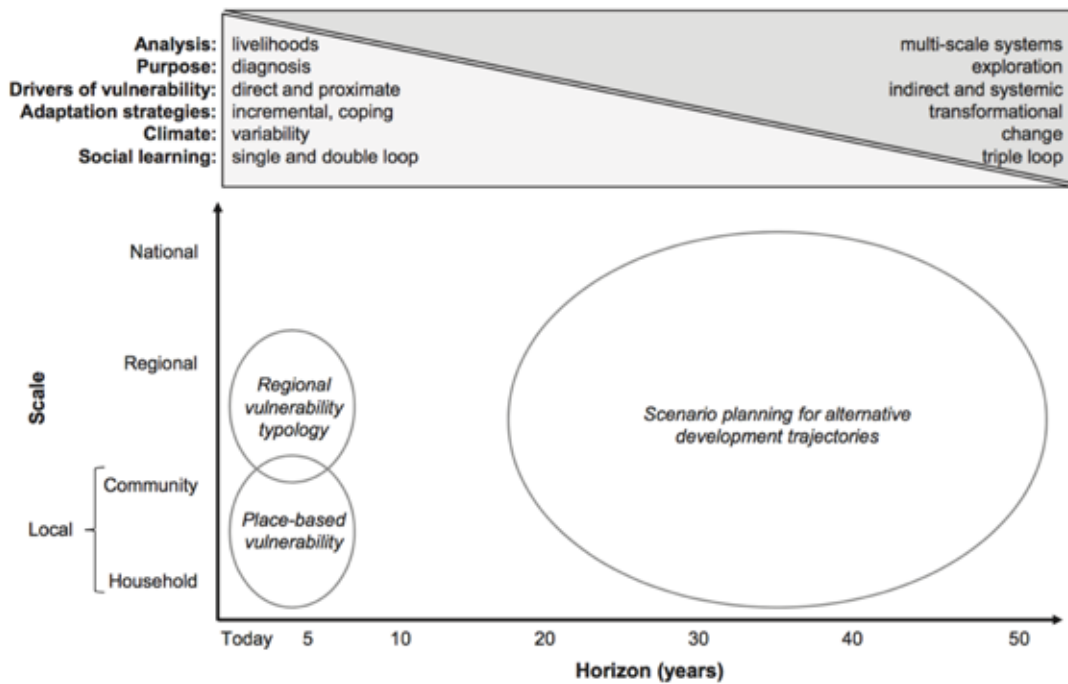


9. Framing the application of adaptation pathways for rural livelihoods and global change in Eastern Indonesian islands.

(Butler et al., 2014)

- Pathways as a continuous decision-making process, of which the objective is to lead societies into sustainable futures.
- Climate change is not considered in isolation but together with other constraints, interacting with climate change in the local sphere.
- Adaptation pathways aim to enable the decision-making process to tackle direct and indirect causes of vulnerability through non-regrets strategies.
- Analyses if the adaptation pathways concept can narrow the adaptation deficit gap in developing countries.

Pathway example

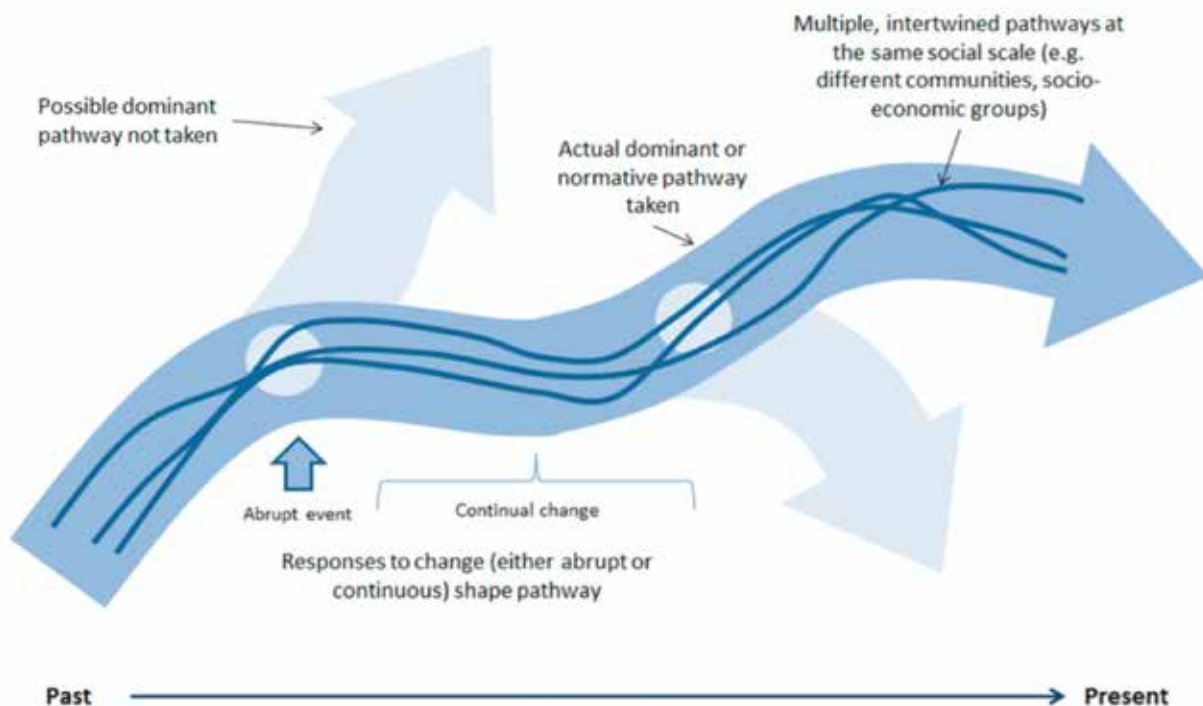


10. Past and future adaptation pathways.

(Fazey et al., 2016)

- Pathways lens application as a retrospective tool for gaining insight into past change to respond better to future change and trajectories.
- Pathways lens emphasizes that current actions shape future trajectories.
- Sees adaptation as a social process with social and power relations, values, and responses that can enhance or block existing inequalities.
- Adaptation pathways go beyond vulnerability studies and aim to identify persistent characteristics of change, which people respond to.

Pathway Example

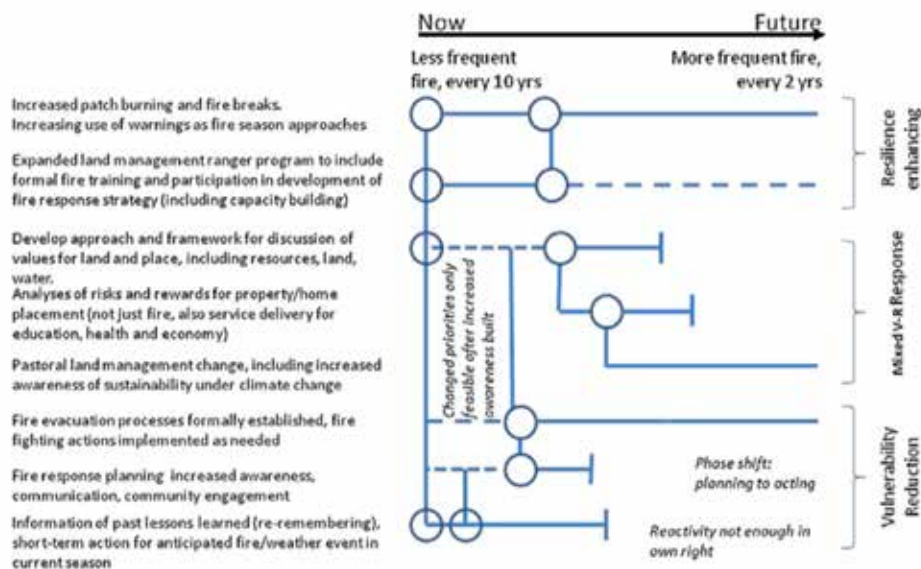


11. A linked vulnerability and resilience framework for adaptation pathways in remote disadvantage communities.

(Maru et al., 2014)

- A framework that explores pathways to climate change with people in disadvantage, remote, and marginalized areas.
- Tests the potential to promote dialogue about adaptation pathways in marginalized communities.
- Framework puts together vulnerability and resilience narratives and offers a scope for an adaptation policy and action on adaptation pathways for remote regions.

Pathway Example



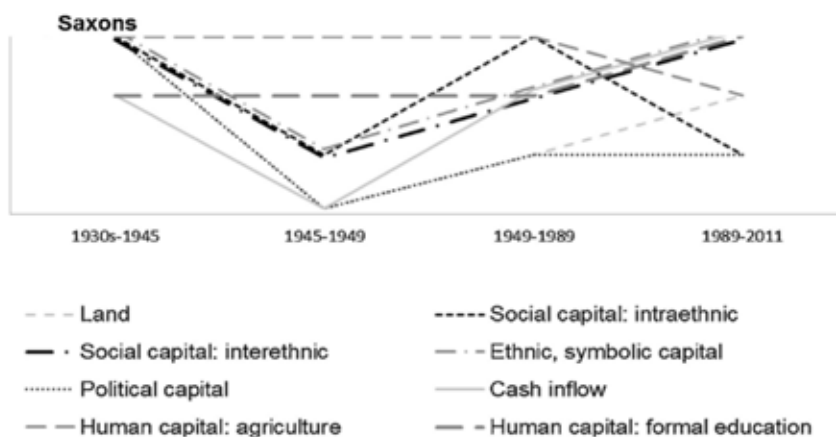
Social and political transitions

12. Adaptation pathways of change and response: a case study from Eastern Europe.

(Câmpeanu and Fazey, 2014)

- Ethnographic approaches to understand the social and political change in the last seven decades in a rural community in Transylvania.
- Adaptation is considered an on-going process, where outcomes and decisions are within social trajectories.
- Adaptation is seen as a process embedded in pathways of change and response that include interlinked pathways, that rise within time and are not external to social or environment factors.
- Pathways are intrinsically linked to 'social hierarchies, power influence and who is considered to be, and becomes marginal.

