

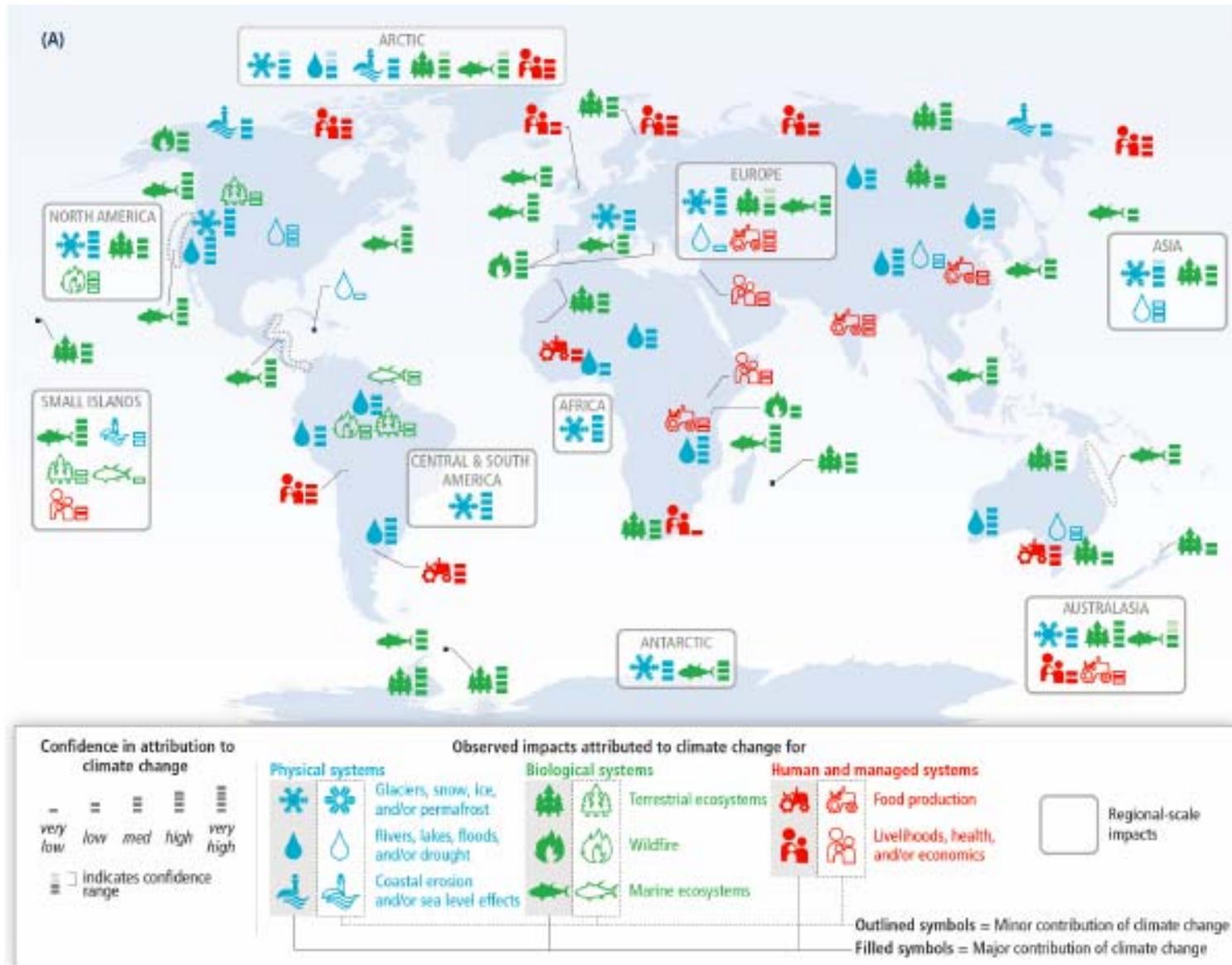
Current challenges in the impacts and adaptation to climate change:

**Introduction to IPCC 5th
Assessment WG2
Summary for Policy Makers**

Observed Impacts Vulnerability & Adaptation

- We are already seeing climate change and responses to it: changing precipitation affecting water resources, shifts in marine species, falls in crop yields and increases in climate related extremes.
- For countries at all levels of development the impacts are consistent with a significant lack of preparedness.

