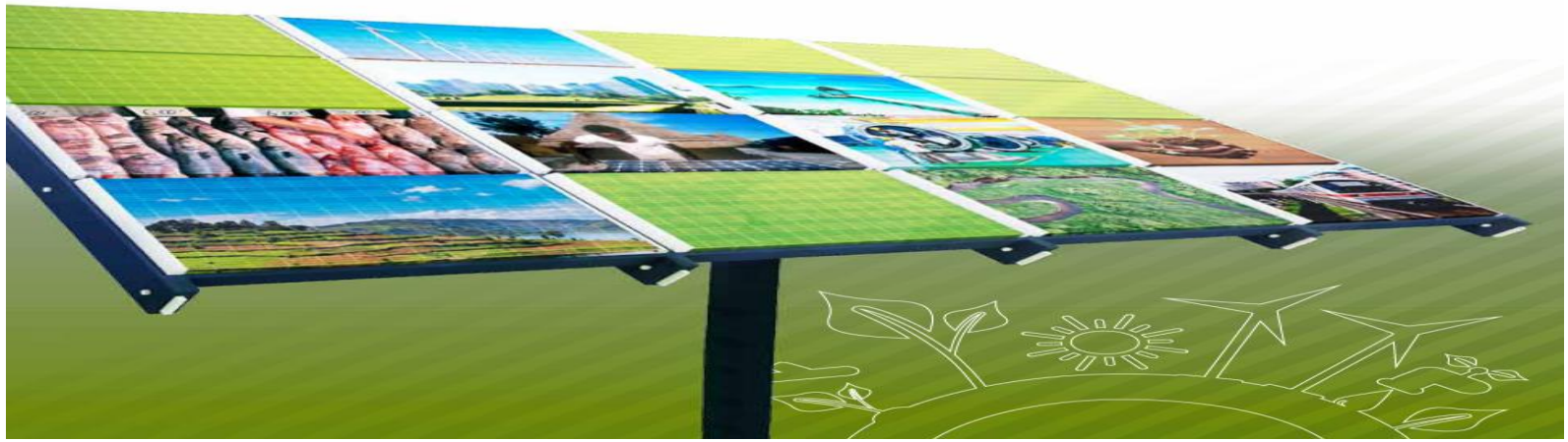
Towards a GREEN economy

Overview of the Modeling Results



Mauritius - 30 June 2014

KnowlEdge Srl

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

Towards a GREEN economy

Overview

1. Sectors covered
2. Model used (M-GEM)
3. Scenarios (BAU vs GE)
4. Results
    1. Macroeconomic results
    2. Sectoral results
5. Conclusions

1. Sectors covered

Four main sectors have been analyzed:

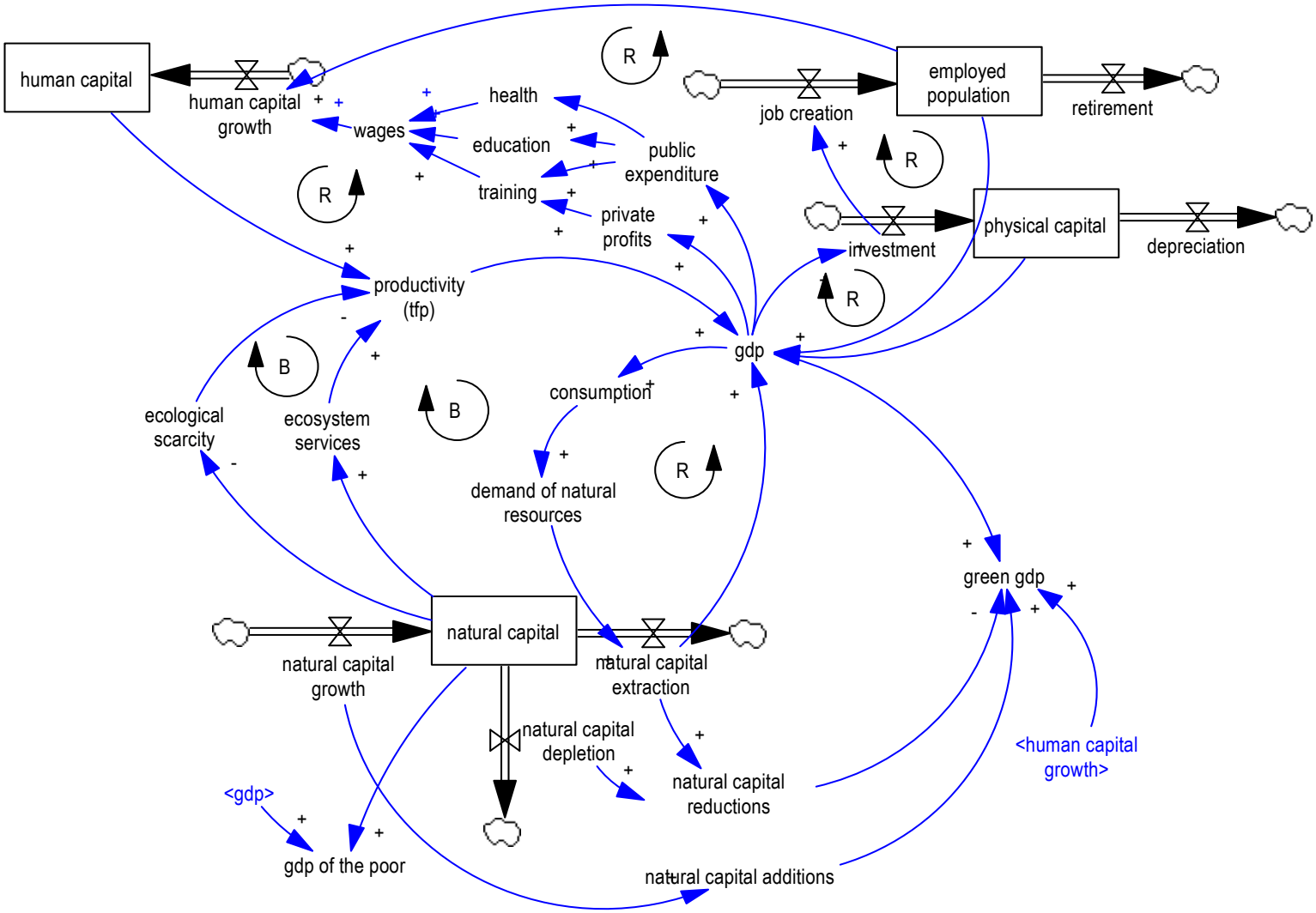
- Agriculture
- Waste
- Energy (including industry and tourism)
- Water (including industry and tourism)

Macroeconomic results were also estimated (e.g. for GDP and emissions)

2. Model used (M-GEM)

- *Industrial sectors:* embedded in the conventional (carbon-intensive) structure that has contributed to modern life styles.
  - Such sectors have to aim for a transition to energy efficient technologies and resource efficiency to prosper while lowering costs and reducing their impact on the environment.
- *Natural capital-based sectors:* heavily relying on the availability of natural resources (stocks and flows).
  - These sectors can thrive and be sustainable only if resource extraction is managed so as to maintain the ecosystem balance.