Pathway example



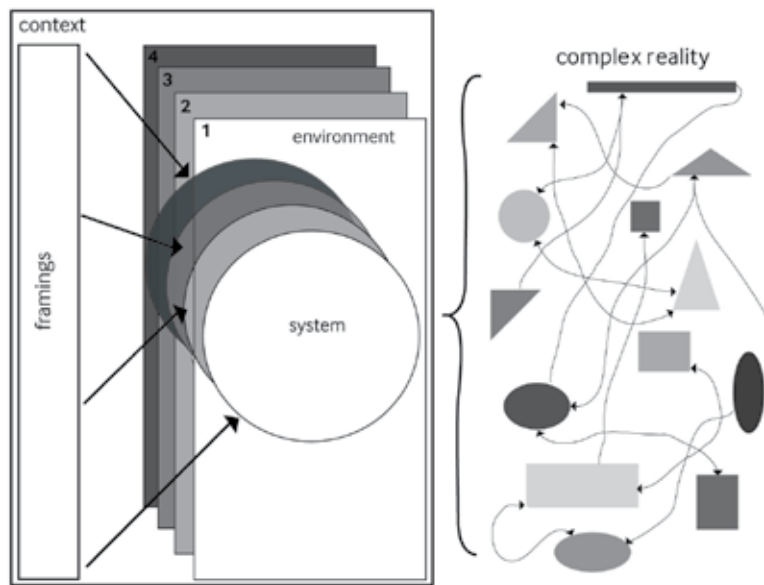
Sustainability futures

13. Pathways to sustainability; An Overview of STEPS Centre approach.

(Leach et al., 2007)

- Pathway is conceived as ‘the way in which the system changes over time’ (Leach, Scoones et al., 2007, pg. 12).
- The understanding of pathways needs to look at historical events, at the on-going change directions and at future scenarios.
- STEPS pathway approach looks at how the debate between different pathways is developed as how different framings structure sustainability decisions.

Pathway example



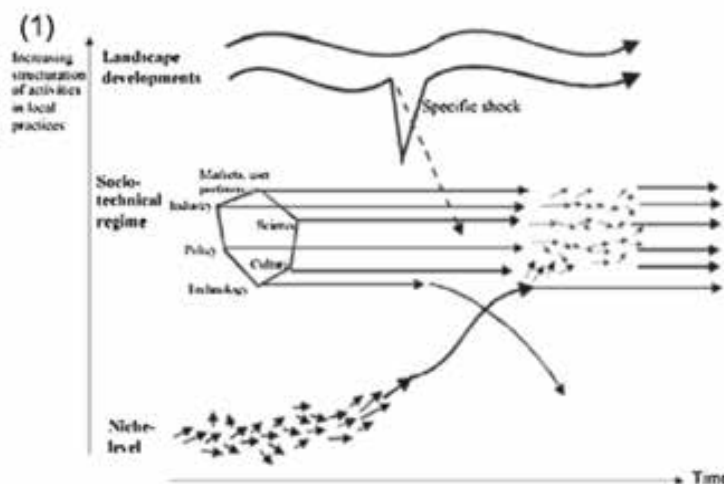
Carbon transitions

14. Pathways, an emerging concept for the theory and governance of low-carbon emissions.

(Rosenbloom, 2017)

- Pathways concept is explored in the context of low-carbon transitions.
- Three central conceptions of pathways in low-carbon emission transitions: (1) biophysical, (2) techno-economic, and (3) socio-technical.
- Pathways as a concept that can connect the diverse perspectives in the complex context of low-carbon transitions.

Pathway example

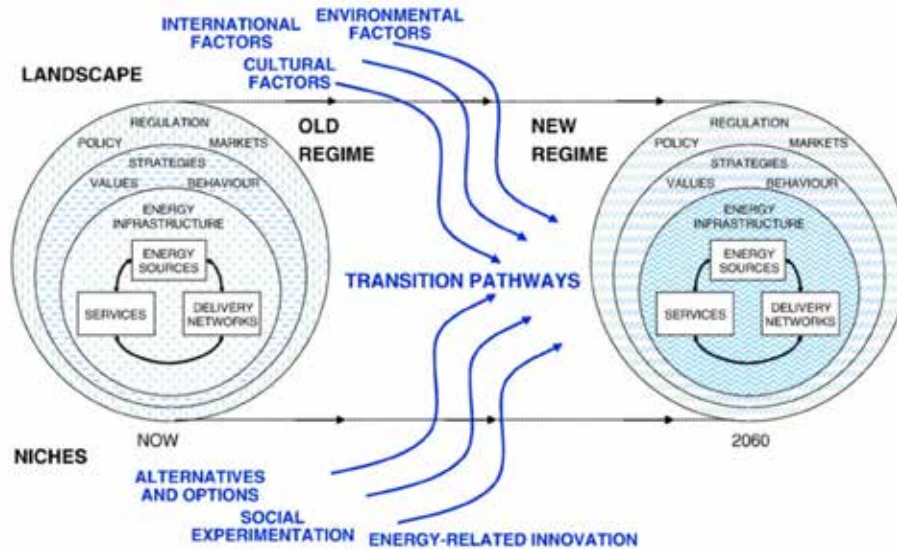


1.5. Developing transition pathways for a low-carbon electricity system in the UK.

(Foxon, Hammond, and Pearson, 2010)

- Transition pathways for a low-carbon electricity system in the UK.
- Learn from past transitions to explore future transitions.
- Transition pathways for socio-technical energy systems.
- Pathways for understanding the role of actors in the dynamic of transitions.

Pathway example



3.2. Case Comparison: Context in Which Pathways are Developed

Seven examples in Table 1 (number 1-7) were developed in higher-income countries, viz. the UK, the Netherlands, Australia, and the United States. Six more examples of adaptation pathways (in 8-12) are from a lower-income context, viz. in Indonesia, the Solomon Islands, Botswana, Amazonian Brazil, remote indigenous Australia and Transylvanian Romania.

Examples 1-4 were made in a data-rich context. Construction of adaptation pathways was based on climate scenarios, thresholds, and adaptation tipping points and triggers. Measures had been identified against climate impact(s). The adaptation goals were defined, and the results are policy and decision-maker oriented. Pathways are mostly expert driven. Wise et al. (2014) argue that these examples only partially (if at all) consider the dynamic interactions between values, knowledge cultures, and institutions that shape (adaptation) decision-making processes. Wise et al. (2014) also propose that adaptation pathways is more of a process rather than an outcome.

Examples five and six include a social component in the pathways development that is different from Example 1-4. In example five, Barnett et al. (2014) ask whether the current adaptation pathways approach can be applied on a smaller scale. Instead of using changes in environmental conditions as thresholds, they identify thresholds that are important for local people. In this case, the adaptation pathways approach is framed as the necessary management of risks for achieving societal goals and collective values for the town. Rosenzweig & Solecki (2014) add to this that (based on lesson learnt from Hurricane Sandy and adaptation pathways in New York) adaptation measures need to be locally appropriate, yet regionally coordinated.

Table 1 offered five other examples of adaptation pathways, developed in lower-income countries and remote and disadvantaged communities. In these examples, the decision-makers and their goals are not unequivocal. The examples explore how adaptation depends on the cultural, environmental, and development context (Wise et al., 2014). For instance, in example seven, Wise et al. (2014) call for a broader conceptualization of adaptation pathways, where adaptation takes place in an evolving social ecological system with multiple stakeholders across scales. They analyse whether the concept is suitable for reducing the adaptation deficit in developing countries.

The argument is that earlier pathway development had not focused on the ‘root’ causes of vulnerabilities as societal institutions and values.

Along with the context, the aim of adaptation pathways development differs between the cases and includes:

- accounting for future uncertainties in adaptation planning (Haasnoot et al., 2013);
- identifying ‘no or low regrets’ interventions, and avoiding lock-in, threshold effects, and maladaptive consequences (Haasnoot et al., 2013; Jones, 2015);
- mapping different stakeholder perspectives, contested values, conflicting interests (Wise et al., 2014; Bosomworth et al., 2015; Fazey et al., 2016); and
- learning journeys, building capacity for long-term planning.

3.3. Case Comparison: Methodological Observations

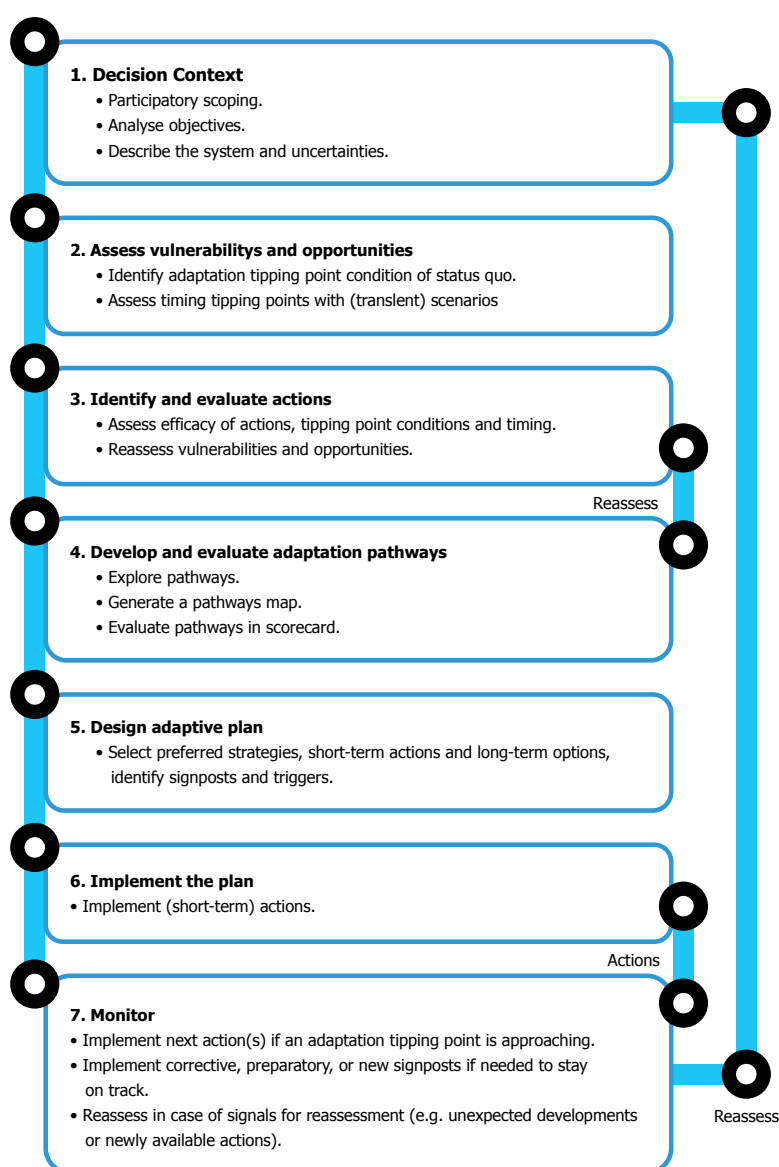
Methodologically, in particular in the Thames Estuary, Rhine Delta, and London City cases, adaptation pathways start with the identification of the conditions in which policy objectives will not be fulfilled. This condition is called a tipping point. After this point additional measures are to be considered.

