Global Adaptation Atlas

Linking Science, Policy, and Practice to Build Resilience to Climate Change

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April 2009
The Challenge of Adapting Well

- Irrespective of the scale of mitigation, some adaptation will be necessary, especially in the South.
- Emissions reductions anywhere “count” everywhere, but adaptations must be locally relevant and broadly coordinated:
  - Complementary, not competing objectives
  - Growing push to set priorities for adaptation funding

Mitigation
Reducing GHG emissions to avoid the worst potential impacts of climate change

Adaptation
Planning for and adjusting to environmental changes already underway
Mapping as the Missing Link

• Geography and spatial information are common threads connecting impact science and policy
  – Climate impacts are site- and population-specific
  – Populations in greatest need are often least able to adapt

• Yet there is a divide between climate science & policy
  – Need for more downsampled data around the world
  – Need for greater integrated research on aggregate impacts
  – Need for coordination of policy and on-the-ground activity
Why We Need Science & Policy Coordination

- Cannot effectively target adaptation investments without a new framework for coordinating science and policy.

- Without coordination, adaptation efforts could undercut one another.

**Sciences divided by methodologies:**
- Diverse research topics & disciplines
- Different scales of analysis
- Incompatible assumptions

**Policy decisions divided by sectors & modalities:**
- Various policy issues and approaches
- Different levels of intervention
- Differing aims and agendas
Global Climate Change
(e.g. changes in temperature & precipitation averages and variability)

Effects of Climate Change on Natural Systems

- Ice cap melt
- Thermal expansion of oceans
- Heat waves
- Cyclones
- Changes in precipitation
- Changes in seasons
- Droughts
- Salinization of freshwater resources
- Floods
- Loss of Biodiversity

Natural System Resilience Improvements
(e.g. mangrove restoration, riparian buffers, glacial lake drainage)

Potential Impacts on Human Systems

<table>
<thead>
<tr>
<th>Land Loss</th>
<th>Public Health Effects</th>
<th>Food Scarcity</th>
<th>Water Stress</th>
<th>Livelihood Disruption</th>
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</thead>
</table>

Human System Adaptive Capacity

Adaptation Measures

- levees, mosquito nets, irrigation, rainwater collection, micro-insurance, institutional and community capacity building, governance and policy reform
The Role of the Atlas

Consolidate scientific information on climate impacts

- Across fields of research (agriculture, water, health, etc.)
- Across scales, from the global and regional to local

Compile data on “on-the-ground” adaptation activities

- Small-scale projects (rainwater systems, microinsurance, etc.)
- Large-scale development plans and investments

Highlight gaps in impacts (science) and adaptations (policy)

- Decisionmaking, priority-setting for adaptation projects and funds
- Monitoring and evaluating impacts/responses over time
## Major Building Blocks

<table>
<thead>
<tr>
<th></th>
<th>Consolidating science on impacts</th>
<th>Mapping on-the-ground adaptations</th>
<th>Creating a tailored outreach vehicle</th>
<th>Sustaining long-term evaluation</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>• Identify gaps in science across disciplines, regions, scales</td>
<td>• Automate continuous data collection on adaptation funding</td>
<td>• Create key user profiles, track with Google Analytics</td>
<td>• Develop a spatial data archive on impacts and activities</td>
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<td>• Highlight areas for new integrated analysis</td>
<td>• Create a comprehensive, searchable project database</td>
<td>• Collect and exchange local lessons and global best practices</td>
<td>• Track changes in projected impacts &amp; adaptations over time</td>
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Building Block 1: Synthesizing Climate Science

• Collecting data on climate impacts
  - Land: Loss of land due to 1m sea-level rise
  - Water: Changes in surface and groundwater
  - Food: Change in agricultural productivity
  - Health: Change in probability of dengue fever epidemic
  - Livelihood: Impacts on number of tourism days

