National Climate Change Adaptation Policy

Framework, Policy, Strategy and Action Plan

Andrea M.Bassi, Ph.D.
Founder and CEO, KnowlEdge Srl

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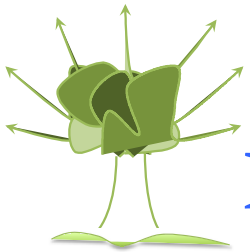

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Contents

1. Introduction

This work requires the creation and elaboration of the following knowledge:

- An analysis of current and projected impacts of climate change for time horizon of 2012-2100, also assessing and quantifying the impacts of climate change on key sectors in monetary terms to better inform decision making;
- To identify key gaps and needs for mainstreaming climate change adaptation in key sectors;
- To propose and recommend climate change adaptation policy options/measures for the key sectors under consideration under AAP in light of socio-economic evidence produced.

1. Introduction

Stock taking report: this study serves to review historical climate change impacts in Mauritius, as well as existing legislation. Knowledge on future climate events is also considered.

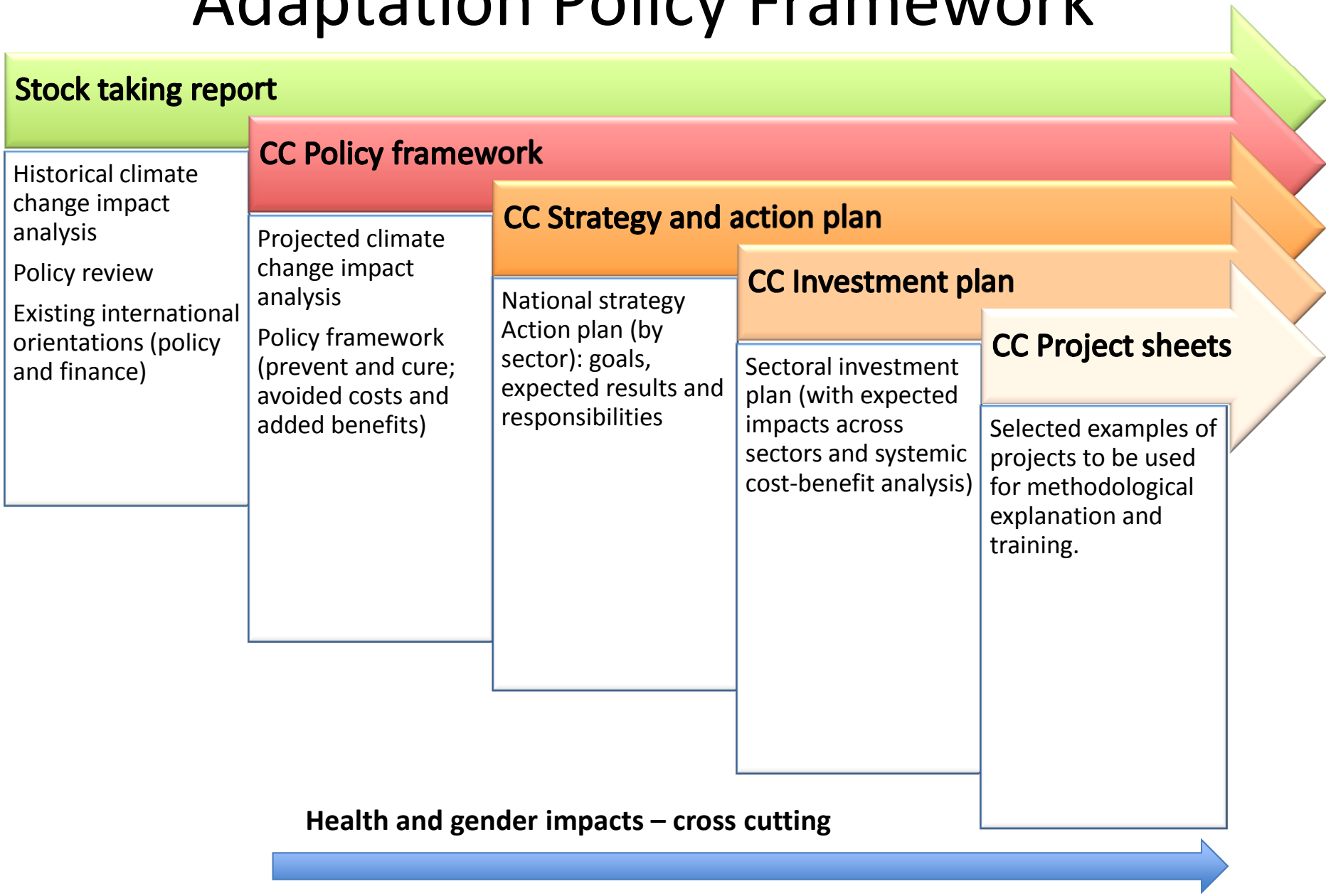
Climate impacts:

- Water: lowered water availability
- Agriculture: reduced yields
- Fisheries: lowered productivity and availability
- Tourism: need for coastal adaptation

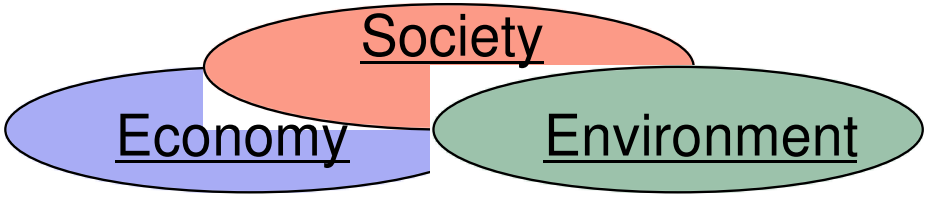
2. Integrated Climate Change Adaptation Policy Framework

- **Climate Change Adaptation Policy Framework**: provides the framework of analysis for creating a climate change adaptation policy.
- **Climate Change Adaptation Policy**: identifies and lists the key policy principles and responsibilities from a national and sectoral perspective. Time frame: 20 years (2030).
- **Climate Change Adaptation Strategy and Action Plan**: defines the main elements of a climate change adaptation strategy at the national level. Time frame: 10 years (2020).
- **Climate Change Adaptation Investment Plan**: provides a cross-sectoral cost benefit analysis of the most relevant investment options that would be triggered by the strategy and action plan. Time frame: 3 years (2015).
- **Climate Change Adaptation Project Sheets**: the project briefs provide more detailed information on the cross-sectoral pros and cons of selected sectoral interventions. Time frame: 3 years (2015).