Measures are assessed in conjunction and progressive under climate scenarios. The chain of measures is represented in a ‘route-map’ that exemplifies the possible ways for achieving policy objectives in the future. Figure 3.1 offers an overview of typical steps taken in these cases.

More development-oriented approaches include different steps. For example, Butler et al., (2014) follow:

1) Livelihood analysis with multi-scale systems focusing on capacities and capabilities, 2) Multi-stakeholder participation with relevant future horizon through participatory methods for the empowerment of communities, and 3) Adaptive co-management and livelihood innovation niches for social and technological transitions. Butler et al. (2016) rely on scenario planning, where pathways were constructed following three steps: 1) identification of drivers of change, 2) an aspirational vision and different scenarios for 2090, and 3) a normative back-casting process to design no-regrets strategies.

Figure 3.1: The Dynamic Adaptive Policy Pathways approach (Kwakkkel et al. 2016)



This approach is proposed as more appropriate in a community setting, where the construction of a vision of the future together with the community builds ownership. This process looks for transformational change and triple-loop learning.

Yet another method is proposed by Maru et al. (2014) for pathways development with marginal and disadvantaged communities. The methodology related two complementary concepts: vulnerability and resilience. The construction of adaptation pathways starts with short-term issues and understanding the vulnerability of the system. The measures identified will deal with on-going disadvantages that reflect the vulnerability of communities. Long-term responses focus on the resilience of the community and are identified in the later stage of pathways construction.

Wise and Capon (2016) identify a generic six-step approach from different examples of pathway development:

- Activity 1: Determine the nature (rate and magnitude) of the drivers of change and the potential consequences of these for the variable of interest (i.e., what is valued by people)
- Activity 2: Characterise the desirable goal, vision or end point, given the understanding of the changes and their consequences; and particularly assess the achievability of current goals in the light of the understanding of projected changes and impacts.
- Activity 3: Identify the focal decision-makers or decision-making processes and the particular decisions that they currently make or that are currently made, that they need to stop or (definitely) make in the future, in order to adapt to changes to realise a goal.
- Activity 4: Explore the timing of these decisions or actions with respect to: i) The leading and consequent times of decisions (i.e. considering the decision planning, implementation, and impact times), ii) The dependencies on other decisions or actions (i.e. the role of each action in paving the pathway for other actions) and the effects on other adaptive options, and iii) The interactions between changes in controlling variables (social, ecological, biophysical, or climate) and adaptation options and decisions (robustness, flexibility, barriers).
- Activity 5: When there are no cultural, institutional, or behavioural barriers preventing further consideration of the options: further prioritise decisions, actions, and options, and develop into pathways.
- Activity 6: In situations where transformational adaptation has been diagnosed to be necessary; goals and objectives need to change, for they are no longer feasible under climate change. This requires a process of co-evolutionary change that enables a broader set of social issues and change processes to be considered.

4. HI-AWARE Approach

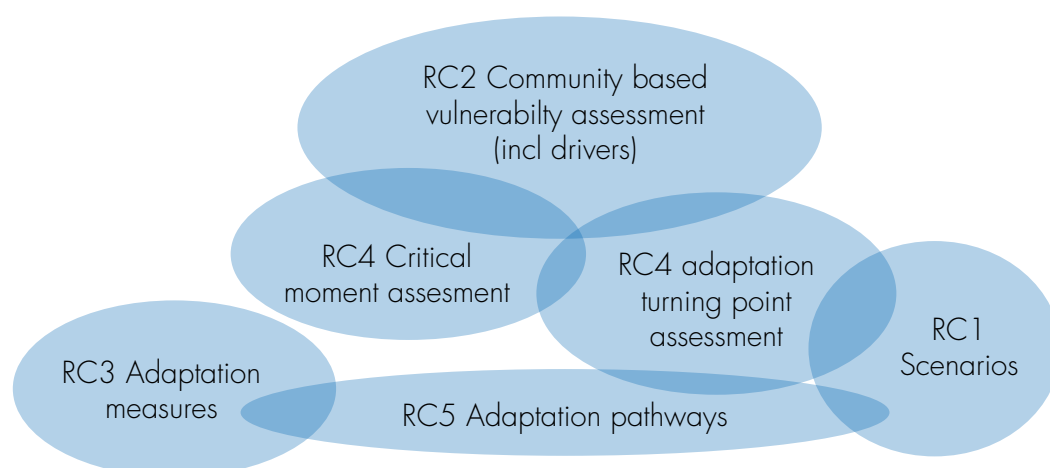
4.1. Adaptation Pathways in the Overall Structure of HI-AWARE

To further adaptation planning, HI-AWARE uses different approaches with partners in the Hindu Kush Himalayan region in each of the project's Research Components (RC):

- Selection and tailoring of climate scenarios (RC1),
- Community-based climate vulnerability and capacity assessments, including drivers of vulnerability (RC2),
- Identification and appraisal of adaptation measures (RC3),
- Critical climate-stress moments and adaptation turning points (RC4), and
- Adaptation pathways (RC5) (this document).

This section aims to delineate and define the relationship between these approaches. Figure 4.1 illustrates the relations and workflow between the concepts and assessments.

Figure 4.1: Relations among the concepts and assessments in HI-AWARE



The assessment of critical moments is proposed to complement community-based vulnerability assessments. 'Critical climate-stress moments' are defined as those moments when households, communities, and the livelihood systems they depend on, are especially vulnerable to climate and weather-related risks and hazards (Groot et al., 2017). The identification of critical moments can help identify the critical climate conditions and the thresholds that society wishes not to transgress.

An important question will be whether the conditions, which can result in a critical moment, occur more frequently under future climate change and give rise to adaptation turning points (Werners et al., 2018). This is the connection between the critical moment assessment and turning points that will be assessed in HI-AWARE cases to see the added value of the combined approach. In particular, the assessment of turning points will determine when current (development) policies and practices run into limits due to climate change and/or when alternatives are becoming attractive.

Related to the adaptation turning points is the adaptation deficit: the failure to adapt to existing climate risks (Levina and Tirpak, 2006). The adaptation deficit is increasing along with climate change, unless action is taken.

Having identified key vulnerabilities and turning points, the next step is adaptation measures. Various interventions could be made in terms of governance, policies, information, and technologies. These measures can be combined into adaptation pathways to reduce critical vulnerabilities, any adaptation deficit identified, and eliminate or postpone adaptation turning points over time, depending on climate change and other drivers.

4.2. Key Research Questions and Sub-questions

In line with the overall philosophy of HI-AWARE, the adaptation pathways work is designed on the basis of key research questions and sub-questions.

The key research questions for the work on adaptation pathways are:

- Content related: What are near and long-term climate-resilient development pathways for the people in the Hindu Kush Himalayan region and at the HI-AWARE study sites in particular?
- Methodological: Can adaptation pathways development help plan and implement activities following an integral vision of development and climate change resilience?

These key research questions may be split into the following research sub-questions:

1. What is the current context and scope for adaptation pathway development?
2. What are the current goals and development objectives or vision? How will these be affected by climate change?
3. What are the decisions and actions needed to reach and sustain the current goals and development objectives?
4. What are the near and long-term climate-resilient development pathways to plan and implement decisions and actions?
5. How can near and long-term climate-resilient development pathways be included in planning?

The research sub-questions largely follow a logical order. Responses to previous questions give direction to subsequent ones. That is why adaptation pathways development may be described as a stepwise process (See Section 4.3). As may be seen from the sub-research questions, in HI-AWARE, the process depends on and integrates the work undertaken in other Research Components (RC).

To ensure scientific rigour and allow for comparison of results from different research sites within and across countries, all HI-AWARE research teams are to study the same key research questions and research sub-questions. Examples of guiding questions and methods that could be used to answer these questions are described in Sections 4.4.1-4.4.5. At site level, the selected method and guiding questions might differ to meet site-specific conditions.

Each research sub-question will need to be further operationalised and tailored to the specific conditions of a study site. This step is not described in this document, but should be combined with the preparation for fieldwork and done by the responsible parties themselves.

4.3. A Stepwise Approach for Adaptation Pathway Development

No agreed method for pathways development exists today. In this section we bring together the approaches reviewed in a number of more distinct activities (Bosomworth et al., 2015, based in particular on: Kwakkel et al., 2016, Siebentritt and Stafford Smith, 2016, Wise and Capon, 2016). We also indicate the contributing Research Components (RCs) and link to more specific example methods introduced in the next section. Specific planning and

method selection in HI-AWARE will differ per case, depending on data and tool availability and on the results of the assessment in the other Research Components (RC). An example of a field manual is included in Annex A.