Observed Impacts of CC



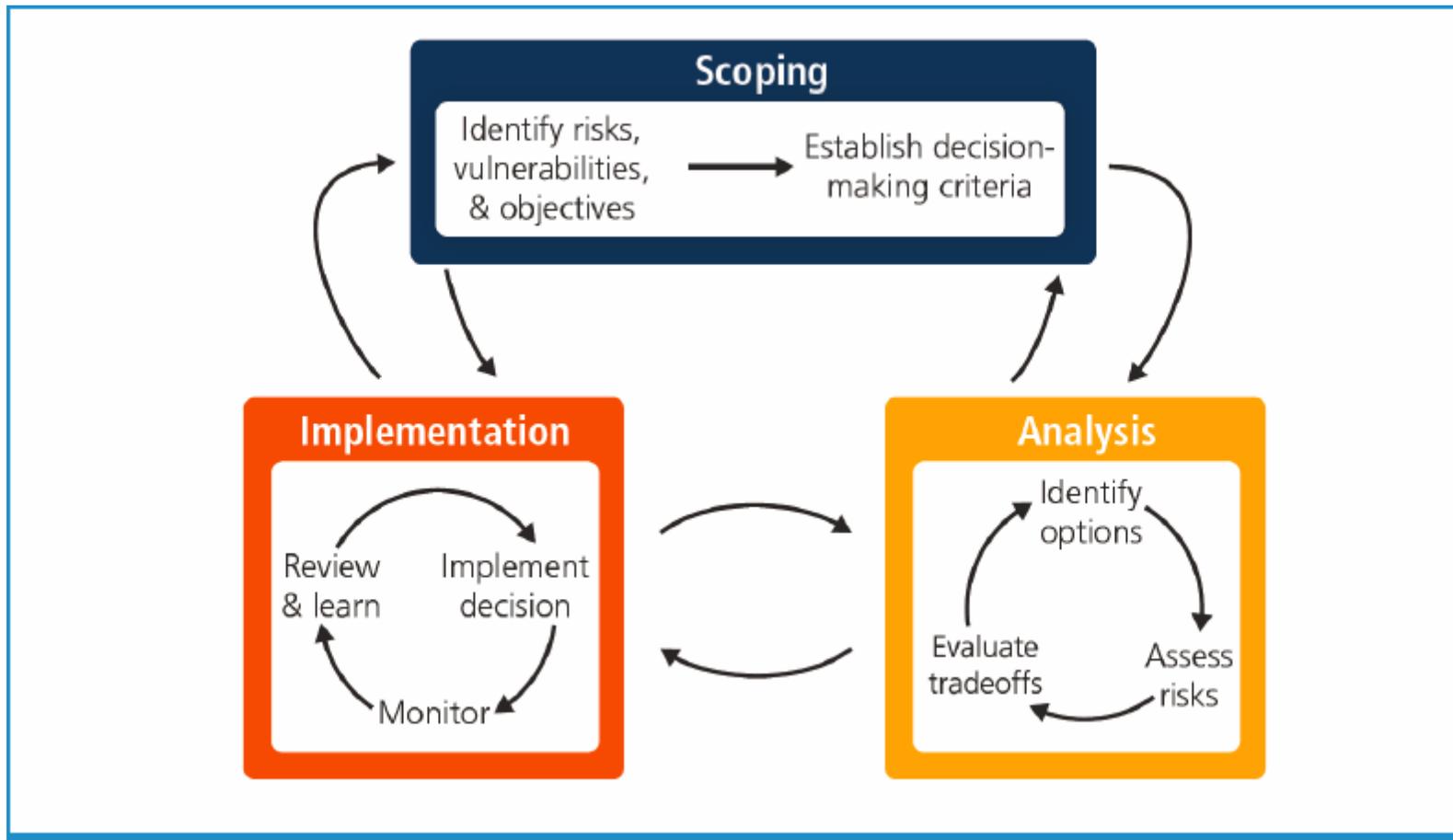
The Adaptation Experience

- Adaptation is becoming embedded in some planning processes but with limited implementation of responses.
- Focus has been on engineering and technological options with incremental actions where co-benefits are strong.
- Most adaptation activity has been restricted to impacts and adaptation planning with very little on implementation.

The Decision-Making Context

- Responding to climate-related risks involves decision-making in a context of high uncertainty about the severity and timing of impacts and of the effectiveness of actions.