2. Integrated Climate Change Adaptation Policy Framework



2. Integrated Climate Change Adaptation Policy Framework

Policies	**Investment** (e.g., capital investment in RE and EE for extra capacity and retrofits)	**Mandates and targets** (e.g., RE and EE standards, deforestation and reforestation targets)	**Subsidies** (e.g., feed in tariffs for energy, tax rebates, payments for ecosystem services)
Scenarios	Climate change, energy prices, conflicts, peak oil, world economic growth, etc.		
Structure **Science**			
	Social sectors	**Economic sectors**	**Environmental sectors**
	Population Education Infrastructure *(e.g. transport)* Employment Income distribution	Production (GDP) Technology Households accounts Government accounts Investment *(public and private)* Balance and financing Government debt Balance of payment International trade	Land allocation and use Water demand and supply Energy demand and supply *(by sector and energy source)* GHG and other emissions *(sources and sinks)* Footprint

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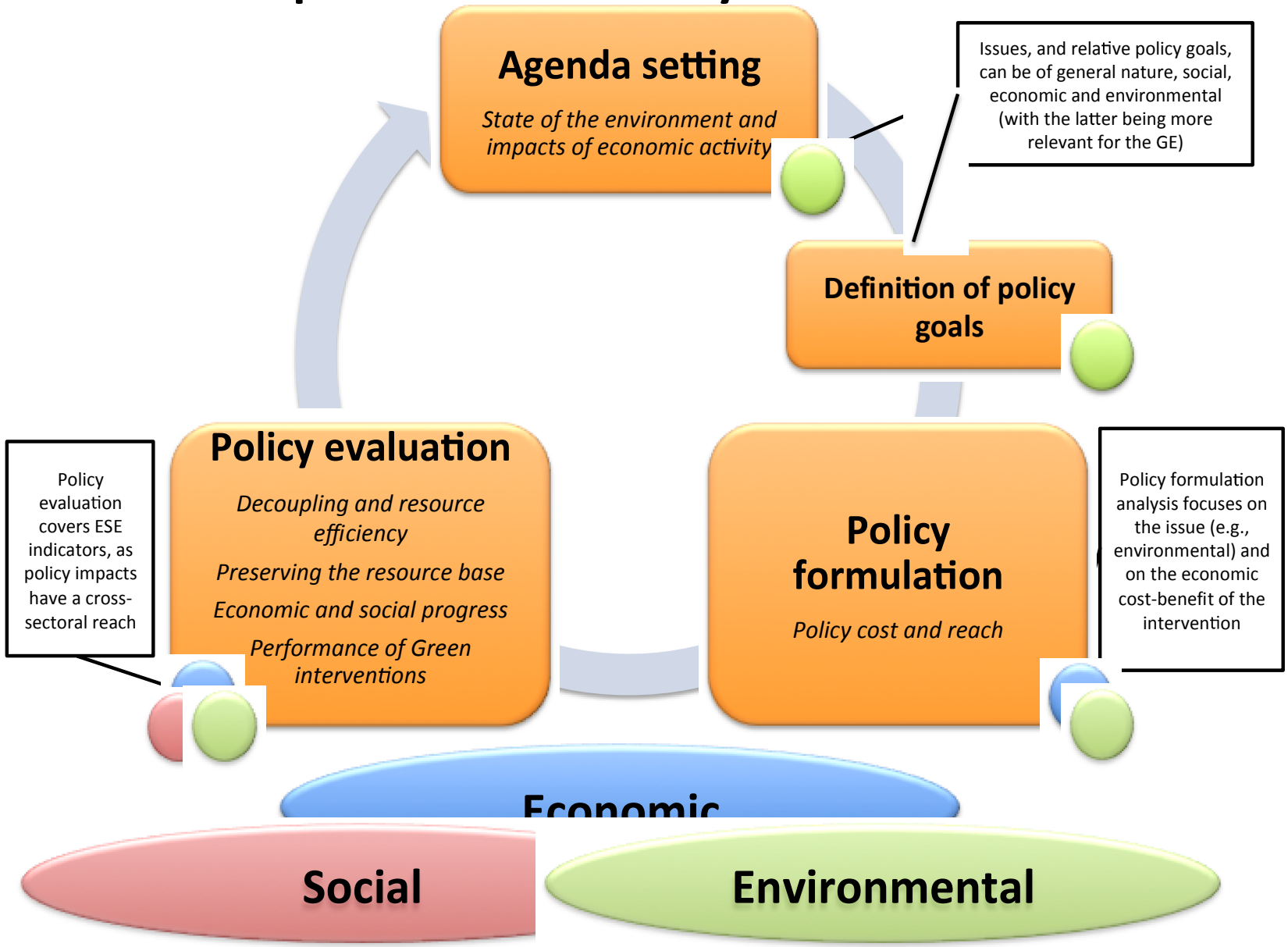
2. Integrated Climate Change Adaptation Policy Framework



3. National Climate Change Adaptation Policy

The objectives of the climate change adaptation policy are to:

- **Foster the development of strategies, plans and processes to:**
  - Avoid, minimise or adapt to the negative impacts of climate change on key assets of Mauritius, namely agriculture, water, fisheries and ecosystems.
  - Avoid or reduce damage to human settlements and infrastructure caused by climate change.
  - To build capacity to understand, analyse and react in a timely manner in the wake of future climate change impacts within the ROM.
- **Integrate and mainstream climate change adaptation into core development policies, strategies and plans of the ROM.**

3. National Climate Change Adaptation Policy (2a)

Policy Principles:

- **Concerning the definition and introduction of long term planning mechanisms:**
  - Ensure that adequate planning (physical, socio-economic etc.) is undertaken on a continual basis to address the impacts of climate change. Such planning should be undertaken, in the wider context of sustainable development, and using an integrated, cross-sectoral and trans-disciplinary approach (i.e. systems approach).