Generic activities in adaptation pathway development	Input from
<p>Activity 1: Assess context and define the scope for adaptation and pathway development</p> <p>Activities include:</p> <ul style="list-style-type: none"> • Actor mapping of involved and affected people. • Determine drivers of change and broad potential consequences of these for the issues of interest (i.e., what is valued by people). 	RC2
<p>Activity 2: Understanding the challenge, adaptation needs, and desirable goal, vision or end point</p> <p>Activities include:</p> <ul style="list-style-type: none"> • Identify specific adaptation needs and when they occur (in particular, achievability of current goals and development objectives in light of projected changes and impacts (critical moments and turning points)). • Select specific adaptation needs and decisions to be addressed. This may include making a development-oriented future vision and narratives or storylines. 	RC4 + RC1 (4.4.3)
<p>Activity 3: Analyse possible futures and the decisions and actions needed</p> <p>For the key actors and the particular decisions that they make: identify actions which need to change, which need to be taken, and opportunities to adapt to changes and to realise a desired goal or development.</p>	RC3 (+ RC5 4.4.1)
<p>Activity 4: Prepare an adaptation pathway map</p> <p>Explore the decisions or actions with respect to: i) Timing of decisions (i.e. considering decision planning, implementation and impact times), ii) Dependencies and effect on other decisions and actions (i.e. role of each action in paving the way for other actions), iii) Interactions between changes in controlling drivers or scenarios (social, ecological, biophysical, or climate) and actions or decisions (robustness, flexibility, effectiveness, barriers).</p> <p>Prepare a visual draft pathway map with information collated from participants, other experts, and review of relevant literature.*</p>	RC5 4.4.1 -4.4.5, input RC1, 2, 3
<p>Activity 5: Review pathways map and select preferred or emerging pathways</p> <p>Review the draft pathways map with actors. In particular, the timing of actions, whether support actions are needed and how pathway(s) can be implemented.</p>	RC5
<p>Activity 6: Include in adaptation planning and/or implement (outside HI-AWARE)</p>	
<p>Activity 7: Monitor implementation and review plan (outside HI-AWARE)</p>	

* In situations where transformational adaptation has been diagnosed to be necessary, goals and objectives need to change, since they are no longer feasible under climate change. This requires a process of co-evolutionary change that enables a broader set of social issues and change processes to be considered, which is outside the scope of the currently foreseen HI-AWARE research.

It is noted that many examples in Table 1 are from a developed-country context and there are fewer examples from developing countries. HI-AWARE seeks to explore cases for the development of Pathways in developing countries, keeping in mind both short and long-term adaptation planning. Some of the methods used in the case studies in Table 1 are data-intensive and require sophisticated tools that can help define the pathways. On the other hand, storylines defining Pathways of Change are also useful and help in adaptation planning. One could choose a method along the string where one end could be highly quantified and the other end use more descriptive, qualitative methods.

The choice is important whether to quantify pathways (e.g. Example 2 in Table 1) or whether to take a more descriptive approach. In the following we offer examples of more descriptive methods to develop pathways, starting from and building on different HI-AWARE outcomes. The selected method and planning may differ per case. Considerations in method selection include:

1. Purpose of pathway development (e.g. to be included in adaptation policy or for capacity building at community level)
2. The team and process (e.g. community-based or expert-driven)
3. Type of change and measures (e.g. aiming at incremental change or transformational change).

Important for all methods is consciously deciding on the geographic scale, inclusion of sectors, generation and delineation of adaptation options, and the performance metrics to be used in the assessment. In particular, the success of pathways development depends on consensus about the adaptation needs to be addressed, including the objective thresholds and the uncertain future changes (c.f. Zandvoort et al., 2017).

4.4. Example Methods for Use in HI-AWARE

4.4.1. Pathways Development, Following the Appraisal of Adaptation Measures

Different from a multi-criteria analysis (MCA), adaptation pathways development does not aim to rank measures and identify the 'best' measure(s). Rather it structures measures in decision trees. It is important to realise that some measures may score low in an MCA, but may nevertheless be necessary to take under at least one of possible future (climate) scenarios. These measures should not be disregarded. Rather, reservations should be made and monitoring installed to prepare for the eventuality that these measures are to be implemented.

Having identified measures (such as in HI-AWARE RC3 & RC5), in an MCA include the assessment of:

- Ease of implementation and time it takes to implement a measure (considering the decision planning, implementation, and impact times).
- Flexibility: can a measure be implemented stepwise and / or reverted?
- Robustness: Performance under different scenarios (RC1) and / or selected key drivers of vulnerability (RC2).
- Maintenance: How often does a measure need to be maintained?

Exercise (can be included in an MCA workshop):

- Write a card for each of the identified measures.
- Make three additional cards to indicate a timeline, labelled: short, medium, long-term.
- Put the three time-line cards on the table and ask stakeholders to organise the measures under the different time intervals (see Figure 4.2).
- Next, discuss the timeline and connection between measures. Include in the discussion:

1. Are measures dependent on each other or exclude each other? Does one measure pave the (path) way for another?
 2. Do long-term measures relate to driver and / or scenario uncertainty (as in Figure 4.3)? Are decisions and actions robust to diverse futures? At what point are measures no longer effective? Can options be easily reversed or their lifetimes shortened, if conditions are expected to change?
 3. Discuss whether all conditions are met for measures to be implemented. Are there institutional or behavioural barriers preventing measures being implemented? Consider different measures (technical, institutional, capacity development).
- Add cards for additional support measures as needed.

Figure 4.2: Example adaptation pathway mapping with stakeholders



4.4.2. Pathways Development, Following Participatory Scenario Development

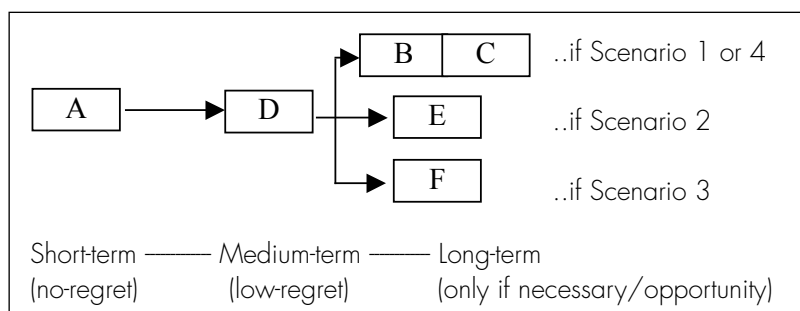
After having developed scenarios, identify measures to be taken in each scenario. The example here is developed for four scenarios, but can be adjusted for any other number of scenarios too.

Outcome of the identification of measures:

- In scenario 1: adaptation measures A, B, C
- In scenario 2: adaptation measures A, D, E
- In scenario 3: adaptation measures A, D, F
- In scenario 4: adaptation measures A, D, B

Identify the no- and low-regret measures in the scenarios: these are the measures, which are mentioned under all scenarios (no-regret) or most scenarios (low-regret). Develop an adaptation pathways map (decision tree) with the measures, as in Figure 4.3. Start with the no-regret measures (short-term) and then add the other measures that are to be implemented later, depending on how the future unfolds.

Figure 4.3: Adaptation pathway map with measures identified for different scenarios



Note: the map can be made together with stakeholders or by the assessment team. Either way the outcome should be verified with stakeholders. Also discuss what could be monitored and agreed to, to realise the medium and long-term measures as time unfolds (and scenario uncertainty changes).

4.4.3. Pathways Development, Using Visioning and Back Casting

The steps in this method are based on the methodology presented in 'Scenario planning to leap-frog the Sustainable Development Goals: An adaptation pathways approach' (Butler et al., 2016) and a study in Northern India (Garcés, 2017). This method is considered appropriate when aiming to build capacity for long-term thinking at community level.

STEP 1: Identification of drivers of change and adaptation needs

Objective: Recognize the drivers that influence the livelihoods of people in the area in a broad sense. It will give a big picture about the concerns and issues in the area and what provokes them.

Method: Open-ended questions (stakeholder group or interviews). Take notes on flip-chart paper

Guiding questions (see also results of HI-AWARE RC2 + RC4 critical moment assessment):

- What is the livelihood system in the area?
- What are you worried about for living in the area?
- What is changing in the area? Are there changes you expect for the future?

STEP 2: Identification of a desired future

Objective: Encourage people to think about the future they would like to live in. Intergenerational awareness can be encouraged by asking community members to imagine the future they would like their (great-) grandchildren to live in.

Method: Participatory mapping with groups of stakeholders (typically 5-8 persons. Consider to have mixed groups or specific groups, such as men/women, youth/elderly).

Guiding questions:

- Let us imagine that our grandchildren are adults and that they are living in this area. How would you like the area to develop so they can live here?
- What are the important things of the area that you would like to maintain?
- How do you imagine the perfect future for this area?

Draw a rich picture of the vision together with participants.



