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ADVANCE Partnership
Adaptation for Development and Conservation

World Wildlife Fund and Columbia University
Center for Climate Systems Research

The ADVANCE Approach

Co-generating and integrating climate risk information to build resilience for conservation, development, and disaster risk reduction

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Rufiji River, Tanzania

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The ADVANCE Approach

Community stakeholders create an ecological drawing for a GIZ-sponsored ecosystem-based adaptation project in Bash-Kaindy, Kyrgyzstan.

Introduction

No region on Earth has been untouched by climate change and its cascading impacts. Rapid and profound change presents major challenges to the field of biodiversity conservation, which has historically designed its activities for robustness under an assumed stationary climate. Species and their habitats not only suffer from the direct impacts of climate change, but also from indirect impacts derived from how people respond to climate change as they adapt to maintain and improve their livelihoods. Decisions that affect ecosystems, ranging from where farmers plant their crops to siting of coastal infrastructure, now require the use of climate risk information to make appropriate choices.

Conventional approaches to improving human well-being (e.g., livelihoods diversification) and conserving ecosystems (e.g., protection and restoration) are increasingly less reliable under a changing climate. Furthermore, conservation, sustainable development, and disaster management activities must be integrated to achieve better outcomes. Practitioners and decision-makers in these fields need new kinds of information and new methods to analyze risk, manage uncertainty, and build resilience to emerging challenges. Yet accessing the most useful information, interpreting it, and applying it to problem-solving remains a large challenge. That's why WWF and CCSR created ADVANCE.

ADVANCE is a partnership between World Wildlife Fund (WWF) and the Columbia University Center for Climate Systems Research (CCSR) at The Earth Institute. Launched in 2015, ADVANCE facilitates planning and decision-making by providing new ways of generating and integrating climate risk information into conservation, development, and disaster management policy and practice. WWF and CCSR are piloting the ADVANCE Approach in conservation and development activities in Bhutan, Colombia, Kyrgyzstan, Myanmar, Nepal, and Tanzania, among other countries.

ABOUT WORLD WILDLIFE FUND (WWF)

For more than 50 years, WWF has been protecting the future of nature. The world's leading conservation organization, WWF works in 100 countries and is supported by 1.1 million members in the United States and close to 5 million globally. WWF's unique way of working combines global reach with a foundation in science, involves action at every level from local to global, and ensures the delivery of innovative solutions that meet the needs of both people and nature.

ABOUT THE COLUMBIA CENTER FOR CLIMATE SYSTEMS RESEARCH (CCSR)

CCSR is the home of the cooperative relationship between Columbia University and the NASA Goddard Institute for Space Studies (GISS) and is a research center of Columbia's Earth Institute. CCSR was established with the objective of providing enhanced understanding of the Earth's climate and its impacts on key sectors and systems. CCSR plays a large role in dissemination of climate change research and information to governments, local and international organizations, educational institutions, and stakeholders.

Elephants drinking at water hole in Sub-Saharan Africa.

The **ADVANCE** Approach

Through the ADVANCE Approach, climate scientists and specialists in conservation, development and disaster management engage with stakeholders to produce and use appropriate climate risk information. This is a departure from the short-term, client/consultant-based manner in which conservation and development organizations have typically engaged the climate science community. Climate information is tailored to meet local decision-making needs, risks are communicated in ways that are easy to understand, and support is provided to integrate climate risk information at the project level. ADVANCE builds capacity so that a wide group of stakeholders can enhance resilience through their existing and future projects and programs. This process, we believe, increases the use of climate risk information and helps build resilience to the shocks and stresses associated with climate change in vulnerable communities, the ecosystems on which they depend, and other key sectors.