3. National Climate Change Adaptation Policy (2b)

Policy Principles:

- **Concerning improving climate resilience:**
  - Recognizing that the resilience of the natural environment is key to coping with climate change, do all possible to enhance and maintain environmental quality;
  - Recognizing that economic resilience is key to coping with climate change, do all possible to promote the development of a strong and diversified economy;
  - Create an enabling environment for the adoption of appropriate technologies and practices.

3. National Climate Change Adaptation Policy (2c)

Policy Principles:

- **Concerning financing options to meet national adaptation financial needs:**
  - Procure and allocate financial and other resources, as appropriate and feasible, to ensure that climate change is addressed in the manner required.

3. National Climate Change Adaptation Policy (2d)

Policy Principles:

- **Concerning strengthening capacities and institutional frameworks:**
  - Endeavour, to the extent possible and necessary, to develop national human and institutional capacity in all aspects of climate change research, response, planning, etc.;
  - Collaborate as appropriate and feasible, with other regional and international states and organisations which pursue confluent agendas in climate change;
  - Endeavour to ensure that society, at all levels and in all sectors is adequately informed on climate change and its implications for the nation and the role that it must play in this respect;
  - Endeavour to obtain, to the extent feasible, the involvement and participation of all stakeholders at the national level in addressing issues related to climate change.

3. National Climate Change Adaptation Policy (3a)

Sectoral Policy Principles: Water

- Develop a long-term national water management plan which incorporates and addresses climate change concerns including catchment and watershed protection and saltwater intrusion;
- Incorporate the national adaptation strategy for the water sector into the land use planning and management processes;
- Promote the strengthening of national water management agencies to ensure the sound management of water resources;
- Assess and address needs for water storage and distribution infrastructure to ensure water availability during drought periods;
- Undertake measures to increase the resilience of aquifers and rivers to maximise water availability and reduce degradation of water quality;
- Promote initiatives to identify and, where necessary, exploit non-traditional water resources such as sea-water through desalination.

3. National Climate Change Adaptation Policy (3b)

Sectoral Policy Principles: Agriculture

- Develop a national adaptation strategy for the agriculture sector, as part of the national climate change adaptation strategy, to address impacts over the short, medium and long term;
- Include adaptation policies into the national policy formulation process;
- Formulate and implement any other such strategies and measures which may help to ensure food security and sustainable food production;
- Endeavour to transform the food crisis into an opportunity for farmers and to build resilience in order to reduce the country's food dependency on imports.
- Ensure the maintenance of a Food Security Fund to sustain the implementation of adaptation measures.

3. National Climate Change Adaptation Policy (3c)

Sectoral Policy Principles: Fisheries

- Promote and facilitate the undertaking of ongoing multi-disciplinary assessment of coastal and marine ecosystems, to ensure that needs of marine life are understood and taken into account for fisheries and coastal zone management;
- Strengthen fisheries governance at national and regional levels;
- Ensure the continuation, expansion and strengthening of capacity for artisanal fishermen;
- Identify and promote alternative fishery and resource use activities (e.g. aquaculture) where impacts on ecosystems and natural resources preclude the continuation of traditional activities;
- Endeavour to create and maintain appropriate infrastructure for storm forecasting, signalling systems and safe refuges for dealing with rising sea level and increased storminess.

3. National Climate Change Adaptation Policy (3d)

Sectoral Policy Principles: Tourism

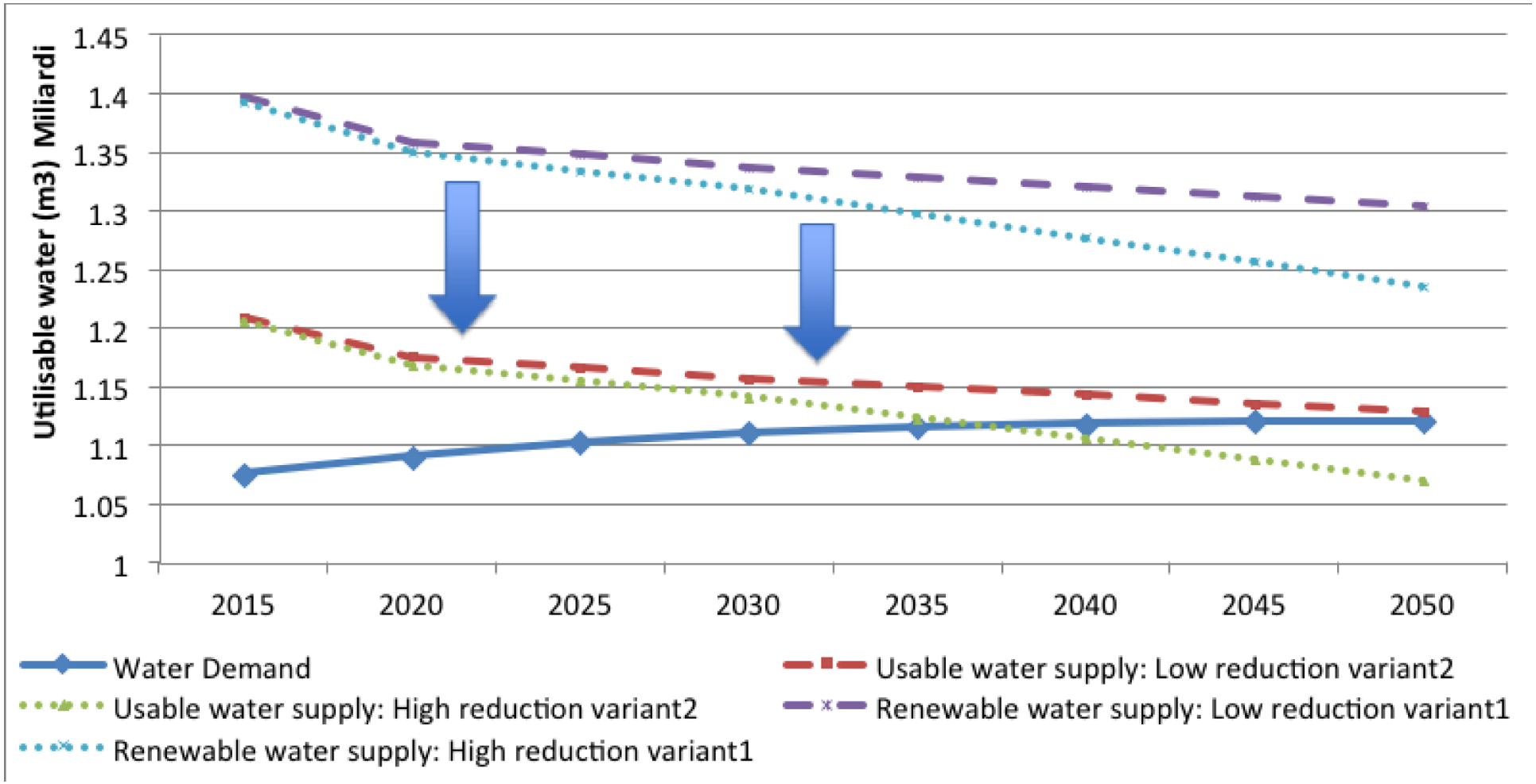
- Ensure that appropriate physical planning guideline such as coastal setbacks are enforced for new tourism developments;
- Undertake measures to incorporate tourism development with natural resources management such as Integrated Coastal Zone Management (ICZM) to preserve ecosystem services;
- Facilitate the protection and rehabilitation of tourism resources, including natural resources such as beaches, and man-made resources (infrastructure);
- Work with stakeholders in the tourism sector to develop a strategic plan that incorporates climate change considerations and appropriate measures such as water conservation programmes as well as general safety and sustainability concerns.

