

# Economics of Climate Adaptation (ECA) – Shaping climate-resilient development A framework for decision-making

Making rural communities more resilient to the impact of climate change requires a comprehensive portfolio of adaptation measures. But decision-makers need the facts to identify the most cost-effective investments.



## Background

**Climate adaptation is an urgent priority for the custodians of national and local economies, such as finance ministers and mayors. Such decision-makers ask: What is the potential climate-related loss to our economies and societies over the coming decades? How much of that loss can we avert, with what measures? What investment will be required to fund those measures – and will the benefits of that investment outweigh the costs?**

The ECA methodology<sup>1</sup> provides decision-makers with a fact base to answer these questions in a systematic way. It enables them to understand the impact of climate change on their economies – and identify actions to minimize that impact at the lowest cost to society. It therefore allows decision-makers to integrate adaptation with economic development and sustainable growth. In essence, we provide a methodology to **pro-actively manage total climate risk**, which means:

- Assess today's climate risk
- Chart out the economic development paths that put greater population and assets at risk
- Consider the additional risks presented by climate change

<sup>1</sup> The methodology is based on the findings of a study by the Economics of Climate Adaptation Working Group, a partnership between the Global Environment Facility, McKinsey & Company, Swiss Re, the Rockefeller Foundation, ClimateWorks Foundation, the European Commission, and Standard Chartered Bank. See reference<sup>6</sup> below.

Where and from what are we at risk?

In a first step, for a given region, economic sector and affected population, we identify the most relevant hazards and analyze historic events (eg, from disaster data sets).

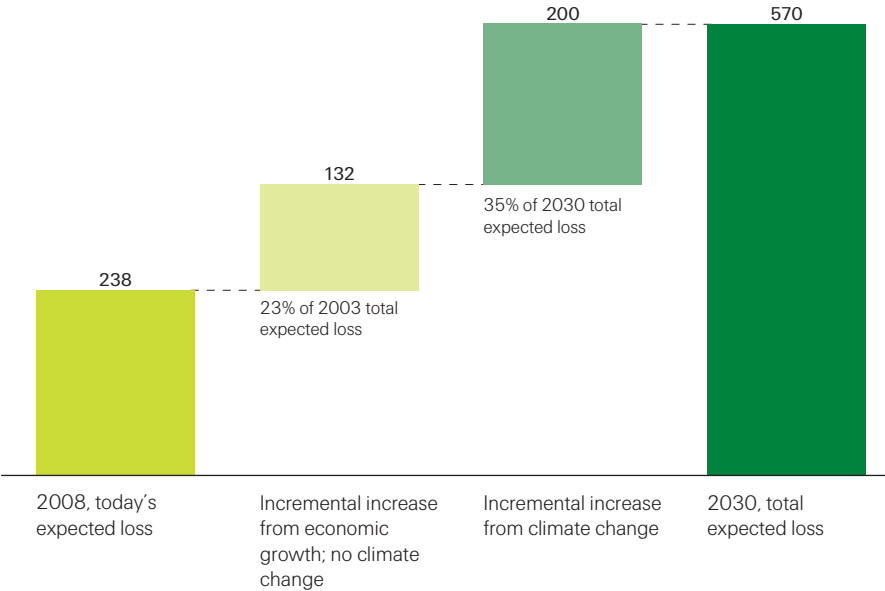
What is the magnitude of the expected loss?

Using state-of-the-art probabilistic modeling, we estimate the expected economic loss today, the incremental increase from economic growth and any further incremental increase due to climate change.

Among the various factors, future change in climate risk is the most difficult to predict. We therefore use scenario analysis<sup>2</sup> as the main tool to help decision-makers deal with uncertainty, constructing three potential climate risk scenarios: today's climate, moderate climate change and high (or extreme) climate change for the year 2030<sup>3</sup>.

**Example Maharashtra, India:** The expected drought loss under the high climate change scenario for Maharashtra, India. In this case, by 2030, the risk more than doubles.

**Expected loss from exposure to climate**  
High climate change scenario, 2008 USD millions



Source: Report of the Economics of Climate Adaptation Working Group 2009

2 To arrive at these scenarios, we use global and regional circulation models to assess changes in precipitation and temperature, mainly based on the A2 IPCC 4th AR emission scenario. We leverage public academic research to flesh out the complex interactions between climate change and potential impact (for example, between increases in sea surface temperature and hurricane intensity).

3 We chose 2030, as this is far enough in the future to result in a climate change impact but close enough to be relevant for decision-making. Any other timeframe could be assessed with the same methodology.