- Iterative risk management methods are being developed but they are still not at a high level of maturity.

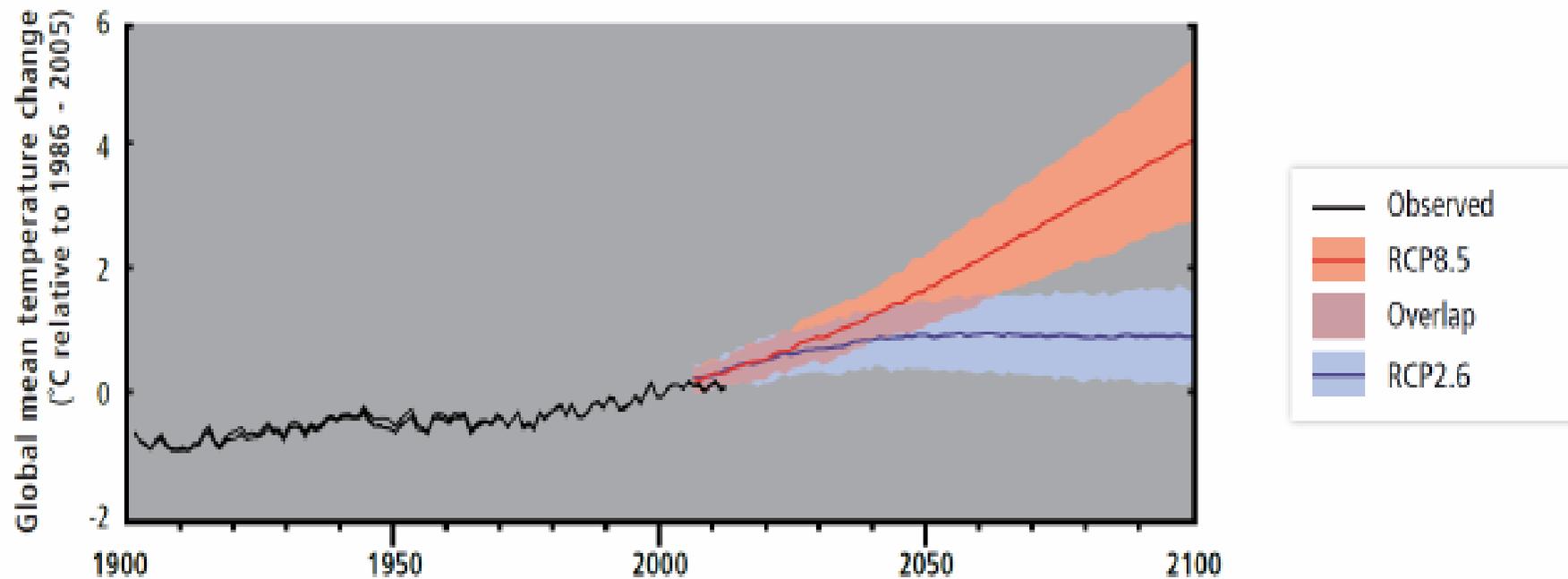
Iterative Risk Management



Adaptation Versus Mitigation

- The benefits of adaptation and mitigation occur over different but overlapping time frames.
- Projected temperature increases are similar across different emission scenarios. During this period risks will evolve as socio-economic trends interact with a changing climate. Adaptation actions will influence outcomes.
- After 2050 temperature increases depend on emission scenarios and risks of climate change will depend on which path is followed.