4. Strategy and Action Plan for Climate Change Adaptation

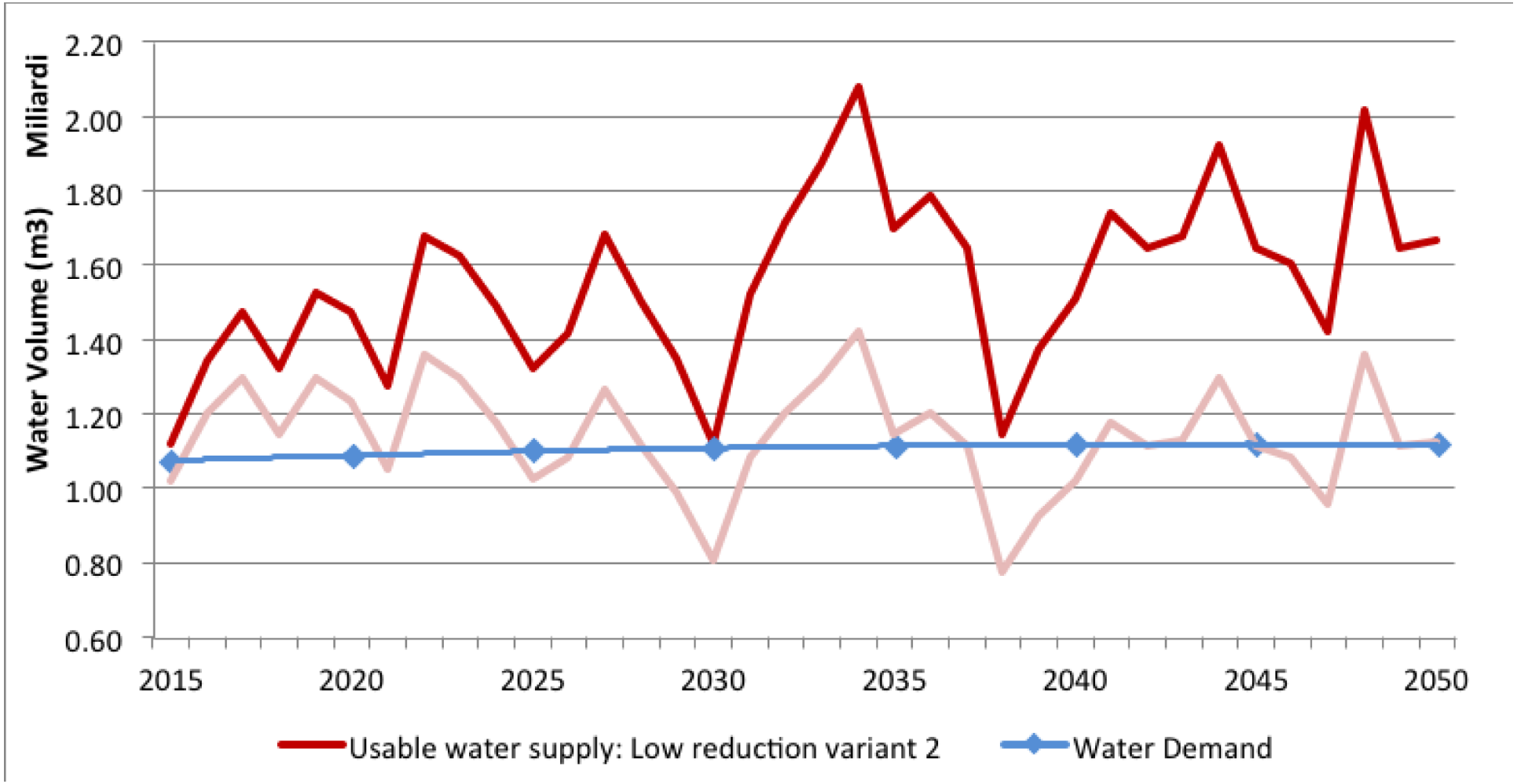
- Cross sectoral and sectoral assessments