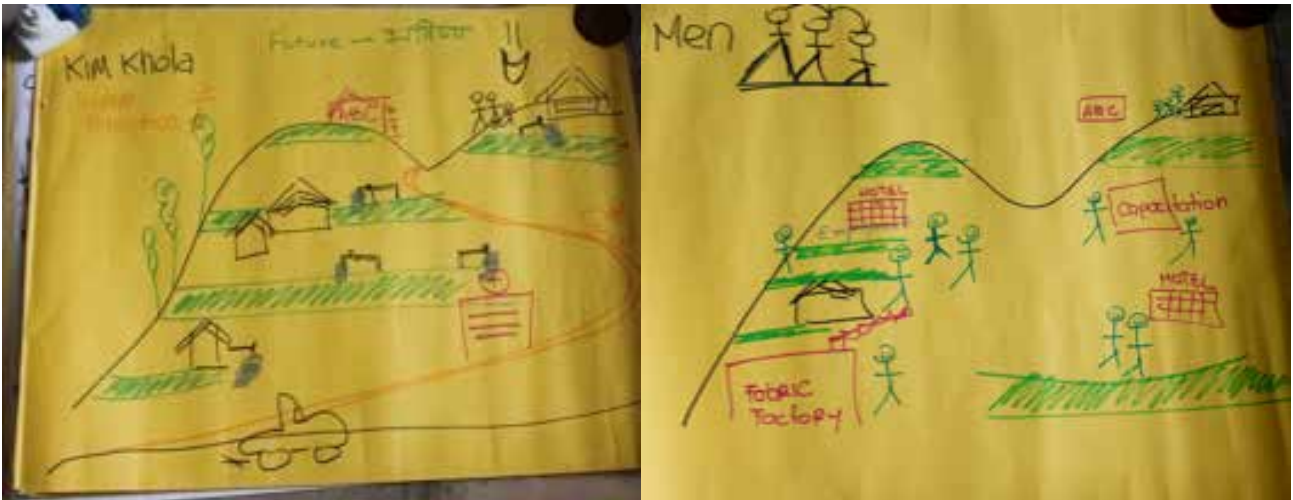


Figure 4.4: Examples of rich picture of future vision prepared with villagers in Devprayag, Indian Himalayan Region (left: women, right: men) (Garcés, 2017)

STEP 3: Back casting process

Objective: Back casting process working from desired goal in the future back to present conditions

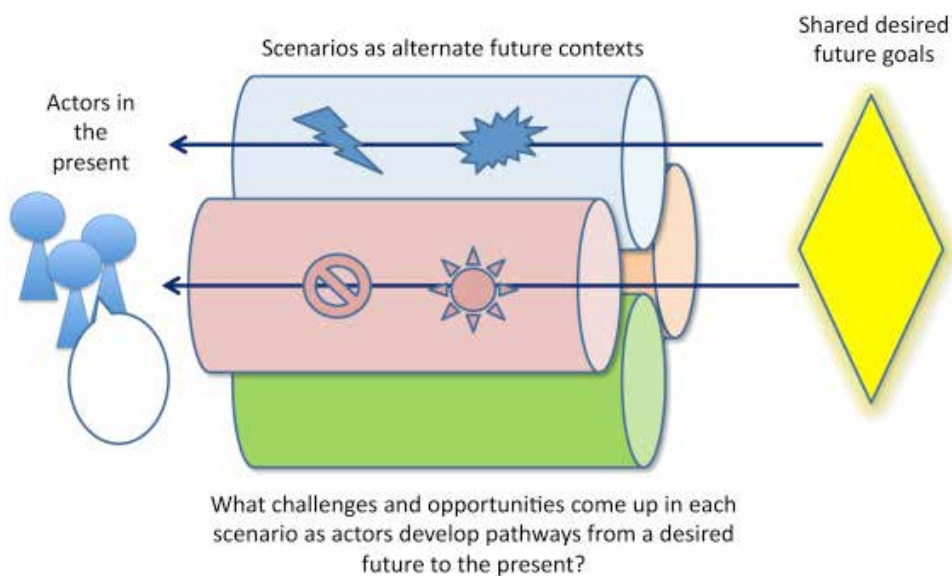
Method: Normative back casting process. Back casting processes work from an end point in the future back to the present condition. Vervoort et al. (2014) define back casting as a process that starts with a desired goal and then ‘works on what needs to happen before that goal is achieved’.

Exercise and guiding questions:

Ask participants what needs to be done (actions) [give participants 5 min to think individually?]

- What needs to be done for achieving the vision?
- What can we do? What needs to be done by others?
- What needs to change?

Figure 4.5: Representation of back-casting process (Source: Vervoort et al., 2014)

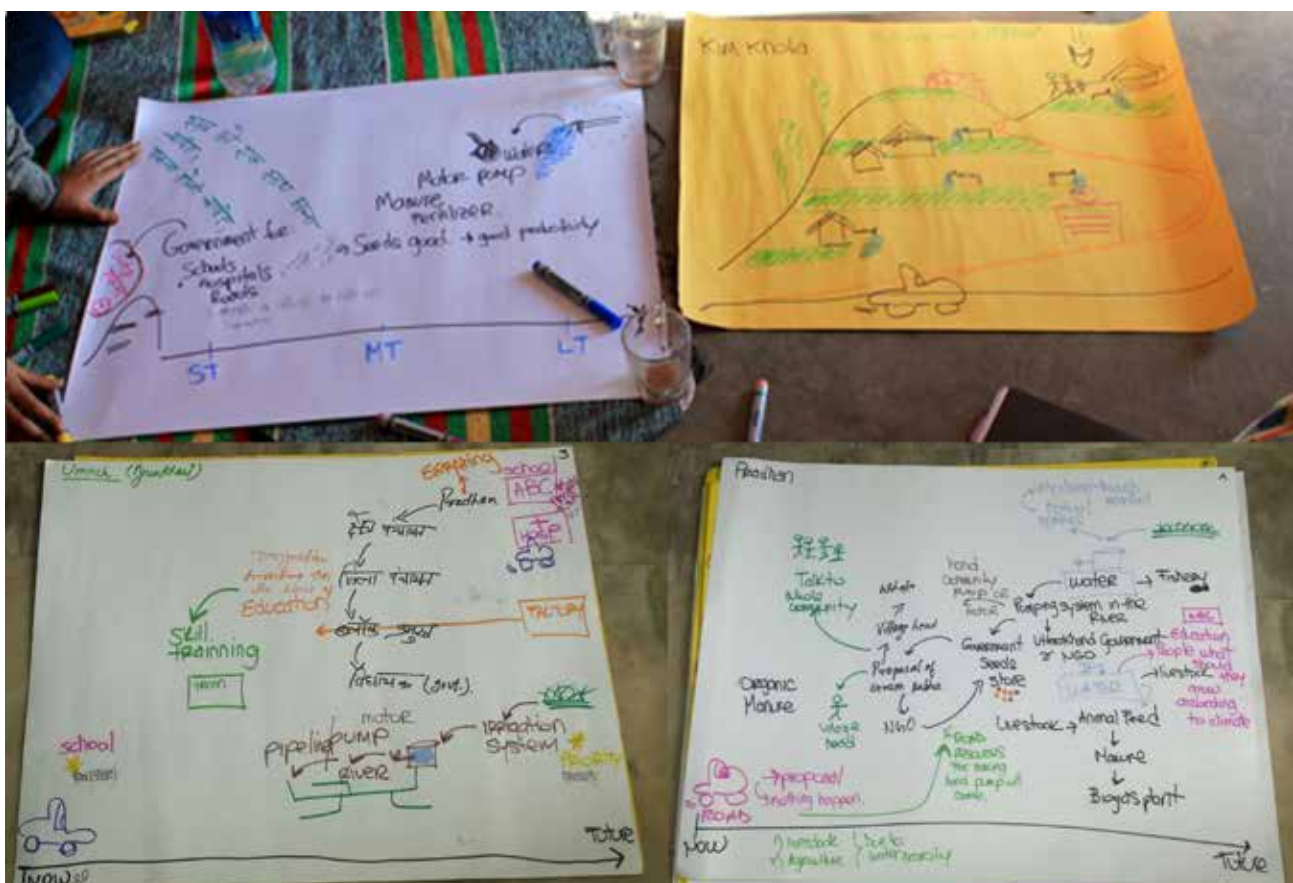


- Make a round and ask each participant to propose one action. Write a card for each of the identified actions (draw if you think reading is difficult). Clarify actions as needed. Ask: who has a crazy idea that can be implemented. Collect people's most crazy ideas. Collect 5-10 actions.
- Take a sheet. Put the vision on the right and write at the bottom: short, medium, long-term. Explain that this is a timeline over which actions have to be taken to achieve the vision. Some actions take more time than other ones to achieve. Some need to be taken first before other things can be done.
- Put all cards on the long-term (close to the vision) and ask stakeholders to organise the measures over the different time intervals to achieve the vision. Which cards would have to be implemented now and which later?

(Give time to do together. Take notes of discussion. Allow to add cards if needed. Allow to put cards aside. Work together with stakeholders to organise cards if needed)

(In case of more than eight participants consider making subgroups. Another idea is to have a male and female group work independently and present to each other afterwards, but this requires more note-takers and helpers with the process)

Figure 4.6: Examples of map with measures prepared with villagers in Devprayag, Indian Himalayan Region (Garcés, 2017)