• Harmonizing results of climate model projections and studies
  - Congruent scenarios (~3-degree C temperature increase by 2080)
  - Matching scales (global 1-km gridded datasets v. regional studies)
  - Compatible assumptions (avoid double-counting of impacts)
  - Coding for level of peer-review/citation using Google Scholar

• Overlay datasets to identify intersections of multiple impacts
Negative impact on surface water runoff and groundwater supply, 2080
Projected changes in supply of surface water (Arnell 2003) and groundwater (Döll et al. 2005) in 2080. Darker colors indicate higher levels of negative impacts. White areas on the map indicate where there is either an increase in total groundwater supply and surface water runoff or no change from the baseline.
Increase in probability of dengue fever epidemic, 2080
Projected increase in probability of a dengue fever epidemic (Hales et al. 2002) in 2080. Darker colors indicate a greater increase in the probability of an epidemic from current levels. White areas on the map show where there is either a decrease in the probability of an epidemic or no change from the baseline.
Decrease in total number of “good” days per month for tourism, 2080
Projected estimate of climate-induced loss of total days suited for tourism in 2080 (Amelung et al. 2007). Darker colors indicate greater decrease in the length of the tourism season. White areas on the map indicate where there is either an increase in the total number of “good” days or no change from the baseline.
Illustrative overlay map of selected negative climate impact “hotpots”
Number of impacts in the “high” and “very high” categories in each 1-km grid cell for four major climate impacts: 1) Water: decrease in surface water runoff and groundwater supply, 2) Land: loss due to a 1-meter sea level rise (CRESIS Database), 3) Health: increased probability of dengue fever epidemic, and 4) Livelihood: decrease in number of days suitable for tourism (Vajjhala and Nackoney, in prep).

- Impact layers (food, water, land, health, livelihood)
- Compatibility criteria, overlay guidance for users
Building Block 2: Mapping Funding Flows

• Automated application for adaptation funding/project upload
  – Collaboration with key data partners to push/pull data into Atlas on ongoing and planned adaptation projects, programs, measures
  – Entries mapped as points and/or coverage areas

• Real-time updating of on-the-ground activities
  – Basis for outreach – filter archived data by project type, size, etc.
  – Basis for analysis – evaluate coverage, density, and types of adaptation activities relative to projected climate impacts

• Oversight, validation, and quality control mechanism
  Periodic “Google Alert” to project contacts, program managers, trusted Atlas reviewers/users to validate and update project entries
### Example Atlas Impact & Project Data

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<thead>
<tr>
<th>Climate Impacts</th>
<th>Adaptation Activities</th>
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<tbody>
<tr>
<td><strong>Food</strong></td>
<td></td>
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<tr>
<td>Change in agricultural productivity</td>
<td>Drip irrigation, modified planting, new crops/seeds</td>
</tr>
<tr>
<td><strong>Land</strong></td>
<td></td>
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<tr>
<td>Land loss from sea-level rise (submergence) and erosion</td>
<td>Levees, sea walls, riparian buffers, resettlement</td>
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<tr>
<td><strong>Livelihood</strong></td>
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<tr>
<td>Loss of income (fishing, hunting, tourism)</td>
<td>Micro-finance, insurance, and retraining programs</td>
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<tr>
<td><strong>Health</strong></td>
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<tr>
<td>Changing disease vectors (dengue), malnutrition</td>
<td>Mosquito nets, vaccine programs, disaster relief</td>
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<tr>
<td><strong>Water</strong></td>
<td></td>
</tr>
<tr>
<td>Drought, contamination, salinization of freshwater</td>
<td>Rainwater collection, filtration systems, desalinization</td>
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Building Block 3: Targeting Outreach Efforts

• Three tiers of tailored “lessons offered” for registered users
• A user who enters or searches for info on agriculture in Mali will receive a dynamic pop-up window with related materials

Local: Other similar projects in your area
Sorted list of other agriculture projects in Mali from archive of Atlas entries

Regional: Related projects in your region
List of related projects in other sectors (water, health, livelihood, etc.) in larger region (e.g. West Africa) sorted by keyword