		Additional economic costs due to climate change (million USD PPP) - yearly average		Additional persons affected/in need of emergency assistance due to climate change - yearly average		
Climate change effect	**Confidence**	**2010**	**2030**	**2010**	**2030**	**Affected groups**
Environmental Disasters						
Drought	Indicative	5	25	-	-	Arid regions, farmers
Floods & landslides	Indicative	-	-	1,500	1,500	Small children, pregnant women, elderly, river basins, small islands, mountainous communities
Storms	Speculative	25	150	500	400	Small islands, cyclone belt countries
Habitat Change						
Biodiversity	Indicative	5	20	-	-	Deforestation zones, farmers
Desertification	Indicative	-5	-40	-55,000	-150,000	Outdoor workers, farmers
Heating and cooling	Robust	1	20	-	-	Small children, elderly, pregnant women, humid tropical countries, Africa
Labour productivity	Robust	550	3,500	-	-	Humid tropical countries, outdoor occupations, subsistence farmers, pregnant women, elderly, heavily labouring workers
Sea-level rise	Robust	20	100	-	-	Small islands, low elevation coastal communities, coastal cities, farmers
Water	Speculative	-10	-65	-	-	Water intensive industries, outdoor workers, subsistence farmers
Industry Stress						
Agriculture	Indicative	25	200	-	-	Farmers, Subsistence farmers
Fisheries	Robust	5	55	-	-	Livelihoods derived from fishing, tropical countries

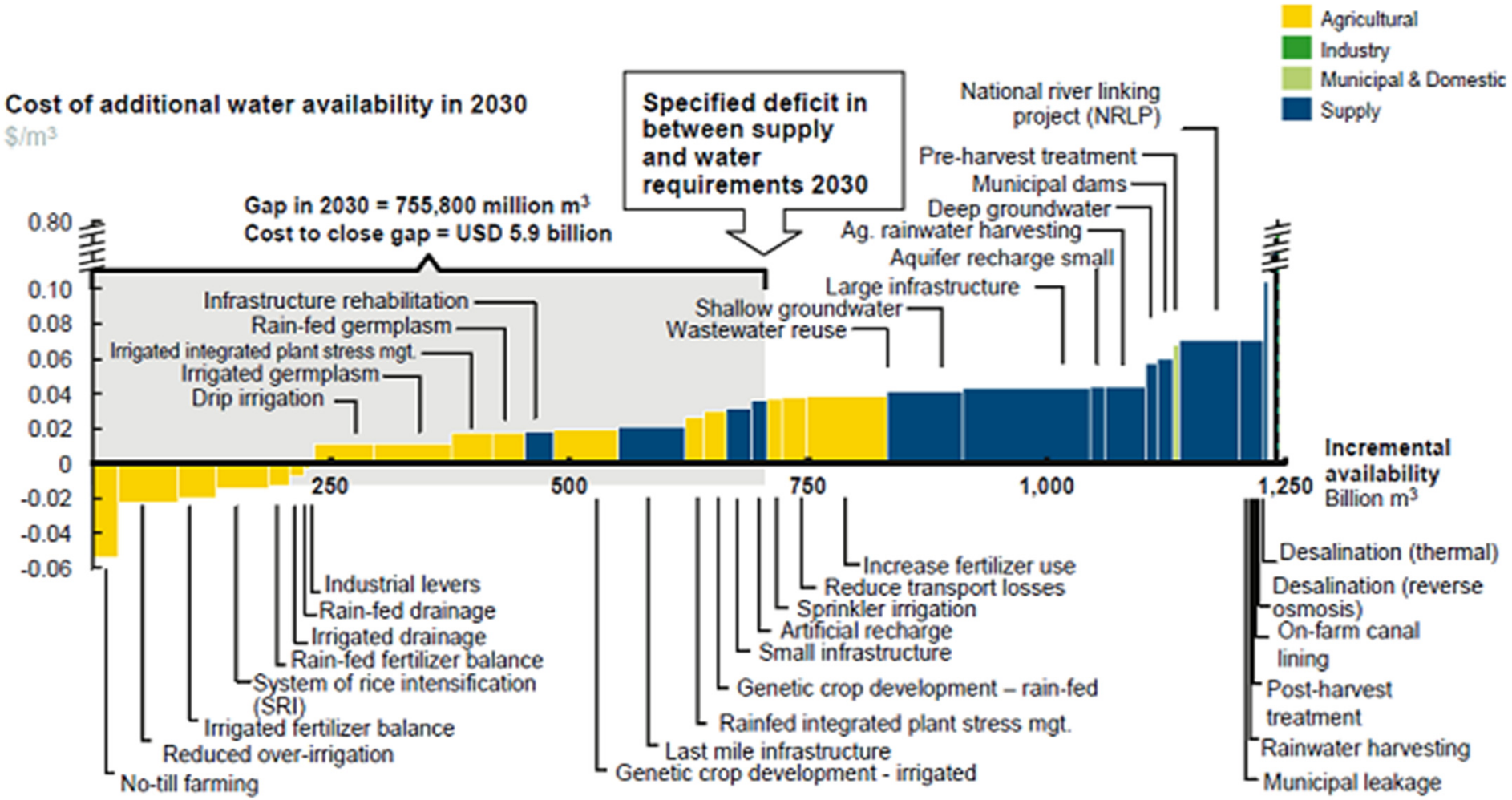
4. Strategy and Action Plan for Climate Change Adaptation (2a)



