High-resolution climate projections for Vietnam

Enhancing Vietnam's capacity to develop regional scale climate projections, enabling more robust national and provincial climate change action plans to underpin adaptation planning and to prioritise investment.

The issue

Vietnam is considered to be one of the countries most vulnerable to the impacts of climate change due to its long narrow coastline, two large deltas and increasing frequency of extreme events (UNEP, 2009). Here, impacts of climate change such as saline intrusion, sea-level rise and flooding are already occurring. The Government of Vietnam is faced with the challenge of planning and prioritising its climate change response in the face of significant uncertainty around the extent of the impacts of climate change. More localised projections will help provincial governments to determine their priorities for adaptation, based on their particular vulnerabilities.

Our approach

The Vietnamese Ministry of Natural Resources and Environment (MoNRE) is building on the national climate change scenarios and undertaking more detailed downscaled projections to better understand climate change effects at the provincial and community levels. All provinces are required to develop or update action plans under the National Target Program to Respond to Climate Change. Working with researchers and government agencies, this project improved Vietnam's understanding of the impacts of climate change, enabling the integration of past and current research for a more complete assessment of the potential effects of climate change. The project also provided information necessary for appropriate planning and investment. In addition, the project developed innovative communication tools to ensure that the data generated are widely accessible.

Project partners

CSIRO, Institute of Meteorology, Hydrology and Environment (IMHEN), Hanoi University of Science (HUS), and the Australian Department of Foreign Affairs and Trade (DFAT).

DFAT-CSIRO Research for Development Alliance

This project was funded by the Research for Development Alliance, a strategic partnership tackling complex development challenges in the Asia Pacific region.

Key lessons for development

- The Vietnamese Government is concerned about the consequences of climate change, and is therefore committing considerable efforts to better understand these consequences.

- While the results suggest little change in annual rainfall, the projected decrease in rainfall during the summer monsoon season may have significant hydrological implications, which could affect areas such as water-resource planning and agriculture.

- Fewer but possibly more intense tropical cyclones (typhoons) are projected.

- The Climate Futures Tool (http://climatetool.vnclimate.vn/) allows the end user to view the spread of possible projections for the seven sub-regions of Vietnam. In addition, the Tool guides the end user in choosing possible projections that may be used to assess the impact of climate change for different applications.

Key achievements

OUR STORY			
What did the project deliver?	**Climate scenarios** were developed for all of Vietnam and for seven sub-regions. The scenarios were communicated to key stakeholders in the regions. A summary report for all of Vietnam and reports for seven sub-regions, including comparison with previous scenarios, are available on the project website (vnclimate.vn).	**A Climate Futures Tool and website** were produced. Use of the Climate Futures Tool can improve user access to and enhance understanding of climate projections by aiding in the selection of internally consistent information that captures a range of future changes, including the 'most likely', 'best case' and 'worst case' scenarios for a particular application.	**A Participatory Planning Approach** was undertaken together with the strengthening of skills and capacities of local researchers and government agencies.
How is it being used?	IMHEN and HUS will apply the results of the project by the end of 2015 to build climate change scenarios and sea-level projections for Vietnam. The website (vnclimate.vn) allows other interested partners such as NGOs and development banks to access the reports.	New partners emerged to take the research forward. The original targeted stakeholder was the Vietnamese Government for use in its 2015 National Adaptation Plan. As the project progressed, however, outputs were increasingly requested by NGOs and other donors in the region such as the Red Cross and CARE for their future planning, and the Asian Development Bank (ADB) for assessing its Ho Chi Minh City road development project.	Leadership and trust emerged among the research team, facilitating new social networks within Vietnam, and allowing IMHEN to gain both confidence and recognition for expertise in downscaling techniques. During this process, complex scientific information was translated into usable knowledge for decision makers, donors and local planners.
What impact did the project have?	The High-resolution Downscaling Project provided training in use of a state-of-the art model and innovative techniques of analysis for the Vietnamese government to undertake downscaling, providing regional information which wasn't previously available.	Provinces such as Can Tho, HCMC, Da Nang, Thanh Hoa, and Ha Tinh are using the scenarios in their development planning. It is expected that this information will better enable these communities to anticipate and adapt to climate change, especially changes to extremes.	The improved connections between IMHEN and HUS will better enable the joint development of the National Scenarios for Vietnam. HUS, in particular, has indicated that they have greater experience in project management and have suggested that this could, in fact, contribute to the activities and successes of the group. Results from this project have been used in a training course for graduate students at Vietnam National University.