2. Model used (M-GEM)



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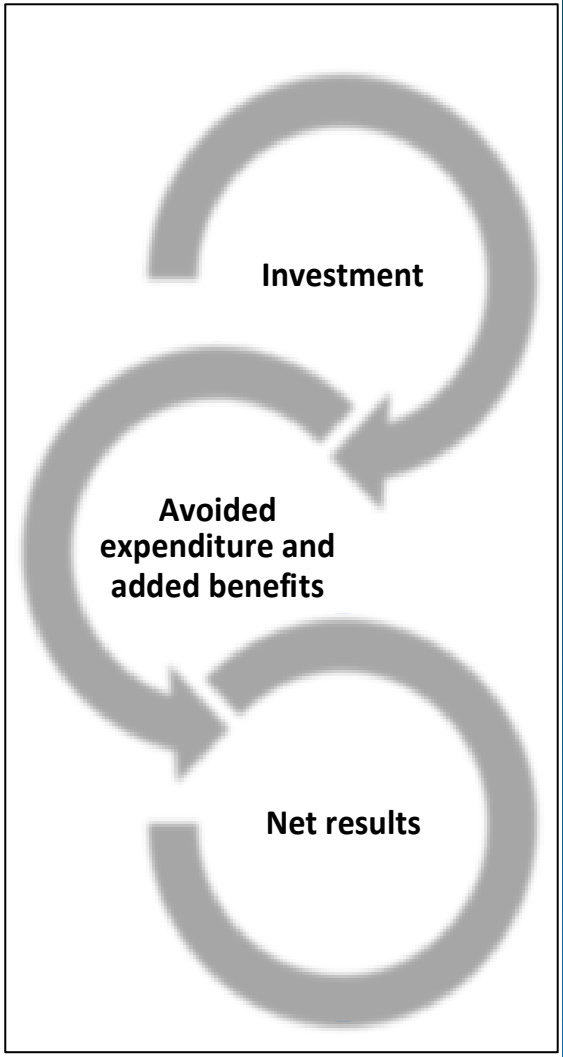
2. Model used (M-GEM)

The model simulates scenarios of policy and/or investment and estimated outcomes related to:

- *Investment required*
- *Avoided expenditure* *
- *Added benefits* *

And overall *Net Results* (or outcomes of policy implementation).

* Estimated across social, economic and environmental indicators



3. Scenarios (BAU vs. GE)

Sector	GE interventions
Agriculture	• Increase **self sufficiency** levels in strategic commodities targeted under the Food Security Fund from 56% in 2012 to 90% in 2015. • 10% agriculture arable land is converted to **ecological agriculture** (organic fertilizers and certifications) by 2025.
Energy	• Increase **renewable energy penetration** up to 35% by 2030 • Increase **energy efficiency** by 10% in 2020 and 20% in 2030.
Industry	• Increase **energy efficiency** in manufacturing increased by 10 % by 2020 and by 20% by 2030, relative to 2010. • Increase **water efficiency** in manufacturing by 20% by 2030.
Tourism	• Increase **energy efficiency** in tourism increased by 10 % by 2020 and by 20% by 2030, relative to 2010. • Increase **water efficiency** in tourism by 20% by 2030.
Waste	• Increase **recycling** from 12% in 2012 to 50% by 2025.
Water	• Increase economy-wide **water use efficiency** by 20% by 2030

4. Results (macroeconomic)

- The GE scenario requires a higher amount of investment relative to the BAU case in the sectors analyzed (approximately 0.9% of GDP per year between 2014 and 2035).
- On the other hand, these should not be considered to be additional (i.e. on top and above BAU).
  - It is estimated that GE investments will generate annual savings in the range of **3% of GDP**, which will be allocated to consumption, savings and partly also to investment.

4. Results (macroeconomic)

- As a result, the green economy investments lead to better economic outcomes than a BAU investment allocation.
- Interestingly:
  - Investments will need to be ramped up first and will decline (as a share of GDP) over the medium and longer term,
  - Savings are initially small and tend to consistently increase over time.
- This shows that green economy investments are capable to deliver advantages in the medium and longer term too.

4. Results (macroeconomic)

- Green Economy investments also prove to be effective in stimulating GDP and employment.
  - GDP is projected to be about 6% higher in the GE case relative to the BAU case, by 2035.
- On the other hand, the GE investments tested in the model were not designed to maximize economic growth
  - This would ensure to avoid future costs (e.g. for the landfilling of waste and for fossil fuel imports) and using available financial resources to create a more resilient (e.g. with higher food security) and equitable economy.

4. Results (macroeconomic)

- The results of these interventions include higher water and energy productivity (lowering costs across sectors) and more environment friendly waste (e.g. increasing recycling) and agriculture (e.g. expanding sustainable agriculture) sectors.