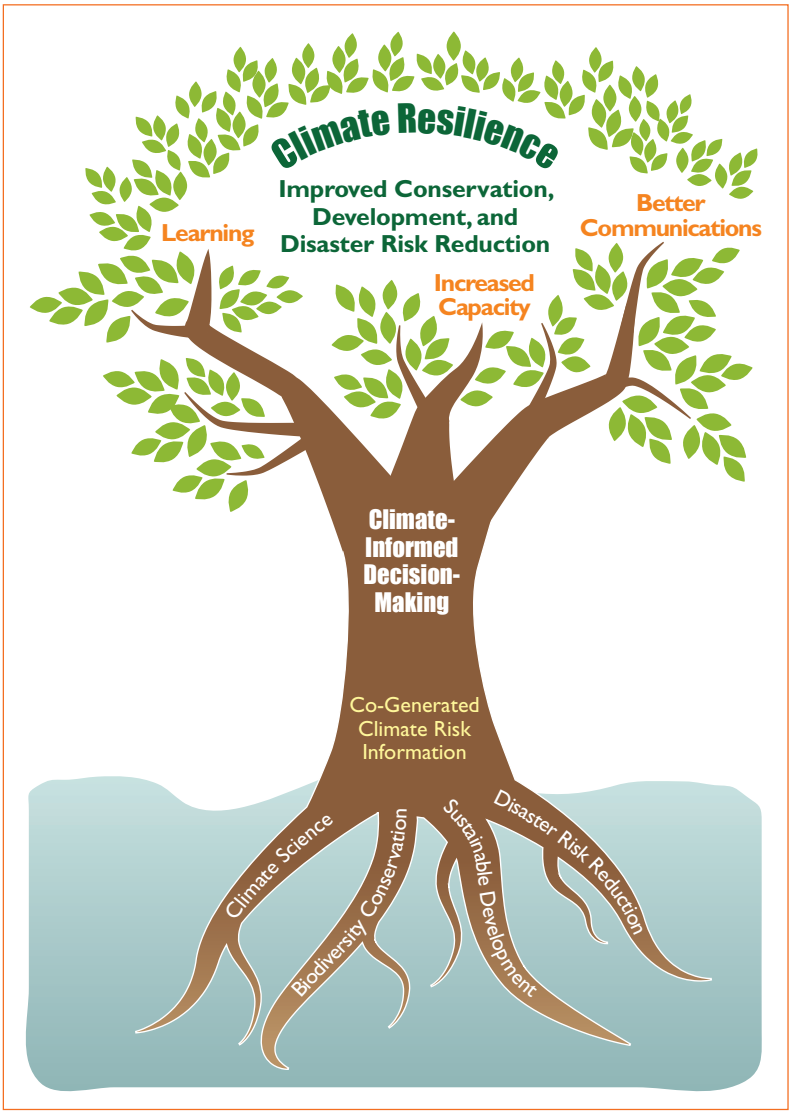


Illustration: Shari Lifson Conceptualization: Lauren Kovach

CO-GENERATING CLIMATE RISK INFORMATION

ADVANCE develops climate risk information through co-generation, a process whereby scientists and specialists interact with stakeholders to identify needs and provide guidance for integrated conservation, development, and disaster management activities. This co-generation process consists of the following steps:

1) Analyze context; 2) Develop learning questions; 3) Gather climate data and initiate projections; 4) Get feedback on initial climate risk information; 5) Produce revised climate risk information; 6) Provide guidance on integration into planning and decision-making; and 7) Evaluate outcomes and follow up. The ADVANCE Approach also works with partners to share expertise in other areas, for example, policy and legal standards and land use change using remote sensing data.

ADVANCE defines climate risk information as data and knowledge about the likelihood and potential impacts of climate and weather-related events and trends that can negatively affect com-

MYANMAR NATURAL CAPITAL ASSESSMENT

ADVANCE is working with the Natural Capital Project in Myanmar to provide climate risk information for a nationwide assessment to support that country's green economy strategy.

A scene in Kyun Chaung village, Yangon Division, Myanmar.

munities, the built environment, and ecosystems. The term risk can be defined specifically as the frequency or probability that an event or trend will occur along with the harmful consequences or impacts of that event or trend.

Climate risk information developed by ADVANCE goes beyond typical climate information (e.g., stand-alone observations of isolated climate variables and future projections unrelated to impacts). ADVANCE and stakeholders co-produce information for use in specific problem-solving and decision-making contexts. The information is developed by first asking questions to determine what climate information is relevant to the goals and decisions of stakeholders. ADVANCE tailors products to address specific needs and capacities of each country, sector, and audience. It helps stakeholders make sense of this information and integrate it into planning.

1. ANALYZE CONTEXT

ADVANCE provides its services for conservation, development, and disaster management initiatives with their own goals and objectives, and often funded by an external donor institution. In consultation with stakeholders and external experts, the ADVANCE approach begins by asking the following questions.

Project and Stakeholders

- Who are the key stakeholders involved in the initiatives? E.g., project implementers, donor institutions, local partners, government agencies and project beneficiaries, etc.
- What are the goals, objectives, and expected outcomes of the initiative for which ADVANCE is providing services? Were key stakeholders consulted in the design of the initiative? Are these agreed upon by all stakeholders?

- What are the geographic scope and duration of the project? How long are its outcomes expected to endure?
- Was the initiative designed with climate considerations in mind and/or designed to specifically address climate challenges?
- What is the local capacity to generate and use climate risk information and who are the in-region climate scientists and their institutions?
- What is the level of understanding, comfort, and buy-in of stakeholders regarding climate science and its utility?
- What are the current observations and perceptions of program beneficiaries regarding weather and climate and how are climate extremes and change affecting their lives and livelihoods?

Scope of Climate, Ecosystems, and Land Use Activities To-Date

- Are there baseline data available on the current state of ecosystems and species populations?
- What is known and unknown about how these ecosystems respond to changing climate?
- What is the scope of climate science, vulnerability assessments, and other similar projects that have already been conducted by other sectors or NGOs, governments, local universities, etc.?
- Have any climate projections or historical climate analyses been carried out for the region? If so, how recently were they done? Are the data they relied on available?
- Are climate, weather and other useful data readily available and who can provide them? Are high-quality station/tide-gauge data available for the region?
- Have any remote sensing analyses been carried out to identify land use change?

Policy Setting and Capacity Needs

- What are the policies, regulations and laws (e.g., related to natural resource management and economic development) that affect expected outcomes?
- What are the capacity-building needs for climate science generation and integration within the context of the project?

Activities

- Review reports and existing information.
- Conduct stakeholder consultations.
- Assess context and baseline knowledge (users, climate-related decisions, state of knowledge, use of climate risk information).
- Gather information about current standards, policies, and laws.
- Document land use change.