Impact Pathway

The project's objective was to produce high-resolution projections of future climate change suited to adaptation planning in Vietnam. To achieve this, the research team developed an Impact Pathway consisting of three linked phases (fig. 1a). Phase 1 focused on 'capacity building'. This enabled the allocation of resources and the development of plans, agreements and new projects through Phase 2 'policy and program development'. Following on from Phase 2, Phase 3 involved 'implementation, adoption and scaling out'. These phases would cumulatively build the adaptive capacity of the project stakeholders. However, while Phase 1 encompassed the project's activities (solid line), Phases 2 and 3 were out of the project team's direct control (dashed line). Consequently, the Impact Pathway was clear for Phase 1, but less so for Phases 2 and 3.
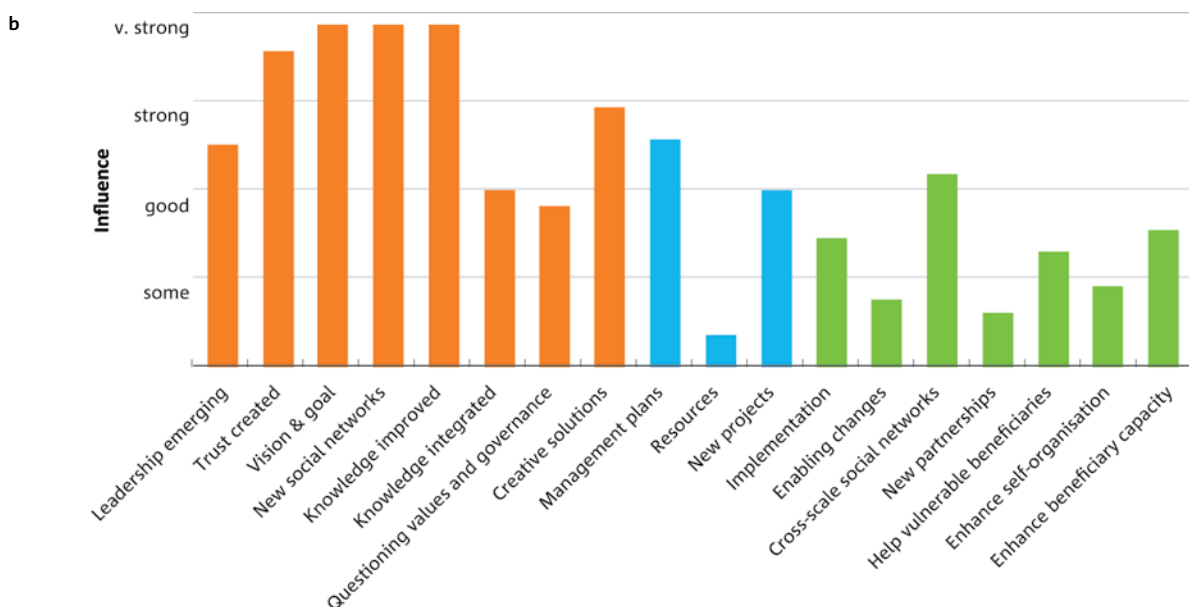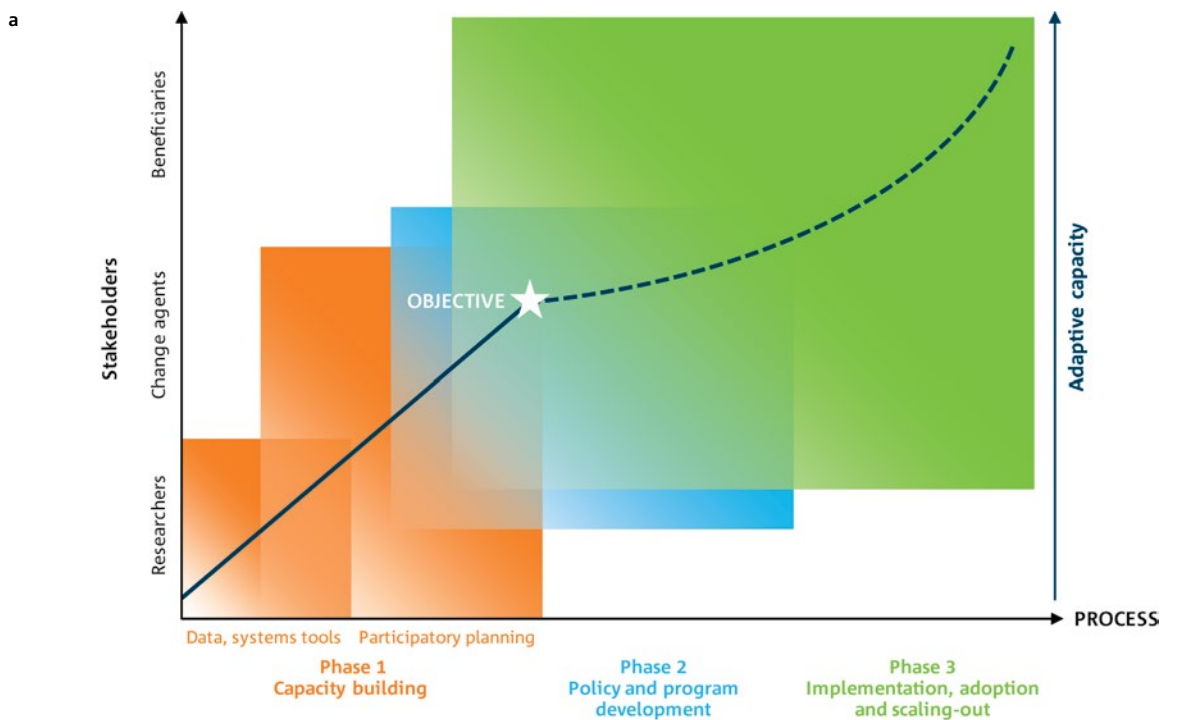