Projected Climate Changes



- Observed increases from 1900 to 2005 are about 0.6°C

Climate-resilient Pathways

- Climate resilient pathways for sustainable development are related fundamentally to what the world accomplishes with climate mitigation.
- Great rates and magnitude of climate change increases the risk of exceeding adaptation limits.
- Priorities in allocating resources between mitigation and adaptation now are, however, unclear: some models indicate priority to mitigation others to adaptation.

Future Risks

1. Risk of death, injury, ill-health and disrupted livelihoods in low-lying coastal areas and SIDS.
2. Risk of death, injury, ill-health and disrupted livelihoods for large urban populations due to inland flooding in some regions.
3. Systematic risks due to extreme weather events
4. Mortality and morbidity due to extreme heat
5. Food insecurity linked to warming, drought, floods, especially for poor populations.
6. Risks of loss of rural livelihoods due to lack of irrigation water and reduced agricultural productivity.
7. Loss of marine ecosystems, biodiversity and services they provide for coastal livelihoods.
8. Loss of terrestrial ecosystems and the services they provide for livelihoods.

Particular Reasons for Concern

- Increasing warming raises the likelihood of severe pervasive and irreversible impacts:
 - Threatened ecosystems, species extinction, food security, compromise on a wide range of human activities.
- These risks can be reduced significantly by limiting emissions of GHGs.

Sectoral Risks & Potential for Adaptation: Freshwater

- Projections are for a reduction in renewable surface and groundwater water in most sub-tropical regions.
- In contrast water resources are projected to increase in high latitudes.
- Quality of water likely to decline everywhere.
- Adaptation options: scenario planning, learning based approaches, flexible non-regret solutions can increase resilience to uncertain hydrological changes.

Sectoral Risks & Potential for Adaptation:

Terrestrial Ecosystems

- A large fraction of both terrestrial and freshwater species faces increased extinction risk under projected climate change during and beyond the 21st century, as climate change interacts with other stressors, such as habitat modification, over-exploitation, pollution, and invasive species.
- Actions, such as maintenance of genetic diversity, assisted species migration and dispersal, manipulation of disturbance regimes (e.g., fires, floods), and reduction of other stressors, can reduce, but not eliminate these risks in part by helping species to adapt to the changes.

Sectoral Risks & Potential for Adaptation:

Coastal & Low Lying Areas

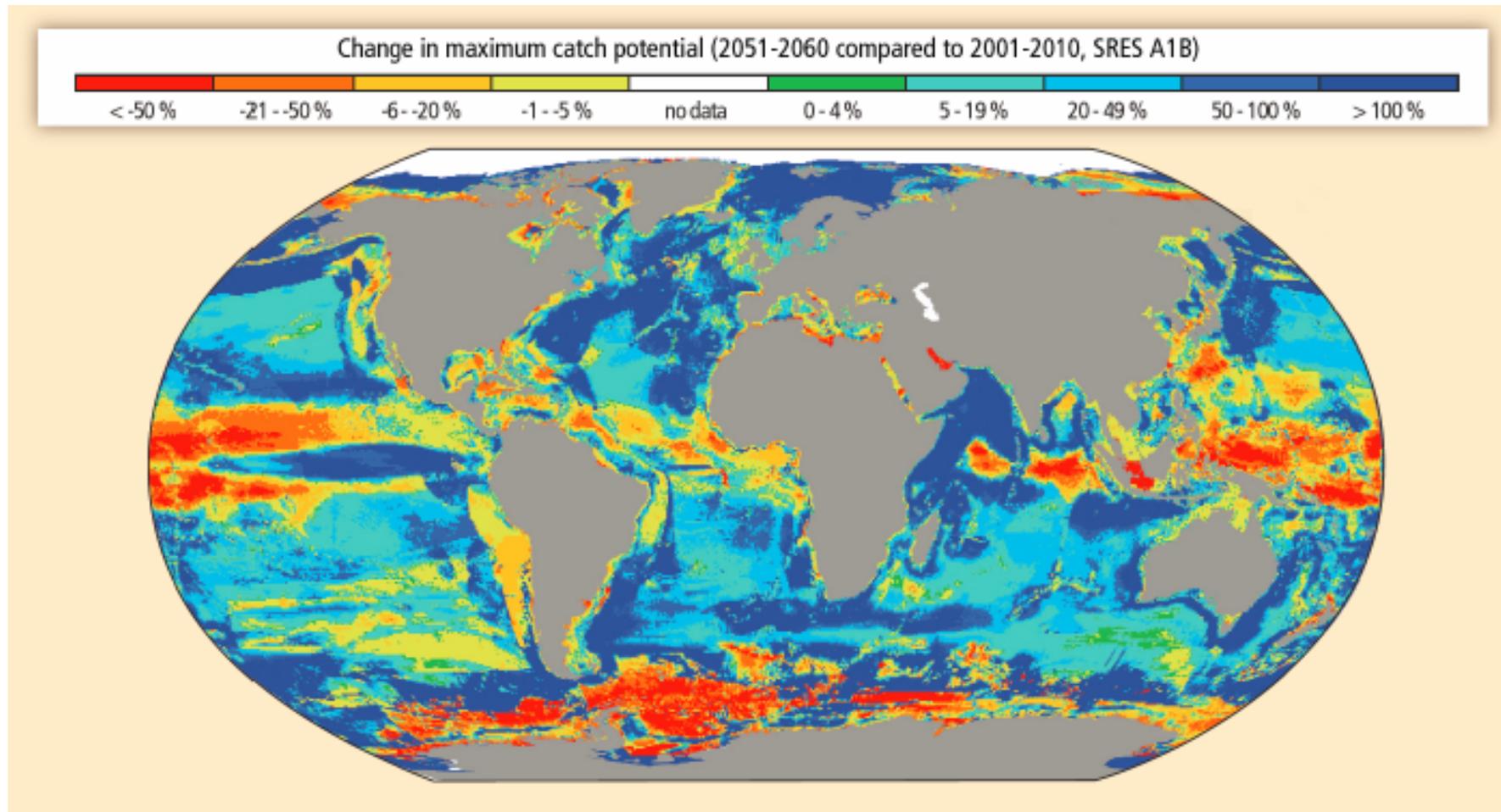
- Sea-level rise projected throughout the 21st century and beyond, will increasingly cause adverse impacts such as submergence, coastal flooding, and coastal erosion.
- The population and assets exposed to coastal risks will increase significantly in the coming decades due to population growth, economic development, and urbanization.
- Adaptation options include protection measures as well as land use planning. Costs vary a lot by region and in some islands could be very high.

Sectoral Risks & Potential for Adaptation:

Marine Ecosystems

- Spatial shifts of marine species due to projected warming will cause high-latitude invasions and high local-extinction rates in the tropics and semi-enclosed seas.
- Richness and fisheries catch potential are projected to increase, on average, at mid and high latitudes and decrease at tropical latitudes.
- For medium to high emissions scenarios ocean acidification poses substantial risks to marine ecosystems, especially polar ecosystems and coral reefs.
- Adaptation options discussed include large scale translocations of industrial fishing, flexible management, reductions of other stressors such as pollution, restoration of mangroves, coral reefs etc..

Changes in Catch Potential 2050+



Sectoral Risks & Potential for Adaptation:

Food Security

- Projected changes in yields vary a lot by region and crop. Declines are larger in low latitudes and declines increase in all regions over time.
- Adaptation measures include development of more resilient varieties, shifts to crops that are less affected by climate change, changes in timing of crops and increased efficiency in the use of water.
- A part of this is autonomous but a part involves public decision-making.