© Simon Rawles

A house damaged by the most recent cyclone, Mousuni Island, Sundarbans, India

2. DEVELOP LEARNING QUESTIONS

All ADVANCE work is designed with explicit learning objectives that can be monitored and refined throughout project implementation. Learning questions focus on process more than on results and outcomes. This informs adaptive management during and following project implementation and is used to refine the ADVANCE approach for future projects. Learning questions are based on the context and baseline knowledge assessment conducted in Step 1, and are contextualized into projects that vary in scope, sector, and geographical area.

Evaluation of the ADVANCE Approach is essential. Each project includes a component that is developed to assess learning, usefulness of climate risk information, and capacity building conducted by the ADVANCE team. A basic survey was developed to gather information about these outcomes at every ADVANCE workshop for each project. This is modified to suit the specific context in each region and conducted in local languages, where necessary. The context assessment and the learning questions established at the start of the project are also essential for evaluation.

Learning Questions

- How is climate change expected to impact development, conservation, and disaster risk management?
- What are the challenges of communicating climate science and climate risk information with audiences comprising diverse stakeholders and what can be done to overcome these challenges?
- Will more relevant, better-communicated climate risk information lead to better (or better-informed) decisions?
- What are the barriers to using climate science and climate risk information to inform program planning and what can be done to reduce these barriers?

Activities

- Create learning plan with list of project-specific questions.
- Modify evaluation survey, if necessary.

See Annex I: ADVANCE Survey for Project Evaluation

CLIMATE-SMART LANDSCAPE MANAGEMENT PLANNING IN ASIA'S HIGH MOUNTAINS

ADVANCE is working with the Snow Leopard Trust and WWF field offices in Bhutan, Nepal, India, Kyrgyzstan, Mongolia, and Pakistan as part of USAID's* Conservation and Adaptation in Asia's High Mountain Communities and Landscapes, to provide historical climate trends analysis and future projections for snow leopard landscape management plans.

© naturepl.com Reinhard ARCO WWF

Snow Leopard

*United States Agency for International Development (USAID)

3. GATHER CLIMATE DATA AND INITIATE PROJECTIONS

In addition to the initial context-setting and baseline knowledge assessment, a series of climate-specific questions is shared with key knowledge providers and stakeholders in the project region. Climate scientists analyze historic climate trends for the project area and create initial projections using the best available climate data for temporal and geographic scales appropriate for the local context. These are then presented to stakeholders to continue the process of co-generation of climate risk information.

Initial climate projections include some or all of the following variables, depending on stakeholder needs:

- Temperature: absolute values, mean changes, minimum and maximum temperatures, hot days, and cold days
- Precipitation: absolute values, mean changes, minimum and maximum precipitation, wet days, snow days, and dry days
- Sea level: mean changes, changes in coastal flood frequency and height

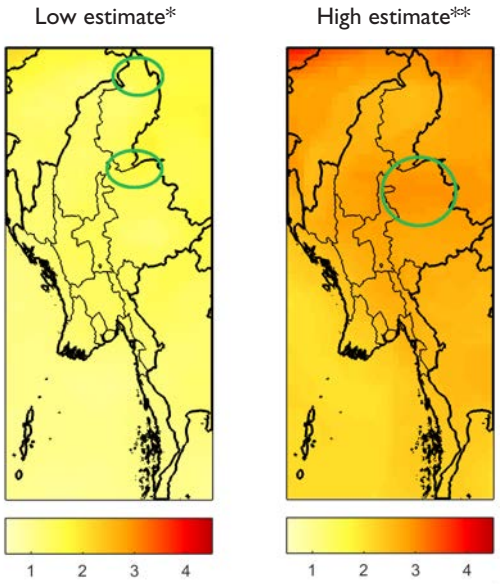
Sources and Attributes

- Historical data: Gridded/reanalysis data or station data
- Projections: Climate model outputs from Coupled Model Intercomparison Project Phase 5 (CMIP5) or NASA Earth Exchange Global Daily Downscaled Projections (NASA NEX GDDP).
- Resolution: 0.25 degree grid boxes (~25km by 25km) or 0.50 degree grid boxes (~50km by 50km).
- Time-scales: Decadal or multi-decadal (e.g., 2020s, 2050s, 2070s)

Questions

- Do climate trends seem realistic for the region/country based on stakeholder experience?

Myanmar's Department of Meteorology and Hydrology requested projections of maximum temperature as this variable is more useful than mean temperature change for many applications in tropical countries.



Projected change in maximum temperature (°C) in 2041-2070 compared to the 1980-2005 base period during the hot season (February to May). Areas of greatest change are circled in green.

*Low estimate refers to the 25th percentile of 21 climate model outcomes in greenhouse gas emissions scenario RCP 4.5
**High estimate refers to the 75th percentile of 21 climate model outcomes in greenhouse gas emissions scenario RCP 8.5

Data source: NASA NEX GDDP

Note: Like all projections, ADVANCE climate projections have uncertainty embedded within them. Sources of uncertainty include data and modeling constraints, the random nature of some parts of the climate system, and limited understanding of some physical processes. The levels of uncertainty are characterized using state-of-the-art climate models, multiple scenarios of future greenhouse gas concentrations, and recent peer-reviewed literature. Even so, the projections are not true probabilities and the potential for error should be acknowledged.