Figure 1. The project's (a) Impact Pathway and (b) influence on adaptive capacity within the Impact Pathway's three phases

Evaluating impact

To track the influence of the project on stakeholders' adaptive capacity, and to enable comparisons between all Alliance projects, a standardised set of 18 indicators was developed. According to the project's Impact Pathway, each phase encompassed a progressively wider group of stakeholders, and the indicators were designed to assess change amongst them. Fifteen researchers and change agents involved in Phase 1 were interviewed at project completion and asked to give their assessment of change by scoring each indicator, providing evidence for their scores. Results showed that there had been a positive influence for all indicators in all phases (fig. 1b).

PHASE 1: Building capacity had the highest-scoring indicators, which was to be expected since this was the focus of the project's activities. The project had a strong emphasis on participatory engagement processes, capability development and the provision of new information for decision making. A key aspect of this project was the creation of climate change scenarios for Vietnam and the associated Climate Futures Tool. The vision was driven by the Vietnamese Government. Accordingly, the research teams and stakeholders had a clear and focused goal from the beginning of the project.

Overall, the project improved the trust and cooperation between individuals and institutions, predominately those participating in the project: IMHEN, HUS and CSIRO. Individuals appreciated the training and the opportunity to exchange information, particularly around researching climate extremes and scenarios. Throughout the project, participants gained awareness of the complexity of the problem, including the consideration of social factors and the management decisions necessary to select the most effective adaptation approaches. Some participants, though, felt that they were unable to answer this indicator, which may have been due to the targeted and technical nature of the problem. Questioning values and governance was not a key part of the project.