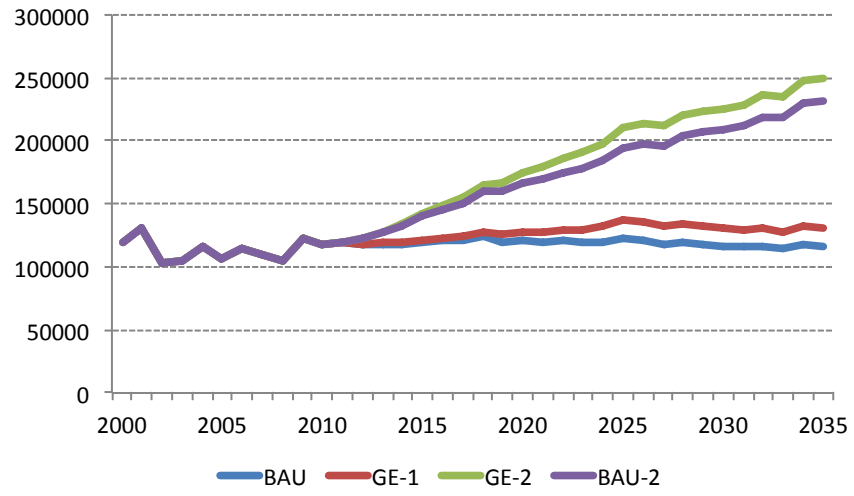
Total	**Investment**	**Rs million**	829	914	1243	8489
	Annual average (2014-2030)		2339			
	Savings		3986	5373	8918	11208
	Annual average (2014-2030)		6805			
	Costs (energy. etc.) % difference	*GE-BAU% difference*	*-8.57%*	*-10.74%*	*-15.95%*	*-18.38%*
	Annual average (2014-2030)		*-12.63%*			
	GDP differential	**Rs million**	8516	11463	18818	24778
	CO2 emissions difference	**GE-BAU% difference**	-16.07%	-16.40%	-18.97%	-19.24%
	Annual average (2014-2030)		-16.17%			

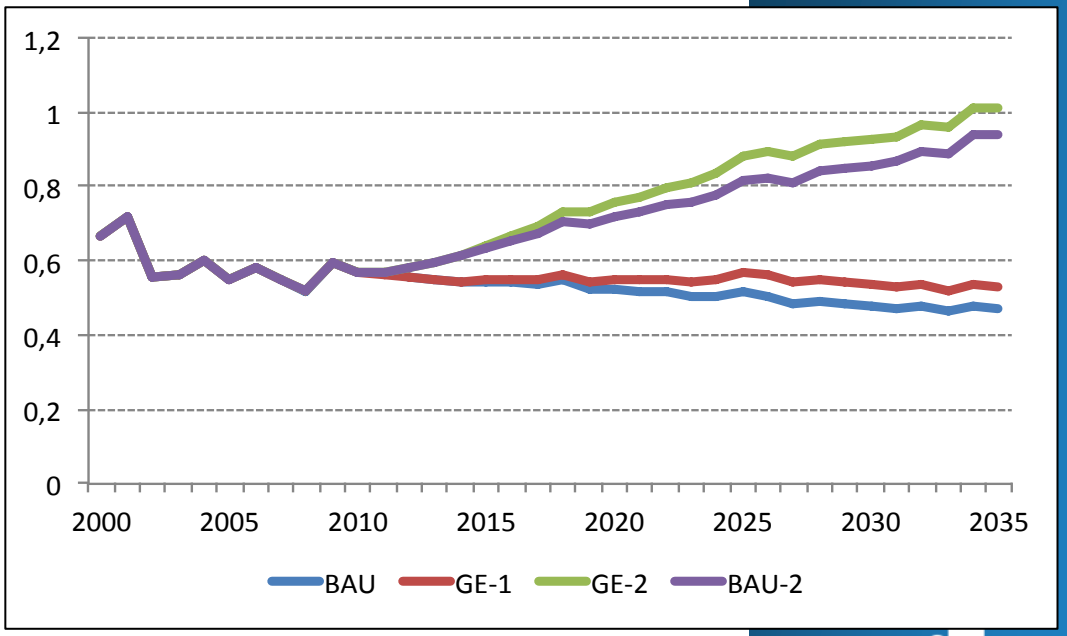
4. Results (agriculture)

- A **Business as Usual (BAU)** case, assuming the continuation of historical and present trends.
- A **Green Economy (GE)** case: increase the land area under sustainable cultivation by 10% by 2025 in order to improve agriculture sustainability and increase production, productivity and employment.
  - In particular, a key target indicated by the government would be reaching a share of crop self-sufficiency of 90% by 2025.