Sectoral Risks & Potential for Adaptation: Urban Areas

- Heat stress, extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, and water scarcity pose risks in urban areas.
- Risks are amplified for those lacking essential infrastructure and services or living in poor-quality housing and exposed areas.
- Reducing basic service deficits, improving housing, and building resilient infrastructure systems could significantly reduce vulnerability and exposure in urban areas.
- Urban adaptation benefits from effective multi-level urban risk governance, alignment of policies and incentives, strengthened local government and community adaptation capacity, synergies with the private sector, and appropriate financing and institutional development

Impacts on Economic Sectors

- In most sectors other factors such as change in population, age structure, technology, relative prices and governance have bigger impacts than climate change.
- CC is expected to change energy demand between heating and cooling, location choices, demand for water. For increases in temperature of around 2°C losses are estimated between 0.2 and 2% of income. But there are large differences between countries and losses go up with temperature.

Sectoral Risks & Potential for Adaptation: Human Health

- Until mid-century, projected climate change will impact human health mainly by exacerbating health problems that already exist . Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income
- Examples include greater likelihood of injury, disease, and death due to more intense heat waves and fires; increased likelihood of under-nutrition resulting from diminished food production in poor regions; risks from lost work capacity and reduced labor productivity in vulnerable populations; and increased risks from food- and water-borne diseases and vector-borne diseases.
- The most effective adaptation measures for health in the near-term are programs that implement and improve basic public health measures such as provision of clean water and sanitation, secure essential health care including vaccination and child health services, increase capacity for disaster preparedness and response, and alleviate poverty

Sectoral Risks & Potential for Adaptation: Human Security

- Climate change over the 21st century is projected to increase displacement of people.
- Displacement risk increases when populations that lack the resources for planned migration experience higher exposure to extreme weather events, particularly in developing countries with low income.
- Expanding opportunities for mobility can reduce vulnerability for such populations.
- Climate change can indirectly increase risks of violent conflicts in the form of civil war and inter-group violence by amplifying well-documented drivers of these conflicts such as poverty and economic shocks.

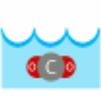
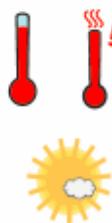
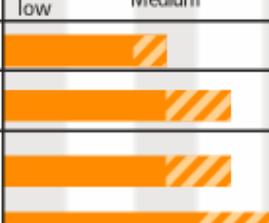
Livelihoods and Poverty

- Climate-change impacts are expected to exacerbate poverty in most developing countries and create new poverty pockets in countries with increasing inequality, in both developed and developing countries.
- Insurance programs, social protection measures, and disaster risk management may enhance long-term livelihood resilience among poor and marginalized people, if policies address poverty and multidimensional inequalities

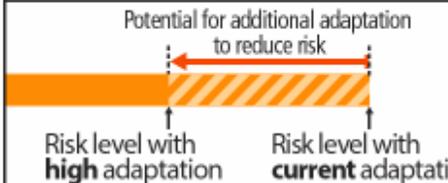
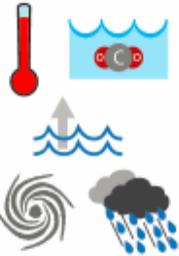
Regional Risks and Actions

- The 5th Assessment reviews the risks by region and identifies the scope for adaptation.
- The pictures show the expected reduction in risk if there is high adaptation by sector and region.
- The capacity for adaptation is evaluated for the present, the medium term and the long term.
- In some cases (e.g. Europe) the projections are relatively optimistic: adaptation can reduce the risks significantly.
- In others (e.g. Oceans, Asia) the assessment is less optimistic but still offers some hope.