PHASE 2: Policy and program development had weaker indicator scores. While the results have yet to be integrated into the Vietnamese National Climate Change Scenarios (expected in 2015), project stakeholders have indicated that they are using the data and Climate Futures Tool in their development planning for areas such as Can Tho, HCMC, Da Nang, Thanh Hoa, and Ha Tinh. In addition, several international organisations requested the project's results for their information and reference, including GIZ, Winrock and the Red Cross. The project team has had many discussions with IMHEN and other related agencies including local organisations in order to apply the results of the project to future activities.

The project had a limited budget for ongoing engagement with policy and program development, with respondents indicating it was too early or they were not aware of resourcing being made available as a result of the project. Additional resources have since been sought from IMHEN and UNDP. Two exceptions were HUS, with more graduate students now researching climate change in Vietnam, and the Vietnam's Ministry of Natural Resources and Environment, who made more resources available for evaluating the change in climate extremes.

PHASE 3: Implementation, adoption and scaling-out also had weaker indicator scores, although cross-scale social networks had increased with improved connections between IMHEN and HUS, who together will apply the results of the project to build climate change scenarios and sea-level projections for Vietnam. Connections have also been created to further the exchange of information and ideas with CARE, the Red Cross, GIZ, Winrock and the water resources research teams at HUS and CTU.

The Climate Futures Tool was designed to support local policy makers and communities in their understanding of climate projections at their location and to aid them in anticipating changes in extremes.

Participants were unsure of the project's ability to enable changes to organisations, rules or the usual practice. This may be due to the short time frame or limited resources for engagement after delivery of the technical output of the project. HUS felt that they have greater experience in project management and have suggested that this could, in fact, contribute to the activities and successes of the group.

Key project findings

Given the inherent variability of Vietnam's climate, combined with other unknowns associated with climate change, projections of future climate are likely to be limited by substantial levels of uncertainty. However:

- **Temperature is projected to increase across all seven sub-regions**, with annual changes ranging from 1.6°C to 3.2°C for RCP 4.5, and 2.4°C to 5.1°C for RCP 8.5 by 2090, with more hot days and heatwaves.

- **Rainfall is projected to change in some seasons and regions**. There are significant variations in projections, with annual changes ranging from -12% to +20% for RCP 4.5, and -17% to +34% for RCP 8.5 by 2090. In general, summer rainfall is projected to decrease throughout Vietnam, with projections indicating a likely rainfall increase for most regions and other seasons.

- **Changes in the frequency and intensity of droughts and extreme rainfall amounts** are projected to vary across Vietnam, which could have significant impacts on agriculture and water resources when coupled with the effects of temperature increases.

- **Fewer but possibly more intense tropical cyclones (typhoons)** are projected. The complexity of tropical cyclone formation makes them hard to predict, so this is an area requiring further investigation.

- **Sea level continues to rise**, with a projected range of increase of between 100 and 400 mm by 2050 and increases of 300-600 mm for RCP 2.6 to 900 mm for RCP 8.5 by the end of the century. Further increases are projected beyond 2100.

Alliance wide lessons

Designing investments to assist vulnerable communities in developing countries adapt to global change (e.g. globalised markets, population growth and climate) is typically complex. This is particularly true for the Alliance where our portfolio of multi-year projects focused on global development challenges related to climate, water resources, sustainable cities, and food security. Each of the projects involved multiple actors (e.g. planning, emergency services, and primary industries) at multiple scales (local, provincial, national and global) and over time, reflecting the broad domain of R4D.