4. Results (agriculture)

Food crop production and self sufficiency
(2 scenarios – 10% land target and 90% self sufficiency goal)





Sector	Category	Unit	2017	2020	2025	2030
Agriculture	**Investment**	Rs million	6.37	6.82	7.43	1.49
	Annual average (2014-2030)		5.20			
	Additional value added		228	453	828	902
	Annual average (2014-2030)		558.24			
	Value added % difference	*GE-BAU % difference*	*5.52%*	*10.07%*	*16.49%*	*16.54%*
	Annual average (2014-2030)		*11.34%*			

4. Results (energy)

- A **Business as Usual (BAU)** case, which relies on the assumption that current trends will continue.
- A **Green Economy (GE)** scenario that simulates additional investments for expanding renewable energy capacity and increasing the share of renewable energy in the energy mix.
  - The objective under the GE scenario is to increase renewable energy penetration up to 35% by 2025.
  - Energy efficiency improvements are simulated in residential, industrial and domestic sectors (10% by 2020 and 20% by 2030).

4. Results (energy)

- As result of efficiency improvements, total power demand under a green economy would be 6.9% lower than BAU in 2020, and 12.7% lower in 2030.
- This is smaller than the target improvement in energy efficiency due to the growth of population and GDP (*rebound effect*).

Energy	**Investment**	**Rs million**	254	248	423	7656
	Annual average (2014-2030)		1636			
	Savings		3132	3891	6233	7463
	Annual average (2014-2030)		4829			
	Energy bill % difference	*GE-BAU% difference*	*-8.03%*	*-9.25%*	*-13.21%*	*-14.41%*
	Annual average (2014-2030)		*-20.12%*			

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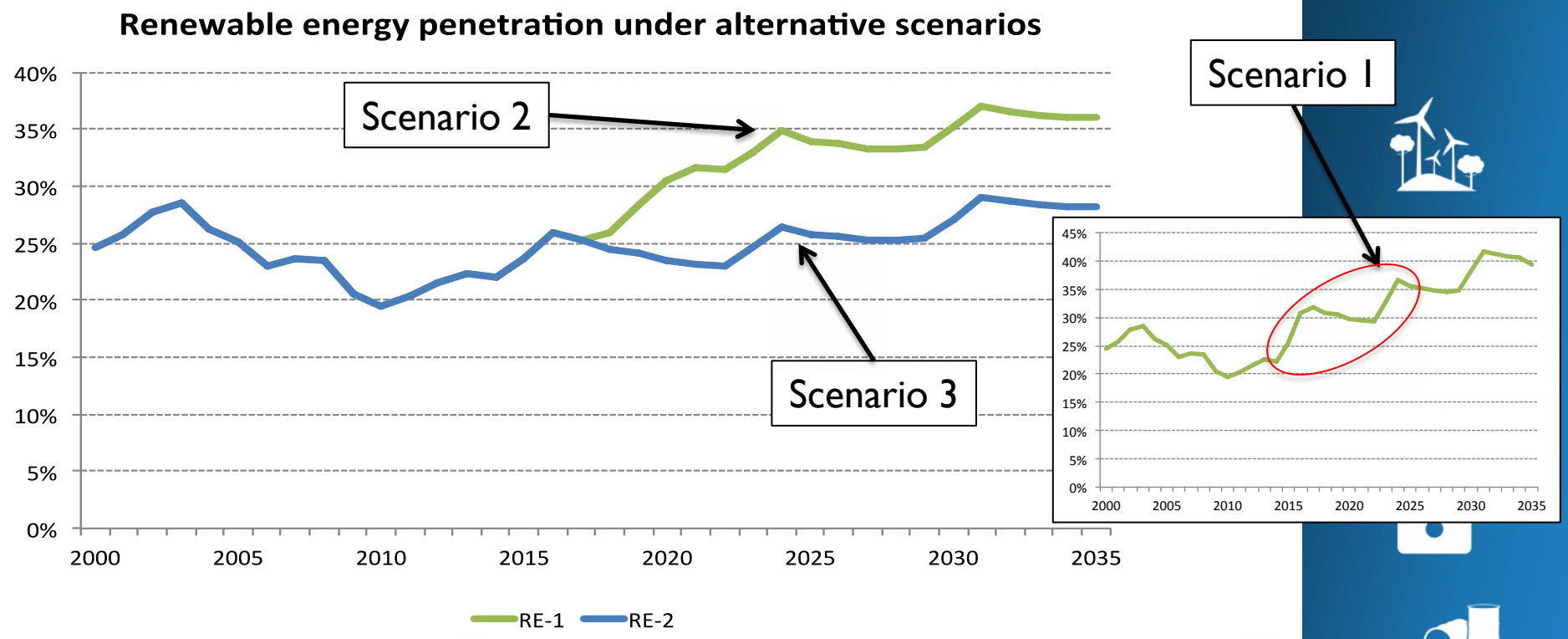
4. Results (energy)