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Snow leopard biologists and spatial mapping experts assess needs for mapping climate change, water, and habitat in eastern Nepal for the USAID Asia's High Mountains Project.

- What essential climate variables are missing and do observations exist?
- How can key climate thresholds be taken into account?

Activities

- Share climate risk information questions with stakeholders prior to workshop and gather feedback (to be shared again at the first and subsequent workshops).
- Identify specific climate information needs and thresholds.
- Base initial climate risk information on existing research on climate impacts and thresholds.
- Collect data on historical trends and climate projections.
- Produce historical analyses and initial climate projections.

See Annex II: Climate Risk Information Questions for Stakeholders

See Annex III: List of Climate Risk Information Variables

4. GET FEEDBACK ON INITIAL CLIMATE RISK INFORMATION

A distinguishing feature of the ADVANCE approach is direct stakeholder engagement to 'co-generate' climate science that is fit for purpose. At this stage, climate risk information is presented for stakeholder feedback at the first in-country workshop, based on the context-setting, baseline assessment, and learning questions of Steps 1 and 2, along with the observed climate data and initial projections from Step 3.

In addition to the workshop, ADVANCE team members consult with stakeholders through interviews to receive their input on the usefulness of the climate risk information in addressing their decision-making needs. In order to capture the current use and understanding of and the need for climate risk information, the survey developed in Step 2 is conducted at the workshop and/or during stakeholder consultations.

Through the workshop, consultation, and survey

process, ADVANCE assesses specific in-country capacity needs to empower local stakeholders to interpret and use climate risk information to inform their work. Local meteorology agency and climate scientists are included in the first in-country workshop in order to strengthen stakeholder-scientist relationships and utilize local climate expertise.

Questions

- What are the key questions related to climate change?
- Do stakeholders share the same priorities but view them through different perspectives?
- Do different stakeholders have different priorities they would like to address?
- Are stakeholders in agreement with the approach and methodology used to generate climate risk information? Do they have other approaches and methods that could be incorporated?
- Does the initial climate information help address their needs?
- Are there future scenarios that are of particular interest to stakeholders?
- Which seasons, geographical scales, and timescales are most useful to stakeholders?
- Are there major climate processes, such as monsoons, that should be analyzed as well?
- What can be done differently to make the information more useful?
- What local capacity is needed to ensure climate information is understood and usable for planning, implementation, and monitoring? How can ADVANCE help build that capacity?

Activities

- Participate in co-generation workshop and meet with stakeholders.
- Document key thresholds and variables that have emerged.
- Administer survey at initiation of project workshop and consultations.
- Identify additional data sources.

See Annex IV: Presentations and Stakeholders for ADVANCE Project Workshops

BHUTAN FOR LIFE

WWF and the Government of Bhutan have committed to create an innovative funding approach called 'Bhutan for Life' to maintain and manage the country's parks and wildlife corridors in perpetuity. ADVANCE is supporting this effort by developing climate risk information to enable climate-informed management of Bhutan's national parks.

Taksang, Bhutan

5. PRODUCE REVISED CLIMATE RISK INFORMATION

Based on learning from the stakeholder engagement process, climate scientists revise the initial projections to better meet the needs of the project. The team engages with local stakeholders to begin integrating climate risk information, such as thresholds, into project activities. Using easily accessible language for a lay (non-climate scientist) audience, the ADVANCE team writes a brief report covering this analysis to present to project implementers and stakeholders. The report includes guidance on how to interpret and use the climate data appropriately. Local meteorology and climate scientists are engaged in this process.

If needed, introductory training on climate change, interpreting climate risk information, climate impact assessment, adaptation, and resilience is provided for stakeholders.

Questions

- Are stakeholders in agreement with the initial projections and what components need revision?
- Does the climate risk information capture the identified thresholds?
- What are the key impacts for various sectors (e.g., critical infrastructure, sensitive ecosystems)? How can the projections be modified to aid decision-making for these different sectors?
- How should capacity building be tailored to best help stakeholders understand and use climate risk information?
- What variables should be presented? How should the climate risk information be presented (e.g., most likely scenario, vs. worst-case projections)?

Activities

- Develop revised climate risk information based on stakeholder inputs.

MANGROVE CONSERVATION IN COLOMBIA

ADVANCE is co-generating climate risk information with WWF Colombia and its local partners to guide conservation planning for mangrove forests along Colombia's Pacific coast.

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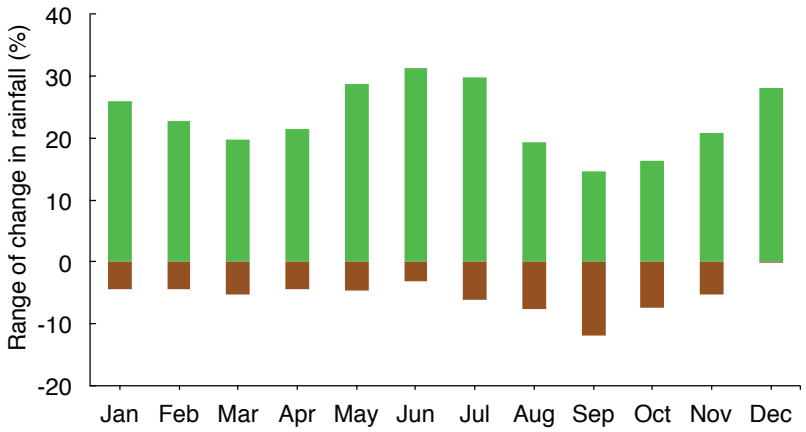
ADVANCE team members and local conservationists visit an intact mangrove forest in Nariño, Colombia.