4 Note that insurance does not come with a cost/benefit ratio below one. This is due to the fact insurance transfers and diversifies risk, but does not reduce it. The price of insurance includes the reserves for the expected loss (that would result in cost/benefit=1), plus the capital and operational costs. Insurance is therefore especially suited to manage low frequency/high severity events, which would exceed the (budget) capacity of the owners of the insured risks.

5 Since the probabilistic loss modeling is carried out at high resolution (postal code or higher) and taking into account the specific vulnerabilities of all assets involved, the effect of adaptation measures is reflected in a highly detailed fashion, too (eg exact position of flood defenses...)

6 Method description and first eight case studies across the globe:  
[http://media.swissre.com/documents/rethinking\\_shaping\\_climate\\_resilient\\_development\\_en.pdf](http://media.swissre.com/documents/rethinking_shaping_climate_resilient_development_en.pdf)  
Latest report assessing adaptation needs in the Caribbean region:  
<http://media.swissre.com/documents/ECA+Brochure-Final.pdf>

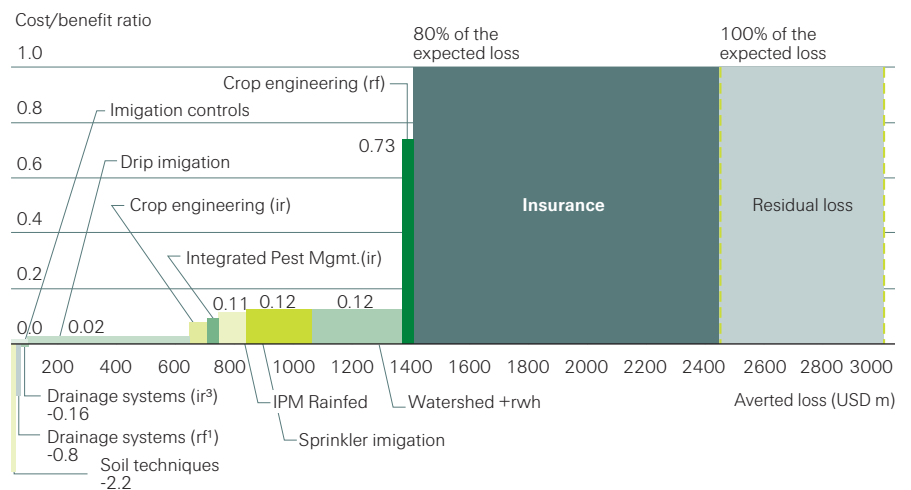
## How could we respond?

We then build a balanced portfolio of adaptation measures, assessing the loss aversion potential and cost-benefit ratio for each possible adaptation measure<sup>5</sup>. The loss aversion potential (the benefit of the measure) is assessed by modeling the effect of each specific measure and its cost by calculating capital and operating expenditures.

The adaptation cost curve shows that a balanced portfolio of prevention, intervention and insurance measures are available to pro-actively manage total climate risk. Insurance – or risk transfer – incentivizes prevention initiatives by putting a price tag on the risk with a premium.

### Example Maharashtra, India:

The adaptation cost curve for drought risk in the state of Maharashtra, India (see referenced report<sup>6</sup> for details). For each adaptation measure (rectangle), the loss aversion potential (horizontal axis) and its cost/benefit ratio (vertical axis) is shown. Note that for this case, almost 50% of the loss under a high climate change scenario can be cost-effectively averted by prevention and intervention measures. Index insurance<sup>4</sup> covers another ~30% of the expected loss.



Source: Report of the Economics of Climate Adaptation Working Group 2009

## Economics of Climate Adaptation case studies

So far, economics of climate adaptation studies have been carried out for<sup>6</sup>:

**Maharashtra, India** and **North and North East China**: focus on drought risk to agriculture; **Mopti region, Mali**: focus on risk to agriculture from climate zone shift; **Georgetown, Guyana**: focus on risk from flash floods; **Samoa**: focus on risks caused by sea level rise (storm surge and groundwater salination); **Tanzania**: focus on health and power risks caused by drought; **Hull, UK**: focus on risk from multiple hazards (wind, inland flood, storm surge); **Miami and South Florida, USA**: focus on risk from hurricanes; **Caribbean**: Multihazard and sector studies in **Anguilla, Antigua and Barbuda, Cayman Islands, Bermuda, Barbados, Jamaica, St. Lucia** and in **Dominica**; and a sector study along the **US Gulf Coast** (Alabama, Louisiana, Mississippi, Texas).

In the 17 studies carried out so far<sup>6</sup>, we learn, that (at least until 2030):

- The key drivers in many cases are today's climate risk and economic development.
- The prioritization of the adaptation measures is not strongly dependent on the chosen climate change scenario. Cost-effectiveness is still valid even without climate change for a substantial subset of proposed measures.

This presents a strong case for immediate action – it is cheaper to start adapting now than to sit and wait.

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