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	Annual average (2014-2030)		*-20.12%*			

4. Results (waste)

- A **Business as Usual (BAU)** case that assumes the continuation of historical and present trends in municipal and hazardous waste generation and landfilling.
- A **Green Economy (GE)** scenario that simulates additional interventions to encourage waste recycling in the residential, commercial and industrial sectors.
  - The goal under this scenario is to achieve the target set by the Ministry of Local Authorities and Outer Islands, namely a waste recycling share of 50% by 2025.

4. Results (waste)

Smaller quantities of domestic, industrial, agricultural and commercial waste are landfilled every year, with positive impacts on the environment and health.

- The stock of landfilled waste would be 8.4% and 16.3% lower than BAU in 2025 and 2035.
- The stock of compost waste is projected to increase by 74.5% in 2025, and by more than three times in 2035, with respect to the baseline scenario.

Waste	**Investment**	**Rs million**	130.65	215.75	359.87	368.66
	Annual average (2014-2030)		250.96			
	Savings		67.67	109.7	180.56	181.46
	Annual average (2014-2030)		126.02			
	Waste mgmt cost % difference	*GE-BAU% difference*	*-16.65%*	*-26.64%*	*-43.25%*	*-43.25%*
	Annual average (2014-2030)		*-30.35%*			
	Additional labor costs	**Rs million**	7.20	11.63	19.31	19.36
	Annual average (2014-2030)		13.43			
	Labor cost % difference	*GE-BAU% difference*	*2.06%*	*3.29%*	*5.39%*	*5.38%*
	Annual average (2014-2030)		*3.77%*			

4. Results (water)

- A **Business as Usual (BAU)** case that assumes the continuation of historical and present trends.
- A **Green Economy (GE)** scenario that simulates additional interventions that (1) reduce water intensity through investments in water efficiency and (2) reduce water losses.
  - Improving water efficiency in residential, industrial and agriculture sectors by 20% by 2030.
  - Replacement of degraded water pipelines across the country: 1,040 km of pipelines are replaced between 2014 and 2030, thereby reducing water losses from 50% to 25% over the indicated period.