STEP 4: Evaluate map and 'What if' exercise

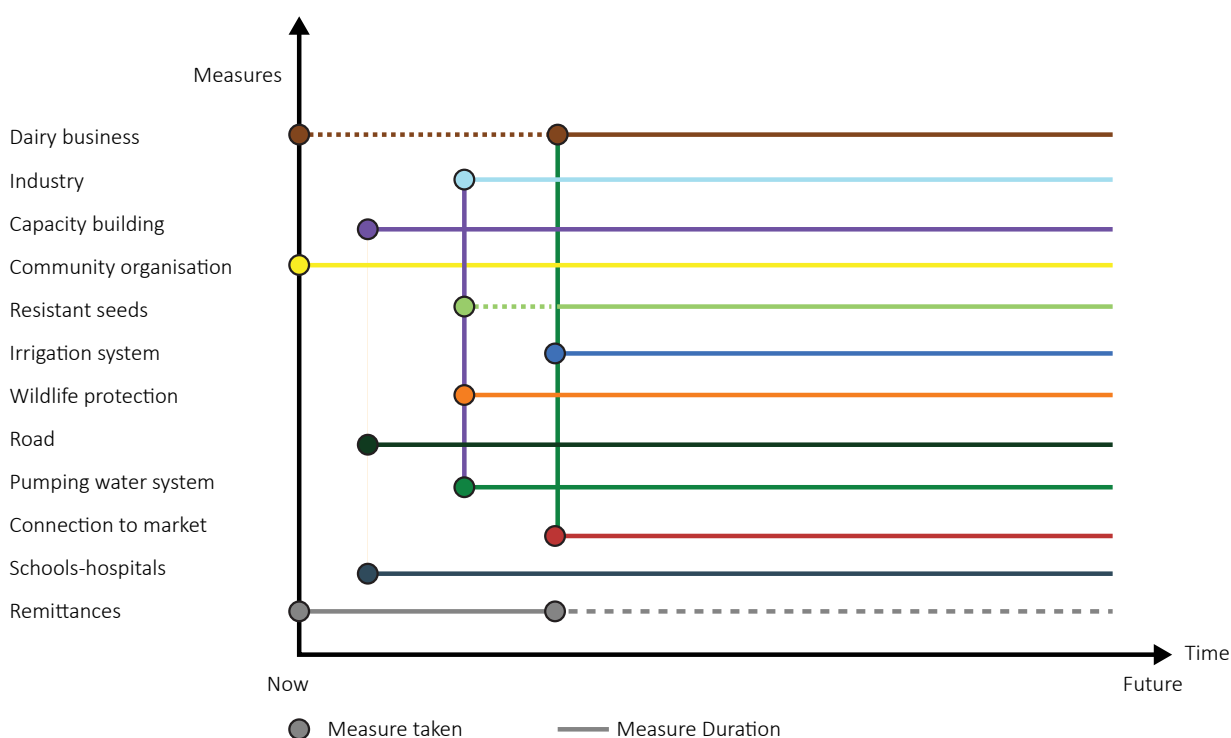
- Discuss timeline + connection between measures. Ask clarification (if unclear from discussion):
 1. Are measures dependent on each other or do they exclude each other? Is one action needed for another?

2. Are some cards left out? If so, why?
 3. Discuss whether all conditions are met for measures to be implemented. Are there 'institutional' or 'behavioural' barriers preventing measures being implemented? Consider different measures (technical, institutional, capacity development).
- Add cards for additional support measures as needed.
 - Remind participants that we started the meeting by listing concerns. If things get worse, would these actions be enough (use the results of step 1 to challenge the pathway developed for getting to the vision. If there is time discuss 2-3 drivers explicitly: e.g. what about increasing drought? What about better/worse market access?). At what point are actions no longer effective? Do other actions need to be taken? What actions would not work in this case? Add cards as needed (preferably in another colour, so you can trace them).

STEP 5: Analysis of back casting process and preparation of pathways map

Based on the results of the back casting process, develop one, comprehensive, adaptation pathways map bringing together different measures and drivers. The map can be made together with stakeholders or by the assessment team. Figure 4.7 shows an example of such a map, made by the assessment team. It does not indicate the different pathways and decision moments between them yet. This intermediary map should be verified with stakeholders. Discuss differences between the outcomes of different groups. Add measures and change the map as appropriate. Also discuss what could be monitored and agreed to, to stay on track, and select and implement medium and long-term measures as time unfolds (and conditions change). [See also the example at the end of the next section].

Figure 4.7: Example of adaptation map with measures, using the results of the back casting exercise (Garcés, 2017)



4.4.4 Pathways Development, Using Scenarios and Assessment of Drivers

The steps in the climate scenario driven adaptation pathways are based in the studies developed in the Thames Estuary and the Rhine Delta (see Examples 1 and 2 in Table 1).

Note: Garcés (2017) finds that this method limits people’s ability to envision actions in the future, compared to the visioning-based method presented in Section 4.4.3. It may also result in more physical ‘hard’ interventions being identified than in the method in Section 4.4.3. An advantage of the method presented here is that it explicitly addresses adaptation in the context of (different) climate change scenarios.

For consideration: use this method with experts in an adaptation planning process rather than with communities, where the aim is to build resilience and to capacitate people to manage change. Use this method with actors if there is one clear driver that you want to plan adaptation for (for example urban heat) and you want to map the opinions and preferences of different stakeholder groups.

STEP 1: Identification and selection of climate impacts

Objective: Identification and selection of key drivers and impacts of climate change.

Method: Open questions with different stakeholders from region and / or experts’ input.

Guiding Questions (see also HI-AWARE RC2 Drivers of Vulnerability):

- What are the main sectors in the region and how are they affected?

STEP 2: Identification of coping strategies

Objective: Identification of the adaptation measures to face selected climate change impacts.

Method: Open questions with different stakeholders.

Guiding questions (see also HI-AWARE RC3 Assessment of Adaptation Measures):

- What is currently done in the area?
- How do you deal with the issues?

STEP 3: Worse case scenario (X scenario)

Objective: Identification of measures in severe climate conditions. A worse-case climate scenario is drawn in a chart and presented to people. People are asked to identify measures to take under this new climate condition. Results of HI-AWARE RC1 and RC3 can be used, as appropriate.

Method: Focus group discussion.

Questions guide:

- ‘What if’ the situation gets worse? What do we need to do?
- What should be done additionally?
- How can we get prepared for this case?
- Until when will these measures be sufficient?

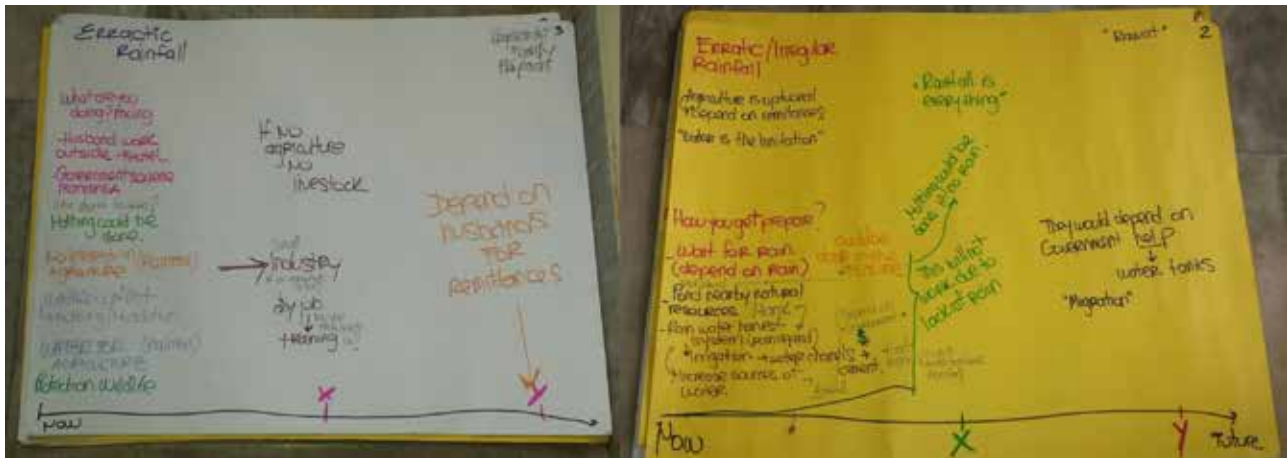
STEP 4: Worst-case scenario 2 (Y scenario)

Objective: Identification of measures under most severe climate conditions. An even worse climate scenario than the X example is represented in a chart. People are asked to identify measures under this worst-case scenario.

Questions:

- What if the situation gets worse?
- What should be done in this situation?
- What would you need to be prepared? (Including measures taken by other actors)
- How did you deal with particularly severe cases in previous years?

Figure 4.8: Examples of map with measures prepared with villagers in Devprayag, Indian Himalayan Region (left: map by women, right: map by men) (Garcés, 2017)



STEP 5: Analysis and preparation of pathways map

Based on the results of the previous steps, develop one comprehensive adaptation pathways map bringing together different measures under increasing impact. Try to assess the effectiveness of measures in terms of avoided impact (See also Method 4.4.1). Add different scenario-timelines. The map can be made together with stakeholders or by the assessment team. The map should be verified with stakeholders. Add measures and change the map as appropriate. Also discuss what could be monitored and agreed to, to stay on track and select and implement measures as time unfolds and impacts change.

Discuss differences between the outcomes of different groups. Also discuss what could be agreed and monitored to stay on track and select and implement medium and long-term measures as time unfolds (and conditions change).

Note the difference between making a pathways map against time and making a map against impact. The latter is particularly suitable to map decisions that are to be taken, if certain conditions occur (Figure 4.9). These maps are most illustrative if planning addresses one particular (climate) concern or driver of change. For multiple drivers or planning issues, consider making a series of maps, indicating interdependencies between maps as appropriate. The process of elaborating and operationalising pathway maps with stakeholders towards implementation is illustrated by Figure 4.9 and Figure 4.10, which show the adaptation paths for the same area (Dutch IJsselmeer) for two consecutive years, 2013 and 2014, respectively.