Regional Risks: Europe

Climate-related drivers of impacts										Level of risk & potential for adaptation	
 Warming trend	 Extreme temperature	 Drying trend	 Extreme precipitation	 Precipitation	 Snow cover	 Damaging cyclone	 Sea level	 Ocean acidification	 Carbon dioxide fertilization		
Key risk			Adaptation issues & prospects			Climatic drivers		Timeframe		Risk & potential for adaptation	
<p>Increased economic losses and people affected by flooding in river basins and coasts, driven by increasing urbanization, increasing sea levels, coastal erosion, and peak river discharges (<i>high confidence</i>)</p> <p>[23.2-3, 23.7]</p>			<p>Adaptation can prevent most of the projected damages (<i>high confidence</i>).</p> <ul style="list-style-type: none"> • Significant experience in hard flood-protection technologies and increasing experience with restoring wetlands • High costs for increasing flood protection • Potential barriers to implementation: demand for land in Europe and environmental and landscape concerns 					<p>Present</p> <p>Near-term (2030-2040)</p> <p>Long-term (2080-2100) 2°C</p> <p>4°C</p>		<p>Very low Medium</p> 	
<p>Increased water restrictions. Significant reduction in water availability from river abstraction and from groundwater resources, combined with increased water demand (e.g., for irrigation, energy and industry, domestic use) and with reduced water drainage and runoff as a result of increased evaporative demand, particularly in southern Europe (<i>high confidence</i>)</p> <p>[23.4, 23.7]</p>			<ul style="list-style-type: none"> • Proven adaptation potential from adoption of more water-efficient technologies and of water-saving strategies (e.g., for irrigation, crop species, land cover, industries, domestic use) • Implementation of best practices and governance instruments in river basin management plans and integrated water management 					<p>Present</p> <p>Near-term (2030-2040)</p> <p>Long-term (2080-2100) 2°C</p> <p>4°C</p>		<p>Very low Medium</p> 	
<p>Increased economic losses and people affected by extreme heat events: impacts on health and well-being, labor productivity, crop production, air quality, and increasing risk of wildfires in southern Europe and in Russian boreal region (<i>medium confidence</i>)</p> <p>[23.3-7, Table 23-1]</p>			<ul style="list-style-type: none"> • Implementation of warning systems • Adaptation of dwellings and workplaces and of transport and energy infrastructure • Reductions in emissions to improve air quality • Improved wildfire management • Development of insurance products against weather-related yield variations 					<p>Present</p> <p>Near-term (2030-2040)</p> <p>Long-term (2080-2100) 2°C</p> <p>4°C</p>		<p>Very low Medium</p> 	