4. Results (water)

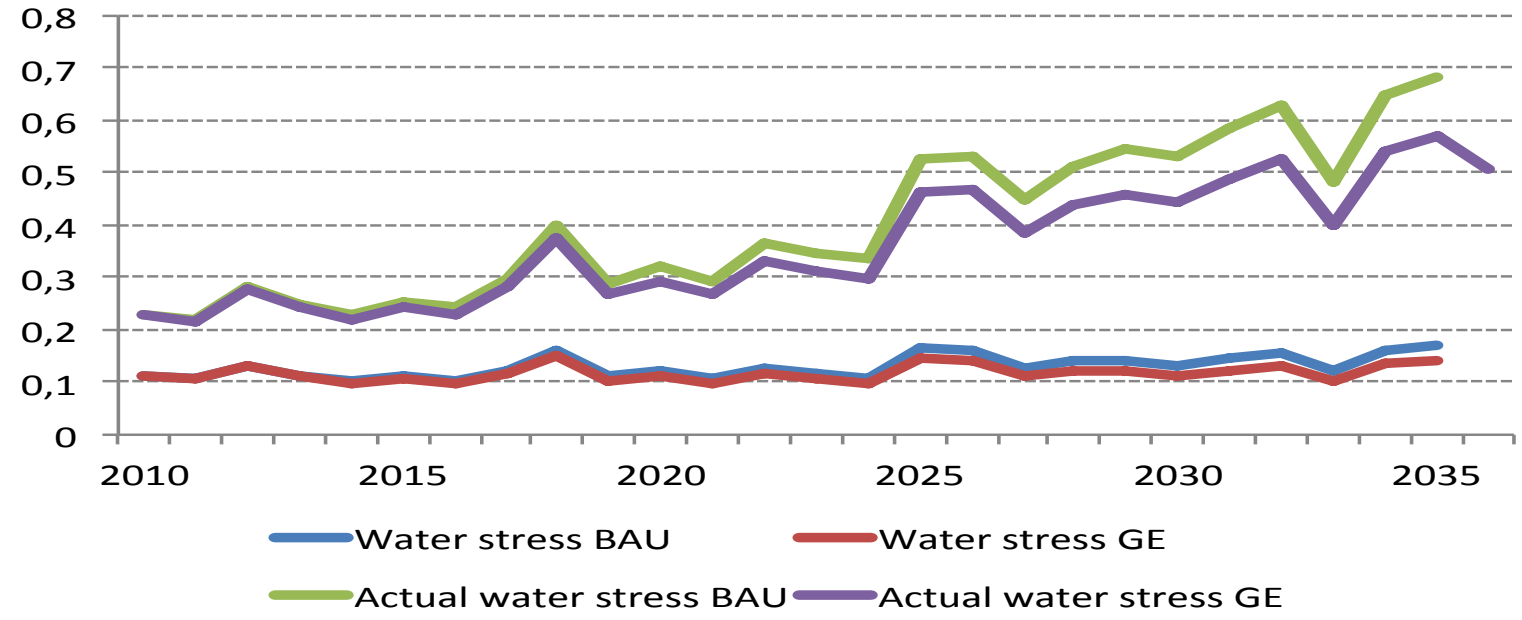
- Water efficiency under the GE scenario is projected to increase water productivity.
- In particular, total water consumption is projected to be 16.7% lower under GE compared to BAU in 2030.
- The water stress index would be 0.11 under the GE scenario, compared to 0.13 in the BAU case in 2030, meaning that 2% of total available water resources would be saved under the GE scenario in 2030.

Water	**Investment in water efficiency**	**Rs million**	9.82	15.18	24.61	34.65
	Annual average (2014-2030)		19.16			
	Savings from water efficiency		145	225	365	518
	Annual average (2014-2030)		285			
	Water bill % difference	*GE-BAU% difference*	*-5.5%*	*-8.3%*	*-12.5%*	*-17.4%*
	Annual average (2014-2030)		*-10.06%*			
	Investment in pipes replacement	**Rs million**	428	428	428	428
	Annual average (2014-2030)		428			
	Savings from pipes replacement		332	565	1098	1930
	Annual average (2014-2030)		858.8			

4. Results (water)

- Noteworthy, when adding the water lost (or unaccounted for), amounting to approximately 50% of water consumption, the water stress considerably increases.
- The replacement of old pipelines, with a 25% reduction in annual water losses by 2030, lowers the actual water stress index to 0.44, compared to 0.53 under BAU.

4. Results (water)



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5. Conclusions

- GE interventions can stimulate the economy and avoid costs (with low payback time and high returns);
- Avoided costs and added benefits should be estimated across social, economic and environmental dimensions;
- On the other hand, not all of them will immediately contribute to economic growth;
- But they all contribute to sustainability.

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Feedback is welcome!

Thank you

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andrea.bassi@ke-srl.com

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