Conservationists in Colombia requested changes in rainfall for mangrove forests on the Pacific Coast. They expect precipitation patterns to alter the productivity and spatial distribution of mangroves by affecting sediment transport and estuarine salinity. Stakeholder consultations revealed that changes in upland precipitation are as important as those in mangrove forests themselves, as vital sediments originate upstream. We are including precipitation projections for the upland watershed in the revised climate risk information.



Range of projected rainfall change by month in 2041-2070 compared to the 1980-2005 base period, Pacific coast of Colombia.
Data source: NASA NEX GDDP

6. PROVIDE GUIDANCE ON INTEGRATION INTO PLANNING AND DECISION-MAKING

With the revised climate risk information, a second in-country workshop is held to present new information and help stakeholders understand the implications for project goals and decisions.

In order to capture the usefulness of the ADVANCE Approach in developing climate risk information for decision-making, a follow-up survey is conducted at the second workshop, during stakeholder consultations, and by email. This complements the first ADVANCE survey carried out during the first workshop and/or consultations, allowing for project outcomes to be evaluated.

Ideally, the second in-country workshop is carried out within a year of the first workshop. In instances where a second workshop is not possible, the ADVANCE team engages closely with the in-country project teams and organizations to disseminate results, provide guidance on using the climate risk information, administer the survey, collect other feedback, and monitor follow-on activities and outcomes.

In addition to the second workshop on the co-generated climate risk information, further capacity-building workshops can be carried out on how to interpret results, as well as on how to use and integrate the information for planning.

Questions

- Do stakeholders find the 'co-generated' climate risk information useful for their own purposes?
- Is any further climate risk information or climate science knowledge required for stakeholder use?
- How frequently should climate risk information be updated?

© Shaun Martin WWF-US

A Kyrgyz community leader discusses potential impacts on local livelihoods and ecosystem services under plausible future climate scenarios co-generated with ADVANCE.

- Have key thresholds and variables been captured in the revised climate risk information? What further work is required?
- Has capacity building been sufficient for key stakeholders to interpret and use climate information?

Activities

- Participate in second in-country workshop to present co-generated climate risk information and engage with in-country project teams/organizations to disseminate results.
- Conduct survey at conclusion of the workshop/consultations.
- Hold capacity-building workshops on how to interpret results and integrate them into planning.
- Identify areas for further research.

7. EVALUATE OUTCOMES AND FOLLOW UP

Results of the two surveys administered from the beginning and end of the project are analyzed to understand the needs, capacities, and barriers related to climate risk information. This enables explicit evaluation of project outcomes. Results from the surveys, together with other lessons learned throughout each project, are used to inform and further develop the ADVANCE Approach.

Each project is tracked to evaluate if the original learning questions have been answered, suggested activities to build climate resilience are employed, there is greater understanding and engagement on climate issues among stakeholders, capacity to use climate risk information has increased, impacts of extreme events that occur during project implementation have been reduced, and stakeholders perceive that using climate risk information helped them achieve their goals at the end of the project.

After the project, the ADVANCE team members are available to assist with follow-up questions and concerns from stakeholders. The ADVANCE team shares aspects of learning that would benefit the project team in follow-on activities and the wider conservation, development, and climate-science communities.

Questions

- What are the main results from the project and how can these help improve the development of climate risk information for other projects?
- What are the key findings of the evaluation surveys?
- How can ADVANCE learn from the stakeholder engagement process to improve co-generation and increase acceptability and use of climate risk information, within-country and beyond?

Activities

- Analyze results of evaluation survey and improve survey for future projects. Establish continuity and feedback plan, tailored to the needs of stakeholders.
- Document ways in which ADVANCE could improve co-generation, development, and integration of climate risk information.

ADDITIONAL ANALYSES FOR A FULL SERVICE APPROACH

The ADVANCE team works with partners from Columbia University's Earth Institute and NASA to meet identified case-specific needs, funding permitting. These may include analyses of existing or envisaged policies, or to identify land use change through remote sensing. A broad set of ADVANCE partners can provide a 'full service' approach to support adaptation and resilience.

In order to ensure long-term sustainability and resilience, existing policy frameworks may need to be revised. More research is needed, for example, on how each country's laws can hinder or support adaptation, and how adaptation can align with or be in conflict with other legal principles and values. Identifying land use change using remote sensing is useful to capture baseline and trends, and to map existing areas that could potentially be used for ecosystem-based adaptation.