Figure 4.9: Example of adaptation map with measures following a scenario analysis (Simple representation of adaptation pathways for Dutch IJsselmeer (Delta Commissioner, 2013))

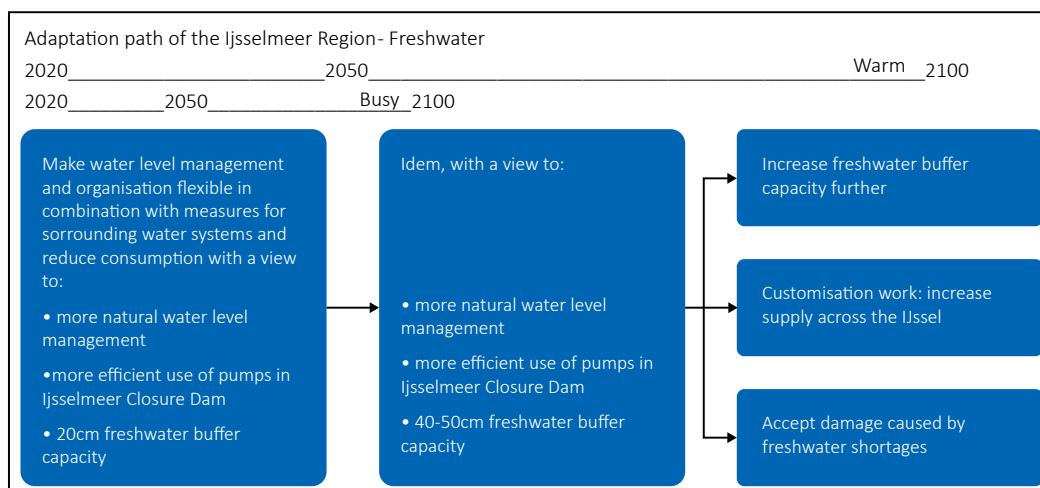
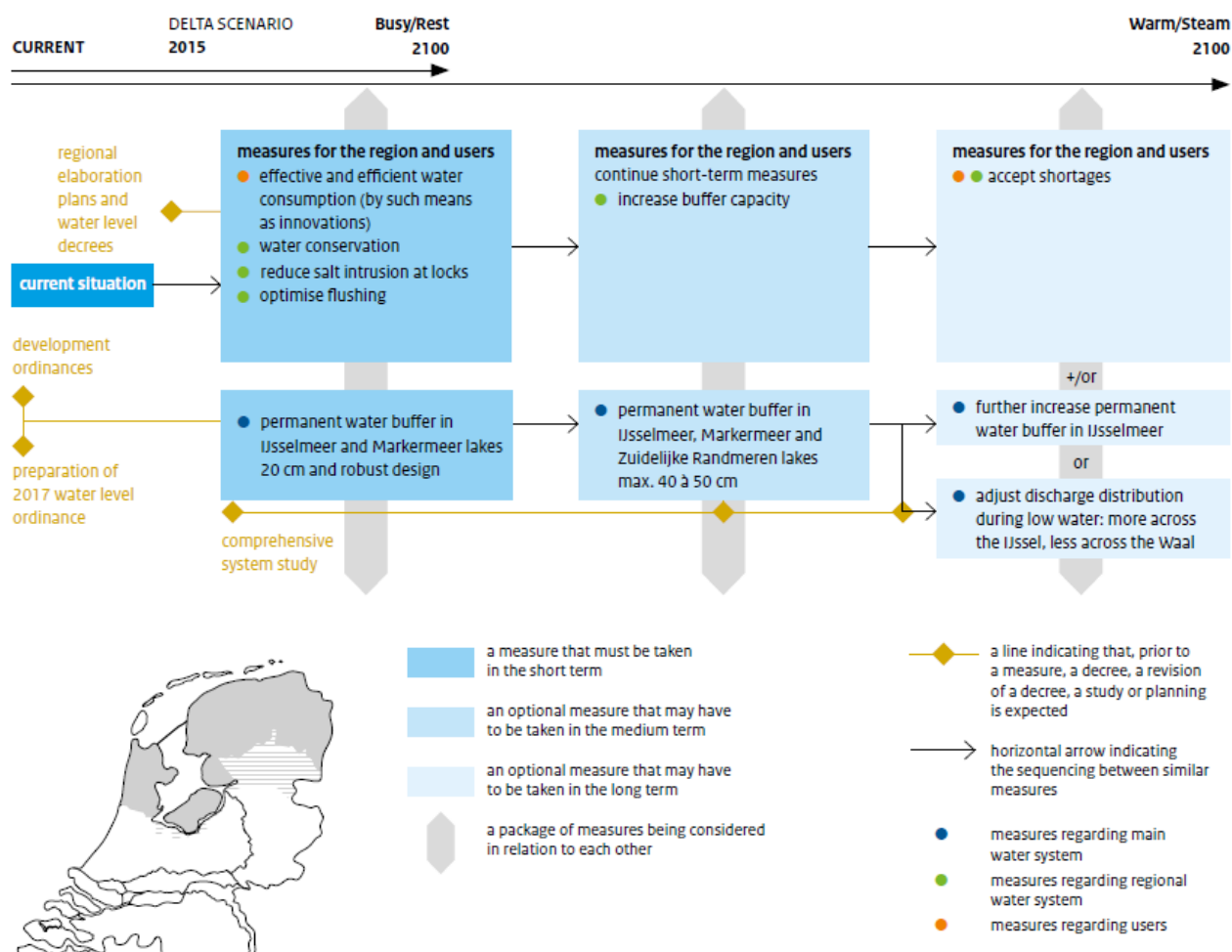


Figure 4.10: Example of adaptation map with measures and interdependencies of other decisions elaborated (Adaptation pathways for Dutch IJsselmeer (Delta Commissioner, 2014))



Additional work in a quantitative assessment: Quantify the effectiveness of measures in terms of avoided impact under different scenarios. Construct a map with decision moments and pathways (different representations are possible. For inspiration see examples 1 and 2 in Table 1 and the Adaptation Pathways Generator and wiki (publicwiki.deltares.nl/display/AP/Adaptation+Pathways)).

4.4.5. Pathways development, using scenarios and turning points

For this example we use the early assessment or turning points elaborated in the HI-AWARE project Deliverable 4.2.1: *Towards a framework for identifying and analysing adaptation turning points in the Hindu Kush Himalayan region* (Section 3.1).

The assessment of critical moments and turning points helps identify when people and communities are particularly vulnerable and when different adaptation needs and opportunities occur. The adaptation pathways are designed in response to this timeline. As an example the following narrative is offered. This example would need to be further detailed and quantified in order to be considered for national or regional adaptation planning.

Example in the case of food security and wheat production in Pakistan: From the critical moment assessment (HI-AWARE RC4) it was concluded that already little rains after sowing and early rains during harvesting challenge winter wheat production. Results for the Soan River Basin in Pakistan show how April has become a critical month over the last ten years. In April many crops germinate and are particularly sensitive to water stress. Here,

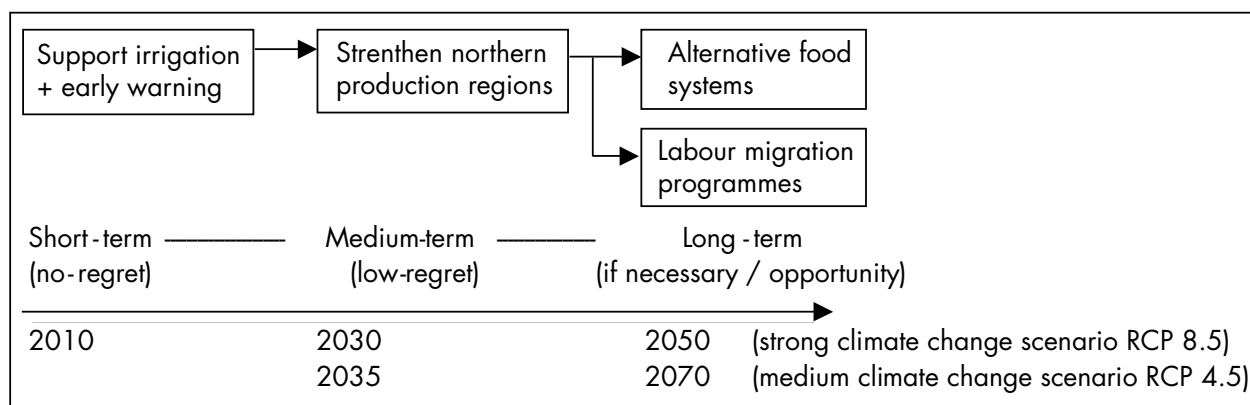
supplementary irrigation would be particularly effective in combination with early warning systems (Climate Information Services).

Looking towards the future we found that precipitation trends are not so clear in the HI-AWARE RC1 scenarios; instead, the real concern stems from high temperatures in winter, hindering vernalization. South Punjab will be hit the first and by 2050, years with reduced yields will become frequent. By the end of the century North Punjab, too, is expected to suffer. So, relying on production in Northern, higher areas may help, but will also run into climate limitations.

This gives us 30-50 years to rethink food safety in this region. *Supporting alternative crops will become essential, rather than compensating for losses of current crops.*

From this narrative the following adaptation pathway emerges:

Figure 4.11: Example of adaptation pathway with measures following a preliminary turning point assessment for food security for Punjab, Pakistan



This pathway may be detailed further by quantifying the effectiveness of measures in terms of avoided impact under different scenarios (See examples in 4.4.1 and 4.4.4).

If the effectiveness of measures can be quantified in terms of avoided impact under different scenarios, pathways can be visualised using the Adaptation Pathways wiki and Pathways Generator (publicwiki.deltares.nl/display/AP/Adaptation+Pathways).



5. Discussion and Recommendation

With this document we aimed to frame the work on adaptation pathways in HI-AWARE. We reviewed existing cases of pathway development and introduced methods to develop pathways in different settings and in relation to work undertaken in the other HI-AWARE Research Components.