Global: Examples of best practices around the world
Links to model projects of similar type and size around the world based on ratings of best practices by “trusted” users (i.e. Amazon.com, Netflix, etc.)
Building Block 4: Supporting Evaluation

• Spatial data archive and research tool
• Monitoring climate impact science
  – Evaluate changes in modeling and projected impacts over time
  – Characterize gaps in research (geography, discipline, scenario, etc.)
  – Identify new research questions on multiple stressors and opportunities for multi-disciplinary collaboration
• Tracking and supporting evaluation of adaptation projects
  – Monitor rate/level at which projects are funded in different regions and across different sectors
  – Correlation between adaptation activities and projected impacts
  – Observe change in adaptation investments over time
What Will the Atlas Look Like?

- Web-based mapping interface using ArcGIS and Google Earth
- Automated data upload features
  - Database of selectable impact layers from climate studies
  - Repository of adaptation projects
  - User compatibility/filtering guide for overlay by scenario, theme, sector, assumptions, citations, etc.
- Detail impact and project pages and tailored summary pop-ups

Wireframe Mockup of Atlas Interface
Illustration of Atlas climate impact overlay filters showing options for selecting ‘compatible’ data layers with pop-up highlighting adaptation project/funds location and detail.
Atlas Interface Features

- **Explore**
  - Mapviewer
  - Data Index

- **Download**

- **Upload**

- **Resources**

- **Register**

- **About**

**Explore**
- Impact/activity map layers
- Overlay criteria (scenario, etc.)

**Download**
- Data filtered by region, theme, citation, etc.
- Multiple formats (shapefile, KML)

**Upload**
- Automatic data pull/push from key partners
- Layer/project upload ‘wiki’

**Resources**
- Data/feature updates
- Advisory board commentary

**Register**
- User profiles
  - Scientists
  - Policymakers
  - Citizens
  - Outreach

**About**
- Mission / Vision
- Core Team
- Partners
- Contact
Who Will Use the Atlas and For What?

**Policymakers & Leaders:** Visualize impacts affecting their regions, view portfolios of projects underway, and identify gaps that need to be filled

- Policymakers
- Ministers and Agency Directors
- Philanthropic Foundations
- Multi-lateral donors
- United Nations staff
- International climate negotiators

**Scientists:** Share impact study results, develop finer-grained analyses, further multidisciplinary collaboration

- Natural Scientists
- Social Scientists

**Citizens:** Act!

Allow civil society leaders, advocates and others to identify key impacts, adaptation options, and opportunities for coordination with others in their region(s)
# How Can We Define and Measure Success?

<table>
<thead>
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<th>Goals</th>
<th>Measures of Success</th>
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<tr>
<td>• Compile and organize science (impact data) and policy (on-the-ground adaptation projects and activities)</td>
<td>• Web traffic, number of Atlas entries, data downloads</td>
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<tr>
<td>• Provide data in formats that are accessible and relevant to scientists, policymakers, and citizens around the world</td>
<td>• Citations using Atlas data in peer-reviewed research</td>
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<td>• Surveys of Atlas users, advisory board members on impact on policy &amp; decisions</td>
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<tr>
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<td>• Google Analytics trends</td>
</tr>
</tbody>
</table>
References

• Many other web-based adaptation tools focus variously on climate impacts, studies, or projects

• Atlas value added is in dynamically linking science, policy, and practice in systematic data collection and visualization platform

WeAdapt and Wiki Adapt (SEI)
  • http://www.weadapt.org

SERVIR (USAID)
  • http://www.servir.net

Adaptation Learning Mechanism (UNDP)
  • http://www.adaptationlearning.net

Climate Analysis Indicators Tool (WRI)
  • http://cait.wri.org/

ADAPT Screening Tool (World Bank)
  • http://sdwebx.worldbank.org/climateportal/
Global Adaptation Atlas*

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*patent pending