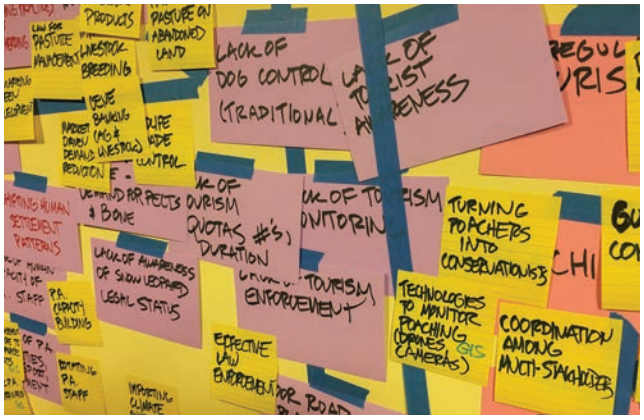
OUTCOMES

A major outcome of the ADVANCE approach is learning. This learning component has multiple elements including stakeholder engagement, technical analyses, and local knowledge. Learning occurs through stakeholder engagement, where the team documents climate-related decisions, key questions, and climate thresholds, and provides guidance on interpretation and integration of climate risk information, and capacity building.

Technical learning on climate science, local and regional impacts, and climate risk information occur throughout each project, both by the ADVANCE team and stakeholders. The climate baseline established at the start of the project is also essential for this aspect of the learning process. Capturing local knowledge is important and is documented by country teams and the ADVANCE team during field visits.

Through the surveys administered at the workshops, the team documents key outcomes related to stakeholders such as useful climate projections, climate-informed conservation and development strategies and activities, and increased capacity.

Through the ADVANCE Approach, scientists and experts co-generate and support the integration of climate risk information to better serve stakeholder needs for conservation and sustainable development.



© Ryan Bartlett WWF-US

An exercise to identify threats using ADVANCE projections for the Asia's High Mountains project.

Annex I: ADVANCE Survey for Project Evaluation

Project location: _____
Date: _____

The following survey includes 9 questions and is expected to take approximately 20-30 minutes to complete. Surveys responses are anonymous and results are held as confidential.

Climate risk information is defined here as data and knowledge about the likelihood and potential impact of climate and weather-related events and trends that can negatively affect communities, the built environment and infrastructure, and ecosystems. The term risk can be defined specifically as the frequency or probability that an event or trend will occur along with the consequences or impacts of that event or trend. Climate risk information developed by ADVANCE goes beyond typical climate information (e.g., stand-alone observations of isolated climate variables and future projections unrelated to impacts) in that it is much better suited for problem-solving and decision-making. It is derived by first asking questions to determine what climate information is relevant to the goals and decisions of stakeholders.

I. Background Questions – The following questions provide baseline information about the respondents.

1. Which of the following best describes your occupation? Circle the option that is most appropriate.
    a. Conservation Professional
    b. Development Professional
    c. Humanitarian Professional
    d. Scientist/Researcher
    e. Technical Field Staff
    f. Resource Manager
    g. Regional Planner
    h. Other (please specify) _____
    i. Don't know/Skip

2. What type of organization is your primary employer? Circle the option that is most appropriate.
    a. National/Federal/Central government
    b. State/Provincial government
    c. Local government
    d. WWF
    e. Other NGO
    f. Private sector business
    g. University or research institution
    h. Community organization
    i. Other (please specify) _____
    j. Skip

II. Climate Risk Information – The following questions provide information about your current use and familiarity with climate information (trends and projections of future climate change) and climate risk.

3. Approximately how often do you use climate information to inform your work?
    a. Less than once a year

b. Several times a year
c. Monthly
d. Weekly to daily
e. I have not yet used climate information to inform my work
f. Don't know

4. If you circled responses a, b, c or d in question 3, please identify areas where you have used climate information to design project activities, programs and how useful it was. (Climate information is considered useful if it results in decisions that are different from what you would have done had you not considered climate information.)

Activity	**Climate information was very useful**	**Climate information was somewhat useful**	**Climate information was not useful**	**I have not used climate information for this kind of activity**
a. Protected area management	◻	◻	◻	◻
b. Species conservation	◻	◻	◻	◻
c. Sustainable forestry, fisheries, agriculture, freshwater management	◻	◻	◻	◻
d. Renewable energy	◻	◻	◻	◻
e. Livelihoods improvement	◻	◻	◻	◻
f. Disaster risk reduction	◻	◻	◻	◻
g. Infrastructure design and construction	◻	◻	◻	◻
h. Policy advocacy	◻	◻	◻	◻
i. Other (specify) _____	◻	◻	◻	◻
j. Don't know/Skip	◻	◻	◻	◻

5. Which *current* and *future* climate hazards do you believe have the greatest potential to impact achieving your conservation, development or disaster management goals at the project site under review by ADVANCE? In other words, which of these hazards currently pose the greatest risk to your work? Select all those that are appropriate.

Climate Hazard	**Current**	**Future**
a. Changes in seasonality	◻	◻
b. Coastal storms	◻	◻
c. Droughts	◻	◻
d. Floods	◻	◻
e. Heat: heat waves, extreme high temperatures, increased number of hot days	◻	◻
f. Cold: cold spells, extreme low temperatures, frost	◻	◻
g. More snow, less snow	◻	◻
h. Other storms including extreme wind events	◻	◻
i. Rainfall: heavy rainfall, more rainy days, less rain, unpredictable rainfall	◻	◻
j. Ice cap or glacial melt	◻	◻
k. Sea level rise	◻	◻
l. Other ocean changes: sea surface temperatures, acidification, changing currents and upwelling	◻	◻
m. Other _____	◻	◻
n. Don't know/Skip	◻	◻

III. Use of new knowledge and information in practice – This section will provide information on how you use new information in decision-making processes and how might your strategies, activities, and practices change with new information.