4. Strategy and Action Plan for Climate Change Adaptation (2b)



4. Strategy and Action Plan for Climate Change Adaptation (2c)



4. Strategy and Action Plan for Climate Change Adaptation (2d)

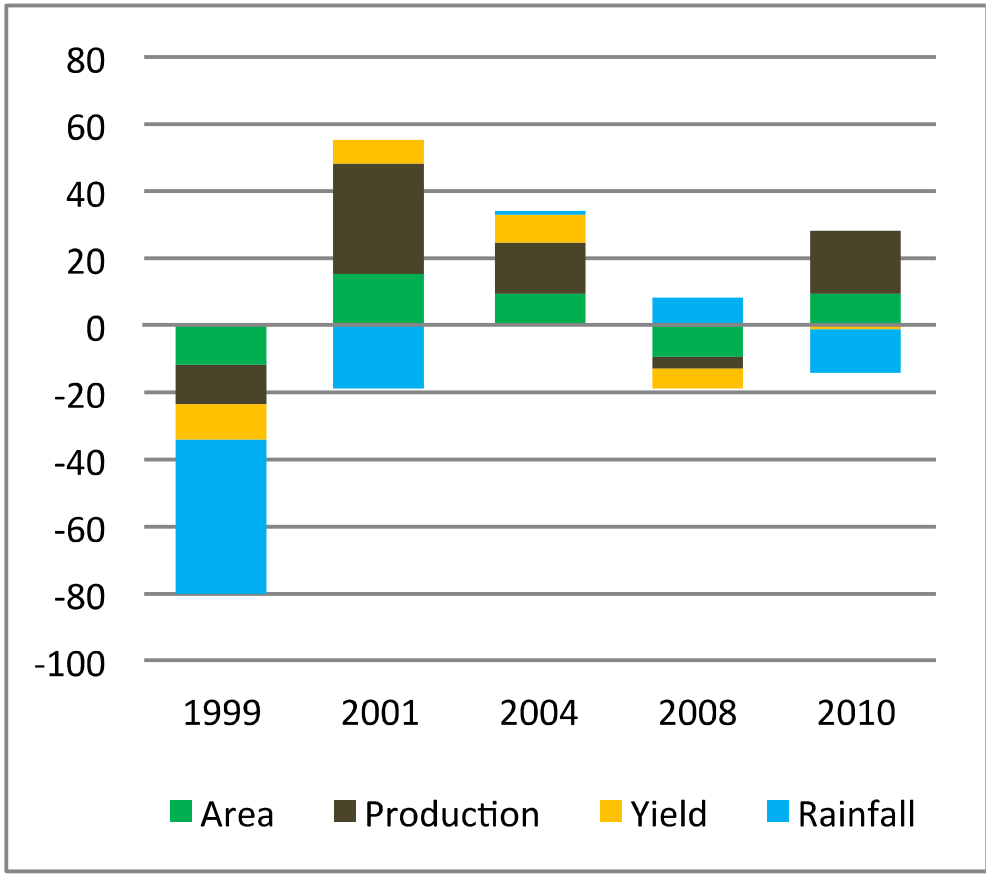
Table 1: Investment and operational costs for selected adaptation technologies in the water sector

Technology	Cost (Rs/m^3)
Stormwater harvesting	38.75
Desalination (brackish water)	33.79
Rainwater harvesting (households)	30.00
Water efficient fixtures	7.83

4. Strategy and Action Plan for Climate Change Adaptation (3a)

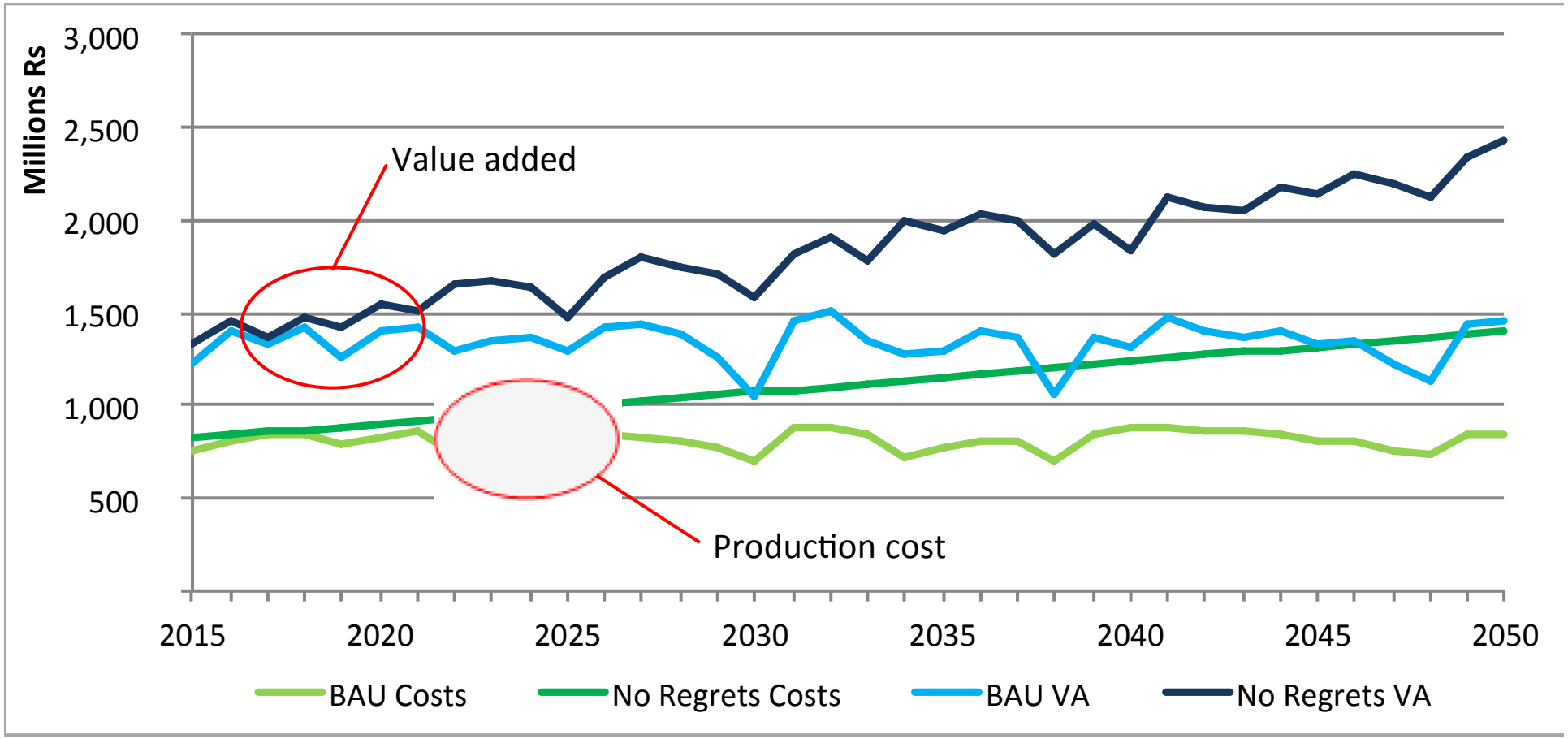
Figure 1: Rainfall, food-crops harvested area, production and yield for selected years with respect to 2005.