From literature review, we noted that the earlier conceptualisations of adaptation pathways as a series of adaptive decisions over time (Haasnoot et al., 2013; Ranger et al., 2013; Rosenzweig and Solecki, 2014) are predominantly from data rich contexts that are (largely) amenable to technical solutions (e.g., the case of the Thames barrier (Ranger et al., 2013)). Other examples are emerging. From these and the related adaptation literature, we identified five important points for further attention in our research on the added value of pathways for adaptation planning:

- More attention is needed for the dynamic interactions between values, knowledge cultures, and institutions (Wise et al., 2014). These have also been found to enable and constrain research and decision-making processes in the HI-AWARE cases (c.f. Pahl-Wostl et al., 2009; O'Brien, 2013a, b).
- There is a need to shift the focus of adaptation from viewing climate change risks as exogenous threats to development to accepting them as both products and drivers of development in an iterative manner (cf. Fazey et al., 2010; Bassett and Fogelman, 2013). Further, to view climate adaptation 'as a dynamic in social-ecological co-evolution', where processes of social learning and self-organisation are the key (Pelling et al., 2012). In this context, attention needs to be given to whether and how pathways may bridge knowledge types and decision hierarchies, particularly deliberative, participatory learning by stakeholders (cf. Butler et al. 2014; Vervoort et al., 2014).
- Also, there is a need to integrate adaptation in the dominant global development pathways, as argued e.g. 'Given the multiple challenges to the climate-poverty-development nexus, debates increasingly focus on transforming the development pathways themselves toward greater social and environmental sustainability, equity, resilience, and justice, calling for a fundamental shift to near and long-term climate-resilient development pathways' (Field et al., 2014).
- Addressing the adaptation deficit may require transformation at various scales. The growing likelihood of a >20C warmer world will require proactive adaptation that continually cycles between incremental and transformative actions (Park et al., 2012). There is need to make explicit the tensions between adaptation policies and actions aimed at proximate causes of vulnerability (i.e., supporting decision-making within prevailing governance arrangements), and those seeking broader and systemic change to social and political regimes – in other words, transformation (Pahl-Wostl et al., 2009; Nelson 2010; Pelling et al., 2012). Also, a need for greater attention to a process of 'continuous transformation' (Stafford Smith et al., 2011).
- More methodological clarity and guidance is needed for adaptation pathway development. In particular: (i) for pathways responding primarily to the climate stimuli that a system is affected by versus those that address drivers of vulnerability broadly, (ii) for the connectivity of measures: how measures are connected and how this connection is achieved methodologically., (iii) how implementation is institutionalised and monitored.

We are at the point of elaborating the adaptation pathways cases in HI-AWARE. We hope this document will provide the basis and the inspiration to do so and to deliver more case evidence to discuss the added value of adaptation pathway development. We also hope to strengthen pathways development methodologically for all interested parties, and, most important, to strengthen the resilience of the peoples of the Hindu Kush Himalayan region.



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7. Annexure

Annex A: Example of A Field Manual for Adaptation Pathway Fieldwork

Guided by results of work undertaken in the Nuwakot field sites in Nepal and the example methods in Section 4.4, this field manual was elaborated for piloting fieldwork on adaptation pathways. The manual is included here for inspiration. Each team would have to prepare its own manual.

A.1 Method workshop discussion adaptation pathways

Time	What	Who
Prepare ahead	Participants: 5-8. Propose to have male and female group (same as in other assessments or fieldwork, as appropriate) Prepare material Handout HI-AWARE + programme	- to be agreed by team -
10 min	Opening, Introduction + goals workshop, introduction round (ask permission to record and/or take pictures)	
10 min	STEP 1: Identification of drivers of change and adaptation needs	
20 min	STEP 2: Identification of a desired future	
(Break 15 min)	If needed	
30 min	STEP 3: Backcasting & making pathways	
10 min	STEP 4: Evaluate map and 'What if' exercise	
10 min	Evaluation Thank you and closing	
Total: 1:30 h		

Opening: Welcome and explain why we are here

Intro-round: ask participants to say name and one thing they are proud of in the study area

STEP 1: Identification of drivers of change and adaptation needs

Objective: Recognize the drivers that influence the livelihoods of people in the area in a broad sense. It will give a big picture about the concerns and issues in the area and what provokes them.

Method: Open-ended questions with different stakeholders from the case study region. Take notes on flip-chart paper. Make long list on flip-chart sheet of drivers of change and adaptation needs.

Guiding questions:

- What are the livelihood systems?
- What are you worried about for living in the area?
- What is changing in the area? Are there changes you expect for the future?

STEP 2: Identification of a desired future

Objective: Encourage people to think about the future they would like to live in. Intergenerational awareness can be encouraged by asking community members to imagine the future they would like their (great-)grandchildren to live in.

Method: Participatory mapping with group of stakeholders

Guiding questions:

- What are the important things of the area that you would like to maintain? Make a list.
- Let us imagine that our grandsons are adults and that they are living in this area. Close your eyes and imagine how the area would smell. How would you like the area to develop so they can live here?

Ask participants to share how they would like the area to develop. Draw a rich picture of the vision together with participants.

STEP 3: Backcasting process

Objective: Identify the actions needed for achieving the vision.

Method: Back-casting process working from desired goal in the future back to the present conditions

Exercise:

- Ask participants what needs to be done (actions) [give participants 5 min to think individually?]
 1. What needs to be done for achieving the vision?
 2. What can we do? What needs to be done by others?
 3. What are opportunities?
 4. What needs to change?
- Make a round and ask each participant to propose one action. Write a card for each of the identified actions (draw if you think reading is difficult). Clarify actions as needed. Ask: who has a crazy idea, which can be done. Collect the peoples most crazy ideas. Collect 5-10 action.
- Take a sheet. Put the vision on the right and write at the bottom: short, medium, long-term. Explain that this is a timeline over which actions have to be taken to achieve the vision. Some actions take more time than others to achieve. Some need to be taken first before others things can be done.
- Put all cards on the long-term (close to the vision) and ask stakeholders to organise the measures over the different time intervals to achieve the vision. Which cards would have to be implemented now and which later?

(give time to do together. Take notes of discussion. Allow to add cards if needed. Allow to put cards aside)

(in case of more than 8 participants consider making subgroups)

(in case participants come at same time: have a male and female group work independent and present to each other afterwards, but requires more note takers and helpers with the process)

STEP 4: Evaluate map and 'What if' exercise

- Discuss timeline and connection between measures. Ask clarification (if unclear from discussion):
 1. Are measures dependent on each other or exclude each other? Is one action needed for another?
 2. Are some cards left out? If so, why?

3. Discuss whether all conditions are met for measures to be implemented. Are there ‘institutional’ or ‘behavioural’ barriers preventing measures being implemented? Consider different measures (technical, institutional, capacity development)

- Add cards for additional support measures as needed.
- Remind participants that we started the meeting by listing concerns. If things get worse, would these actions be enough (use the results of step 1 to challenge the pathway developed for getting to the vision. If there is time discuss 2-3 drivers explicitly: e.g. what about increasing drought? What about better/worse market access?).

At what point are actions no longer effective? Do other actions need to be taken? What actions would not work in this case? Add cards as needed (preferable in another colour).

Evaluation & closing

HI-AWARE evaluation if required + ask whether interview has offered new insights. Questions to us?

Thank participants. Explain what will happen with results. Ask if want to be sent the results.

A.2. Expert and practitioner interviews adaptation pathways

Time	What	Who
Ahead	Contact and agree on meeting time. Prepare material. Handout HI-AWARE?	- to be specified by team -
5 min	Opening, Introduction + goals interview, introduction round (ask permission to record and / or take pictures)	
10 min	Identification of a desired future and / or development goals	
5 min	Identification of drivers of change and adaptation needs	
15 min	Backcasting & making pathways	
10 min	Evaluate map and ‘What if’ exercise. Implementation?	
2 min	Evaluation? Thank you and closing	
Total: 47 min		

Explain, why we are here

Intro: ask interviewee to explain affiliation and responsibility in the Nuwakot region.

STEP 1: Identification of a desired future and / or development objectives

Objective: Identify objective and future vision for the region.

Note: adjust the questions to match the specific location and affiliation of the interviewee

Guiding questions:

- How do you see the future of the Nuwakot / Charghare area?
- What are the objectives of your organisation / development / water management? Are there specific targets? If so, what are these and by what year? [ask for strategic plan / adaptation plan, as appropriate]

- What are you proud of in Nuwakot? What are the important things of the area that you would like to maintain?

Make a list of the answers in key words. Write big

STEP 2: Identification of drivers of change and adaptation needs

Objective: Recognize the drivers that influence the livelihoods of people in the area in a broad sense.

Guiding questions:

- What is changing in the area? Are there changes you expect for the future?
- What are you worried about for the area?
- (ask: what about changes in the climate/weather? Are these a concern?)
- Is your organisation already preparing for these changes?

Make a list of the answers in key words. Write big

STEP 3: Backcasting process / making pathways

Objective: Identify the actions needed for achieving the objectives.

Explain we would like to understand what needs to be done – and may be is already planned- over time to reach the objectives.

On the table put the list of the objectives + challenges on the right. Put cards at the top with:

Short, medium, long-term. Explain that this is a timeline over which actions have to be taken to achieve the objectives.

- Ask interviewee what needs to be done (actions) for achieving the objectives?

Write a card for each of the identified actions. Ask with each card where to put it on the timeline. Clarify actions as needed.

Take note of (and ask for clarification if unclear):

- Actions done by own organisation and done by others
- Actions planned already and new

If it is difficult to write cards, ask support questions:

- What are opportunities?
- What needs to change?
- What are a crazy ideas?

STEP 4: Evaluate map and 'What if' exercise

Once cards are on the table:

- Discuss timeline and connection between measures. Ask clarification (if unclear):
 1. Are measures dependent on each other or exclude each other? Is one action needed for another?
 2. Discuss whether all conditions are met for measures to be implemented. Are there 'institutional' or 'behavioural' barriers preventing measures being implemented? Consider different measures (technical, institutional, capacity development)

- Add cards for additional support measures as needed.
- Remind interviewee of the challenges listed. If things get worse, would these actions be enough? (use the results of step 1 to challenge the pathway developed for getting to the vision. If there is time discuss 2-3 drivers explicitly: e.g. what about increasing drought? What about better/worse market access?).

Evaluation & closing

HI-AWARE evaluation as appropriate + ask whether interview has offered new insights. Questions to us? Thank interviewee. Explain what will happen with results. Ask if want to be sent the results.

A.3. Preparation of pathways map after workshops and interviews

Based on the results of the groups discussions and the interviews, develop one comprehensive adaptation pathways map, which brings together different measures and drivers and possibly illustrates main trade-offs (See Section 4.4.5). Note the difference between making a pathways map against time and making a map against impact.

Discuss differences between the outcomes of different groups. Also discuss what could be agreed and monitored to stay on track and select and implement medium and long-term measures as time unfolds (and conditions change).

Share results with all parties involved!



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