6. Which of the following has been the most useful source(s) of climate risk information? Select the option that is most appropriate under each sub-category.

Information Source	Not useful	Somewhat useful	Very useful	Most useful	Not applicable
a. Climate scientists	◻	◻	◻	◻	◻
b. Community leaders	◻	◻	◻	◻	◻
c. Government sources	◻	◻	◻	◻	◻
d. Media and news	◻	◻	◻	◻	◻
e. NGOs	◻	◻	◻	◻	◻
f. WWF colleagues	◻	◻	◻	◻	◻
g. Online sources (websites, blog posts, etc.)	◻	◻	◻	◻	◻
h. Scientific reports	◻	◻	◻	◻	◻
i. Other _____	◻	◻	◻	◻	◻

7. What are significant problems you face utilizing climate change information? Select the option that is most appropriate under each category.

Problems with climate change information	Not significant	Somewhat significant	Very significant	Most significant (select only 1)	Not applicable
a. Climate change information is difficult to understand; don't know how to interpret	◻	◻	◻	◻	◻
b. Don't understand the impacts and risk implied by climate information	◻	◻	◻	◻	◻
c. Climate change information is not relevant to my work activities	◻	◻	◻	◻	◻
d. Climate change information is too generic (not customized)	◻	◻	◻	◻	◻
e. Climate change information is not at a relevant spatial scale for planning	◻	◻	◻	◻	◻
f. Climate change information is not at a relevant temporal scale for planning (e.g. too far in the future)	◻	◻	◻	◻	◻
g. Don't know how to use climate change information in planning and decision making	◻	◻	◻	◻	◻
h. Too much information. Difficult to know which is best to use.	◻	◻	◻	◻	◻
i. Too much uncertainty in climate projections	◻	◻	◻	◻	◻
j. Other _____	◻	◻	◻	◻	◻

8. Which of the following factors do you feel has prevented you from incorporating new climate risk information into decision-making processes? Circle all those that are appropriate.
    a. Climate risk information is not available.
    b. It is not part of my job description to incorporate new climate risk information. Others work on this issue.
    c. Lack of organizational mandate or support. No institutional incentives for incorporating climate risk information.
    d. Not enough time to learn about climate risk information and how to use it.
    e. My project site or program is facing other risks that are more urgent.
    f. The topic of climate change is too politically sensitive.
    g. There are no financial or human resources available to respond.
    h. Other _____
    i. Don't know/Skip

9. Which of the following conditions would be most important in making information about climate hazards more user-friendly for you? Circle all those that are appropriate.
    a. Information presented in scenarios format (i.e., quantitative and qualitative statements about future climate projection)
    b. Information presented as data tables, graphs and charts
    c. Information presented in maps and illustrations
    d. Information presented with statistical background data on uncertainty and likelihoods
    e. Information targeted directly to my type of activities (customized by sector)
    f. Information presented with a lot of front matter regarding climate change processes
    g. Information presented in a need to know basis (e.g., demand driven – asking for only the information I think I need.
    h. Other _____
    i. Don't know/Skip

Thank you for your responses to this questionnaire. Your efforts are very much appreciated. For more information about the results of this survey please contact WWF US or the Columbia Center for Climate Systems Research.

ADVANCE is a collaborative initiative between World Wildlife Fund (WWF) and the Columbia University Center for Climate Systems Research (CCSR) at The Earth Institute. Launched in 2015, ADVANCE facilitates adaptation by providing new ways of generating and integrating climate risk information into conservation and development planning, policies, and practice. The objective of the survey is to assess current knowledge of climate change and use of climate risk information by project participants especially those who attend ADVANCE workshops.

Annex II: Climate Risk Questions for Stakeholders

Local stakeholders on the ground can provide valuable input for targeting climate risk information. These questions can help to elicit context on the local climate and specific stakeholder needs for the climate information. Using this information, ADVANCE researchers can analyze appropriate data that will have tangible applications for decision-making.

- What are the major seasons that govern the targeted landscape, and that provide relevance for decision making to the stakeholders with whom you are working?
- Which geographic/political regions should be used for projections? List the coordinates of the landscape that are relevant to these geographical regions.

- What future time slices would be useful for projections (e.g., 2020s and 2050s; 2030s, 2060s, and 2090s; etc.)?
- How would you like to see these projections presented (e.g., maps, tables, graphs)?
- Any regions or protected areas that should be specifically focused on?
- What extreme events affect vulnerability in your region (e.g., heat waves, floods, drought)?
- Do you measure any climatic variables? If so, which ones? At what intervals are they measured (e.g., monthly, daily)?
- What are the important thresholds? These could be temperature thresholds, number of consecutive hot days, precipitation level (low rainfall, total rainfall, consecutive dry/wet days, rainiest day of season/month/year).
- What scenarios are useful for planning (e.g., middle range, worst-case scenario)?
- What are the major climate and weather related changes have affected people, conservation, disasters, and agriculture (e.g., shorter rainfall season, increased number of hot days each month, damaging cyclone)?
- How have people (local communities) and nature (ecosystems and species) responded to extreme events (e.g., droughts, intense precipitation, increased number hot days)?