	Area (Ha)	Production (t)	Yield (t/Ha)	Rainfall (mm)
2005	6901	96782	12.6	2027.9
1999	6059	86083	11.2	1102.4
2001	7918	129119	13.4	1653.4
2004	7553	111633	13.6	2054.6
2008	6266	93021	11.8	2192.1
2010	7570	114844	12.4	1753.3
% Change relative to 2005				
1999	-12.2	-11.1	-11	-45.6
2001	14.7	33.4	6.9	-18.5
2004	9.4	15.3	8.1	1.3
2008	-9.2	-3.9	-5.9	8.1
2010	9.7	18.7	-1	-13.5



4. Strategy and Action Plan for Climate Change Adaptation (3b)

Figure 1: Value added and costs under BAU, No-regrets and Best-case scenarios



4. Strategy and Action Plan for Climate Change Adaptation (4)

Sectoral strategy and action plan:

- Based on the sectoral policy principles.
- Strategies are coupled with specific actions, for water, agriculture, fisheries and tourism.
- DRR is also considered, and specific recommendations are added for Rodrigues when information is available.

5. Integrated Policymaking for Climate Change Adaptation

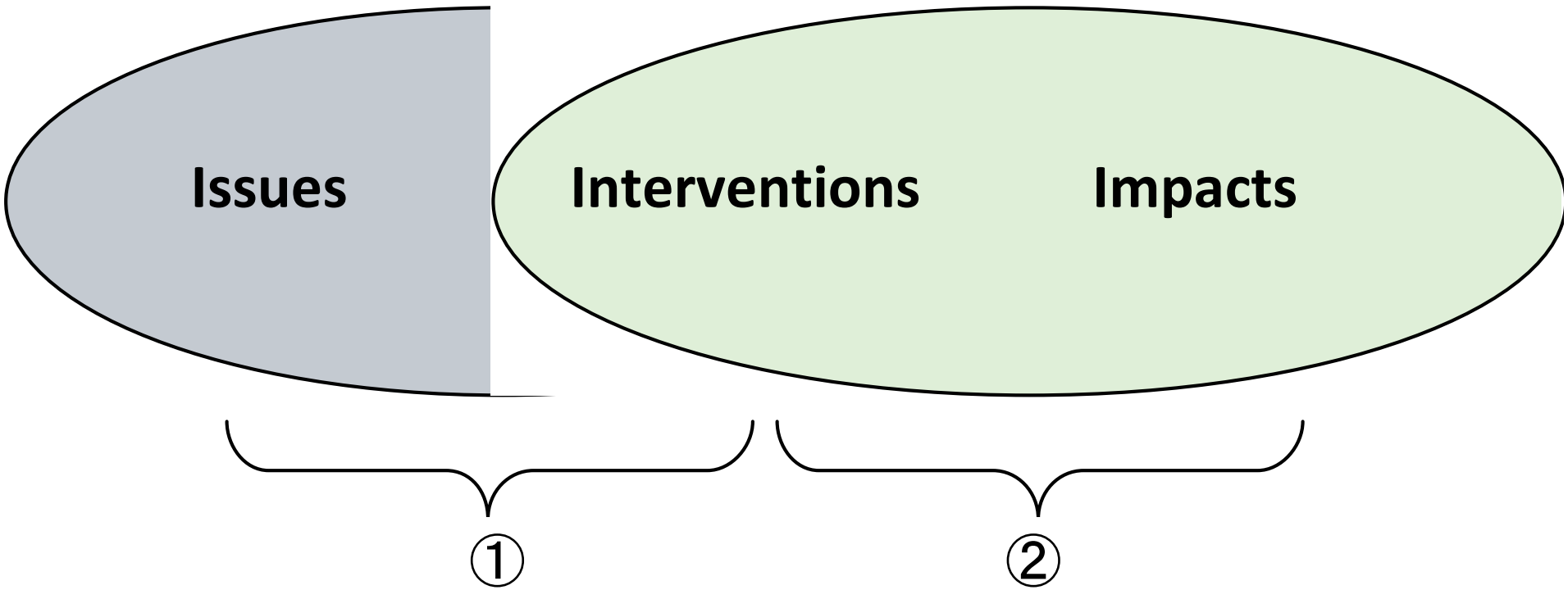
- Review of existing policy efforts, with the identification of gaps and definition of needs and responsibilities for the implementation of the strategy and action plan presented in earlier sections.

6. Indicators for agenda setting, policy formulation and evaluation

Framework proposed:

- Agenda setting indicators
- Policy formulation indicators
  - Policy objectives indicators
  - Intervention options and cost indicators
  - Policy formulation indicators
- Policy Monitoring and Evaluation indicators
  - Green, investment, jobs, and sectors
  - Decoupling impacts and resource efficiency
  - Indicators of progress and well-being

6. Indicators for agenda setting, policy formulation and evaluation (2)



6. Indicators for agenda setting, policy formulation and evaluation (3)

Water

Issues	Interventions	Indicator subset 1	Impacts	Indicator subset 2
Anticipated water scarcity	Expand water storage and conjunctive management of surface and groundwater resources	Renewable internal freshwater resources per capita (m3)	Increased capacity of storage system and increased buffer of resources	Importance of national expenditure for water supply and sanitation
		Annual freshwater withdrawals, total and by sector (% of internal resources)		Change in hydropower productivity
		Groundwater depletion		
Water use inefficiency	Aggressively increase water use efficiency	Water Footprint (FT) for domestic consumption, considering the regionally varying water stress by adequate contextualization	Reduced waste of water resources	Water productivity, total (constant 2000 US$ per m3 of total freshwater withdrawal)
			All of the above	Percentage of population using improved sanitation facilities
Water contamination, ecosystem degradation	Review of water management laws, regarding contaminants release in the environment	Organic water pollutant (BOD) emissions (kg per day)	Improved ecosystems health and productivity	Change in aquifers quality status (quality/salinity)
	Protection of wetlands	Inland and coastal wetland ecosystem condition	Improved aquifer quality, protection from storm damage	Value of land and infrastructure protected by wetlands

7. Investment Plan for Climate Change Adaptation

- Cross sectoral investments:
  - Based on the DRR report, these investments affect several sectors simultaneously. They include:
    - Implement a sound (spatial) data infrastructure
    - Preserve a healthy natural environment
    - Flood management plans
    - Coastline management plans for inundation
- Sectoral investments:
  - Based on the TNA and CG reports, for water, agriculture and fisheries.
  - Each investment is linked to a specific action in the strategy/action plan.