Our experience is that the context-specific nature of these investments is best served by a well-informed approach to project structure and design. Practical learning from these projects can support the development of guidance to improve aid investment outcomes. Key findings included:

- **Strong partnerships and collaboration lead to better outcomes:** Partnerships can be developed or evolve in a number of ways, all of which can be effective. Our projects included partnerships where we led, where we worked with our in-country partners to build demand, and those where we responded to demand. These partnerships were formed and evolved around relationships and purpose. A general observation is that 'pull' type projects appear to have the most clearly articulated impact pathway at the national policy level and provide the least scope for expansion; whereas co-developed or evolutionary type projects provide greater flexibility and also more opportunities to broaden partnerships over the life of projects, which can significantly improve impact. In all cases, it takes time to build appropriate, effective communication processes and trust; especially when there are cultural and institutional differences. This can be expedited through ongoing in-country presence and two-way exchanges of personnel, which provides high strategic value but carries a high operational cost.

- **Capacity building and engagement:** Engagement early on (i.e. pre-project) provides a valuable platform for co-development of projects that are then shaped by and can be responsive to local context. This has the added value of building trust between partners, which can be increased over time through capacity building initiatives. Traditional develop-deliver skillsets such as two-way mentoring, use of trusted advisors and local champions to facilitate engagement, improved project management and engagement skills, remain important; however, our experience is that conjointly developed knowledge, products and services are more context-specific and tractable.

- **Participatory approaches:** Partner institutions have high levels of connectedness with government institutions and other boundary partners – giving the research a stronger pathway to impact and increasing its relevance. Participatory approaches can improve the status of research partners and encourage buy-in from key decision-makers, which is important for longer-term support. Participatory planning approaches also strengthen formal and informal networks amongst decision-maker communities and between decision-makers and researchers, building capacity of all participants.

- **Creation of and access to data:** Datasets that are well-structured and accessible will have ongoing value. Where mandates or jurisdictions are unclear and there is a limited history of data curation and sharing, a trusted relationship between parties needs to be developed in order to overcome such procedural and institutional challenges. A trusted third party can play an important role in these situations.

- **Scenario planning:** Scenario planning provides a structured and powerful tool to think about the future and challenges, especially where there are large uncertainties such as changes to natural systems (e.g. water and climate), changes in rules or an adjustment of goals (e.g. livelihood goals); and can be based on existing data, modelled, or a combination of both. Scenarios work best when elicited from in-country partners or developed in conjunction with in-country partners rather than imposed.

- **Systems thinking and approaches:** Systems approaches to better integrate biophysical with social and economic information are highly valued by project partners, from design through all stages of the project lifecycle to decision making. Systems approaches also promote participation from a broader range of stakeholders. In general most local research teams had limited experience of these approaches, including scenario planning, and Alliance activities significantly enhanced their capacity to understand and apply such systems tools.

- **Evaluation methods:** Assessments often take place in complex policy settings and systems where there are multiple actors. Accurately defining, measuring and attributing impacts is vital to describing and communicating the success of investments. The use of mixed methods approaches, and better understanding of which approaches work best under certain conditions, will improve the quality of impact evaluation studies and the articulation of impact. Also, the timely return of results to project research teams and partners is important to maintain the salience of results.

Steps required to maintain the Impact Pathway

The results presented from this research are only the first step in developing a greater understanding of future climate in Vietnam. Further capacity building and research is needed to fully understand the drivers behind projected changes, especially for rainfall, and implications for other climate features such as typhoons and droughts.

- Careful analysis is required for assessing the impact of these projections. For example, while the results suggest little change in annual rainfall, the projected decrease in rainfall during the summer monsoon season may have significant hydrological implications, which could impact areas such as water-resource planning and agriculture. This may potentially be made worse by the projected increase in the frequency of droughts and the more intense extreme rainfall.

- Scientific, peer-reviewed publications of the results will confirm the scientific basis of the results, provide training on publication procedures and will increase the scientific standing of the organisations and authors.

- Further training in the modelling and development of the Vietnamese version of a Climate Futures Tool is also needed to keep implementation on track.

- Resourcing updates of the Climate Futures Website would enable greater access to the data for decision makers and other stakeholders such as regional NGOs. However, users would need to collaborate with climate experts and other advisors to identify the best means for applying the new findings in their planning processes and in future project design.