Note: Some stakeholders request all available climate risk information variables. Often stakeholders may then receive an overwhelming amount of climate risk information. Through the ADVANCE Approach, stakeholders are encouraged and guided to identify the types of information/questions and the major climate risk factors that are essential and useful for planning.

Annex III: List of Climate Risk Information Variables

Climate risk information and projections can be developed for a range of temporal and spatial scales:

- Regional level, country level, key sites (e.g., protected areas, cities)
- 30-year future time slices for projections: 2010-2039, 2040-2069, 2070-2099, etc. Note: Projection time slices of 30 years are required to minimize influence of climate variability.
- Different likelihood scenarios: middle-range, worst case, 90th percentile, mean, etc.

Temperature

Historical

- Base period (minimum 30 years – roughly 1980-2010, or longer) annual, seasonal, and monthly mean temperatures
- Annual/seasonal total hot/cold days (below or above a certain threshold)*
- Annual/seasonal consecutive hot/cold days (heat waves and deep freezes, usually duration of mean/longest stretches above given threshold)*
- Trends in the above across the base period (change in ºC or number per decade)

Projections

- Annual, seasonal (based on local climate) and monthly mean temperature (general climatological means)
- Annual, seasonal (based on local climate) and monthly means of daily maximum and minimum temperature (means of daily highs and lows)
- Annual/seasonal total hot/cold days (below or above given thresholds)*
- Annual/seasonal consecutive hot/cold days (heat waves and deep freezes, usually duration of mean/longest stretches above given threshold)*

- Mean diurnal range (mean of monthly [max daily temp – min daily temp], this can be important for crops, ecosystems, livestock, and wildlife)*
- Temperature annual range (based on monthly means or max/min)*

Precipitation

Historical

- Base period (nowadays roughly 1980-2010) annual, seasonal, and monthly mean total precipitation
    - Duration/start/end of the rainfall season*
    - Annual/seasonal total rainy/dry days (using locally meaningful threshold)*
- Annual/seasonal consecutive rainy/dry days*
- Rainiest day of season/month/year*
- Trends in the above across the base period (change in mm or number per decade)

Projections

- Annual, seasonal and monthly mean total precipitation
- Precipitation seasonality (coefficient of variation – this is a bit technical)
- Duration/start/end of the rainfall season*
- Annual/seasonal total rainy/dry days (using locally meaningful threshold)*
- Annual/seasonal consecutive rainy/dry days*
- Rainiest day of season/month/year*
- Heavy rain events and droughts (using locally meaningful definitions)*

Sea Level

Historical

- Sea level rise for country coastline
- Coastal flooding from storm events (based on hourly/daily tide-gauge data), including frequency of flooding

Projections

- Sea level rise for country coastline (includes thermal expansion, local ocean height, loss of ice and land water storage)

** Note: Availability of good quality and continuous daily weather data from a nearby station for at least 30 years is needed for these variables.*

Station Data and Other Requirements for Climate Change Projections

Temperature and Precipitation

- Localized projections – station data in the location or close to the location is required.
- Broad regional projections – at least two stations representing the broad climatic/geographic region.
- Data in electronic format
- At least 30 years of data of good quality and continuous data – a longer period is preferred.
- Daily data
    - Temperature: mean, maximum and minimum
    - Precipitation: total
- The main seasons and associated months are also required to carry out seasonal projections.

Sea Level Rise

- Daily and hourly tide gauge data for coastal area

Annex IV: Presentations and Stakeholders for ADVANCE Project Workshops

Presentations by CCSR

(a) Climate 101 - Introduction to Climate Science

This is an introductory climate science presentation to get everyone up to speed on the basics.

(b) Introducing the ADVANCE Approach to Co-Generating Climate Risk Information

This presentation will introduce the core elements of the ADVANCE Approach and the main steps on how the program will work with stakeholders to co-generate climate risk information.

(c) Draft Regional Climate Projections and Potential Impacts

This presentation will cover summary results from CCSR's climate projections, including temperature, precipitation, and sea level rise projects (where appropriate). It will discuss potential impacts and how stakeholders can interpret and use climate risk information.

(d) Discussion on climate projections, potential impacts, stakeholder needs.

In the discussion session the ADVANCE team will answer questions relating to the presented information, discuss stakeholder needs and uses of climate risk information.

Potential topics by country team/WWF/local experts

- Overview of the project and how it relates to the conservation, climate change, development and disaster risk reduction goals of the region/country.
- Past studies on climate change, projections, and impacts related to the project location.

List of stakeholders

The following stakeholders are suggested as invitees for the workshops.

Stakeholders working in the following sectors

- Meteorology
- Climate change
- Conservation/forestry/wildlife
- Environment
- Hydrology
- Geology (for subsidence input in coastal areas)

Types of agencies

- National/regional/local government agencies
- Academics and local experts
- Non-profit and UN agencies, both local and international
- Community groups (including livelihood groups - fishing, forestry, farming etc.)
- Donor agencies such as The World Bank, USAID
- Private sector/businesses

Additional data and analyses: Landsat land-use change, 1982 to present; analyses of existing and potential policies for climate change adaptation, conservation, and development.

ADVANCE

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