7. Investment Plan for Climate Change Adaptation

Project / Programme	Duration	Cost (MUR)	Action Plan items addressed
Cross-sectoral investments			
Preserve healthy natural environment	2013-2015	45,000,000	W4.2, A4.1, A4.3, F2.1, F4.1, F4.2, T2.2, T2.3
Coastal management plans for inundation	2013-2015	60,900,000	W4.2, W7.1, A6.1, A6.2, F2.3, T1.1
Sound spatial data Infrastructure	2013-2015	270,000,000	W4.1, W6.1, W7.1, A6.2, F4.2, T2.3
Flood management plans	2013-2015	937,000,000	W1.2, W3.1, W4.1, W5.4, A1.3, F2.3

	Duration	Cost (MUR)	AP items addressed
	1 YEAR	< 1 million	4 and above
	1 – 3 YEARS	1 – 10 million	3
	3 – 5 YEARS	10 – 100 million	2
	> 5 YEARS	> 1000 million	1

7. Investment Plan for Climate Change Adaptation

Water			
Hydrological models	TNA	574,200	W1.1
Rooftop rainwater harvesting	TNA	2,000,000	W5.2
Desalination	TNA	14,000,000	W5.3
Tourism			
Climate Change Awareness	1 YEAR	1,722,600	T1.1, T1.2
Training and capacity building on climate change in the tourism sector	3 YEARS	6,172,650	T1.1, T1.2
Extreme Events Damage Control	3 YEARS	10,048,500	T1.1, T1.2
Coral Reef Bleaching Reduction	5 YEARS	14,355,000	T2.2, T2.3
Water Supply Enhancement	7 YEARS	21,532,500	W5.1
Tropical Storms Damage Minimization	5 YEARS	25,839,000	T1.1, T1.2
Management of Sand Movement and Accumulation	5 YEARS	27,274,500	T1.1, T1.2
Beach Erosion Management	5 YEARS	35,887,500	T1.1, T1.2
Product Enhancement and Diversification	5 YEARS	143,550,000	T2.2

7. Investment Plan for Climate Change Adaptation

Fisheries			
Support programme 1: Fisheries Management			
Capacity building	2013/2014	2,000,000	F4.1, F4.3, F4.4
FMP prep and Implementation	5 TO 10 YEARS	12,000,000	F1.1, F1.2, F1.4
MCS & VMS vigilance	CONTINUOUS	15,000,000	F1.3, F2.3
Stock assessment & resource potential	2013/2014	20,000,000	F1.1, F4.2, F4.4
Support programme 2: Institutions Strengthening			
Stakeholder consultation	2013/2014	500,000	F4.1
Encourage aquaculture projects	2013/2015	1,500,000	F3.1, F4.1
Comprehensive training programme	2014 Onwards	2,900,000	F2.1, F4.3
Skills and equipment provision	2013/2020	50,000,000	F1.1, F1.2, F1.5
Support programme 3: Infrastructure			
Quay space adapted to SLR	2013/2020	50,000,000	F1.4
Support programme 4: Aquaculture			
Assistance to start aquaculture projects	2013/2020	20,000,000	F3.1, F3.2, F3.3
Support programme 5: Conservation of the Marine Environment			
Capacity building	2013/2014	4,000,000	F1.2, F1.6, F4.1, F4.3, F4.4
Audit of Marine resources	2013/2014	4,500,000	F2.1, F4.1, F4.2
Revisit legislation & regulations	2013/2014	6,000,000	F1.6, F2.4
Promote ecotourism	2013/2014	9,000,000	F4.1, F4.2

7. Investment Plan for Climate Change Adaptation

Agriculture			
Pest and disease diagnosis service	TNA	912,500	A2.2
Climate Change Awareness	1 YEAR	9,388,170	A2.3, A5.1, A6.2
Soil & Water conservation	1 YEAR	10,995,930	A1.1, A1.3, A3.2, A4.3
Forest Development Plan	3 YEARS	26,700,300	A3.2
IPM Technologies	TNA	28,564,000	A2.1
Food/crop production and security	5 YEARS	33,303,600	A4.2, A4.3
Research and Technology Development	3 YEARS	34,164,900	A4.2, A4.3, A6.1
Training and capacity building on climate change in the Agriculture sector	3 YEARS	49,094,100	A2.3, A3.2, A4.2, A4.3, A5.1, A6.2
Micro irrigation	TNA	187,125,000	A1.2, W2.1, W2.2

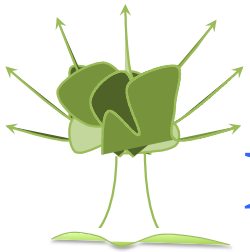
8. Selected Project Prospects

WATER SAMPLE PROJECT SHEET: Rooftop rainwater harvesting	
Project description The collection of rainwater by using rooftops as catchment areas can help reduce the use of treated water for secondary purposes, thus preserving water resources destined for primary purposes (e.g. drinking water).	
Logical Framework	
Goals i. Conservation of water resources ii. Raising awareness of the need to conserve water	**Objectives** i. At least 5 enterprises should be able to install rainwater harvesting systems in the first year of the project
Inputs i. Source or offer rainwater collection systems suitable for residential, commercial and industrial buildings. ii. Demonstrate the effectiveness of the system iii. Promote the commercialisation of the technology	**Outputs** i. Small scale enterprises should offer the systems and installation service ii. Awareness of the national benefit is raised
Estimated costs MUR 2,000,000 – for installations only	
Proposed timeframe 2 YEARS (primarily to stimulate market uptake)	**Executive bodies** Ministry of Energy and Public Utilities
Cost-benefit analysis Potential volume that can be collected = 62.5Mm^3 per year as compared with the total annual potable water harnessed for use which is 212 Mm^3 per year.	**Risks** • Reluctance to retrofitting existing water systems
Experts required	
Profile Local expertise in water systems usage and dissemination.	**Key tasks** • Identify critical areas for, and facilitate participatory workshops • Identify adequate media to reach the different targeted groups

Thank you!

For more information you can find me at:

andrea.bassi@ke-srl.com



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