Regional Risks: Oceans

Climate-related drivers of impacts										Level of risk & potential for adaptation		
 Warming trend	 Extreme temperature	 Drying trend	 Extreme precipitation	 Precipitation	 Snow cover	 Damaging cyclone	 Sea level	 Ocean acidification	 Carbon dioxide fertilization			
Key risk			Adaptation issues & prospects				Climatic drivers		Timeframe	Risk & potential for adaptation		
<p>Distributional shift in fish and invertebrate species, and decrease in fisheries catch potential at low latitudes, e.g., in equatorial upwelling and coastal boundary systems and sub-tropical gyres (<i>high confidence</i>)</p> <p>[6.3, 30.5-6, Tables 6-6 and 30-3, Box CC-MB]</p>			<ul style="list-style-type: none"> Evolutionary adaptation potential of fish and invertebrate species to warming is limited as indicated by their changes in distribution to maintain temperatures. Human adaptation options: Large-scale translocation of industrial fishing activities following the regional decreases (low latitude) vs. possibly transient increases (high latitude) in catch potential; Flexible management that can react to variability and change; Improvement of fish resilience to thermal stress by reducing other stressors such as pollution and eutrophication; Expansion of sustainable aquaculture and the development of alternative livelihoods in some regions. 						<p>Very low Medium</p>	Present		
									Near-term (2030-2040)			
									Long-term (2080-2100)	2°C		
									4°C			
<p>Reduced biodiversity, fisheries abundance, and coastal protection by coral reefs due to heat-induced mass coral bleaching and mortality increases, exacerbated by ocean acidification, e.g., in coastal boundary systems and sub-tropical gyres (<i>high confidence</i>)</p> <p>[5.4, 6.4, 30.3, 30.5-6, Tables 6-6 and 30-3, Box CC-CR]</p>			<ul style="list-style-type: none"> Evidence of rapid evolution by corals is very limited. Some corals may migrate to higher latitudes, but entire reef systems are not expected to be able to track the high rates of temperature shifts. Human adaptation options are limited to reducing other stresses, mainly by enhancing water quality, and limiting pressures from tourism and fishing. These options will delay human impacts of climate change by a few decades, but their efficacy will be severely reduced as thermal stress increases. 						<p>Very low Medium</p>	Present		
									Near-term (2030-2040)			
									Long-term (2080-2100)	2°C		
									4°C			
<p>Coastal inundation and habitat loss due to sea-level rise, extreme events, changes in precipitation, and reduced ecological resilience, e.g., in coastal boundary systems and sub-tropical gyres (<i>medium to high confidence</i>)</p> <p>[5.5, 30.5-6, Tables 6-6 and 30-3, Box CC-CR]</p>			<ul style="list-style-type: none"> Human adaptation options are limited to reducing other stresses, mainly by reducing pollution and limiting pressures from tourism, fishing, physical destruction, and unsustainable aquaculture. Reducing deforestation and increasing reforestation of river catchments and coastal areas to retain sediments and nutrients Increased mangrove, coral reef, and seagrass protection, and restoration to protect numerous ecosystem goods and services such as coastal protection, tourist value, and fish habitat 						<p>Very low Medium</p>	Present		
									Near-term (2030-2040)			
									Long-term (2080-2100)	2°C		
									4°C			

Principles for Effective Adaptation

1. Adaptation is place and context specific: no single approach will work in all settings.
2. Adaptation planning can be enhanced thorough complementary actions: protecting vulnerable groups, supporting economic diversification, providing information and improving coordination across levels of government and partnerships between private and public sectors.
3. A first step in adaptation is to reduce vulnerability to current climate variability.

Principles for Effective Adaptation

4. Recognition of diverse interests, circumstances and contexts can benefit decision-making.
5. The decision support is most effective when it is sensitive to context and diversity of decision types, processes and constituencies.
6. Existing and emerging economic instruments can foster adaptation by providing incentives for anticipating and reducing impacts.

Principles for Effective Adaptation

7. Common constraints that impede adaptation include limited financial and human resources, limited integration of governance, uncertainties about projected impacts etc. Underestimating the complexity of adaptation as a social process can create unrealistic expectations of outcomes.
8. Poor planning, emphasizing short term outcomes or failing to anticipate consequences can result in maladaptation.

Principles for Effective Adaptation

9. Limited evidence indicates a gap between global adaptation needs and the funds available for adaptation.
10. Significant co-benefits, synergies, and tradeoffs exist between mitigation and adaptation and among different adaptation responses; interactions occur both within and across regions. Increasing efforts to mitigate and adapt to climate change imply an increasing complexity of interactions, particularly at the intersections among water, energy, land use, and biodiversity

Conclusions

- IPCC WGII has made a sober assessment of the impacts of climate change. They are significant, vary by region and country and pose important threats to our future.
- The report concludes that while impacts in the next 30 years or so are not dependent on mitigation, after that time they depend a lot on what emissions scenario we face. Adaptation options post 2050 are much more limited with high emissions

Conclusions

- On adaptation it is more optimistic for several areas. We can adapt to a significant extent if we take the right actions.
- The key is to focus on developing adaptation strategies that are inclusive, flexible, that look at the wider picture and that are based on a realistic estimate of the benefits.
- Not all regions and not all problems can be solved in this way but many can.
- For some problems we have a more difficult agenda but even for these there is some hope.



**Hercules Arrives
Nazaré, Portugal
January 6, 2014
Photo by André Botelho**

THANK YOU