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ADVANCING A **NEXUS APPROACH**
TO THE SUSTAINABLE MANAGEMENT
OF **WATER, SOIL AND WASTE**



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OF **WATER, SOIL AND WASTE**

Water, Soil and Waste Management Practices in Mauritius and Prospects for their Integrated Management

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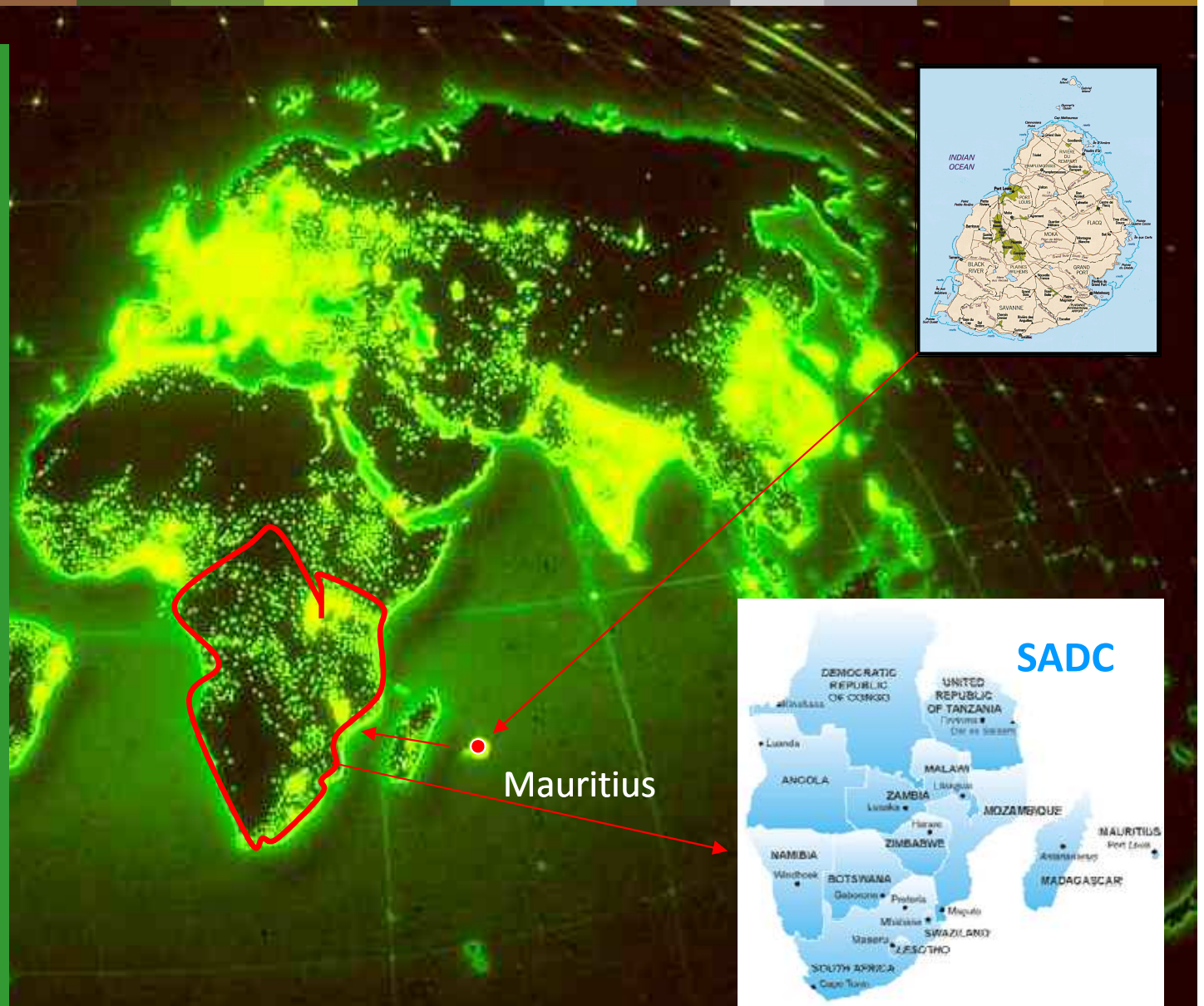
Contents of Presentation

- Mauritius on the world map
- **Key socio-economic and environmental statistics**
- Water, soil and waste management practices
- **Challenges and targets**
- Possible options for integrating the management of water, soil and waste



Mauritius on the World Map

- ESA subtropical country in the Indian Ocean
- 2040 km² land area & 2.3 M km² EEZ
- 1.3 million inhabitants: high population density of 635 people per km²
- Upper middle income developing country
- GDP growth rate of >3% over past 3 decades (4-6% before the economic crisis)
- Current GDP/capita of 8734 USD
- Economic pillars: Textile & Manufacturing, Tourism, Agriculture/Sugarcane industry, Financial Services sector, ICT, Seafood industry, Property/Healthcare/Education





Other Key Socio-Economic & Environmental Statistics (2011)

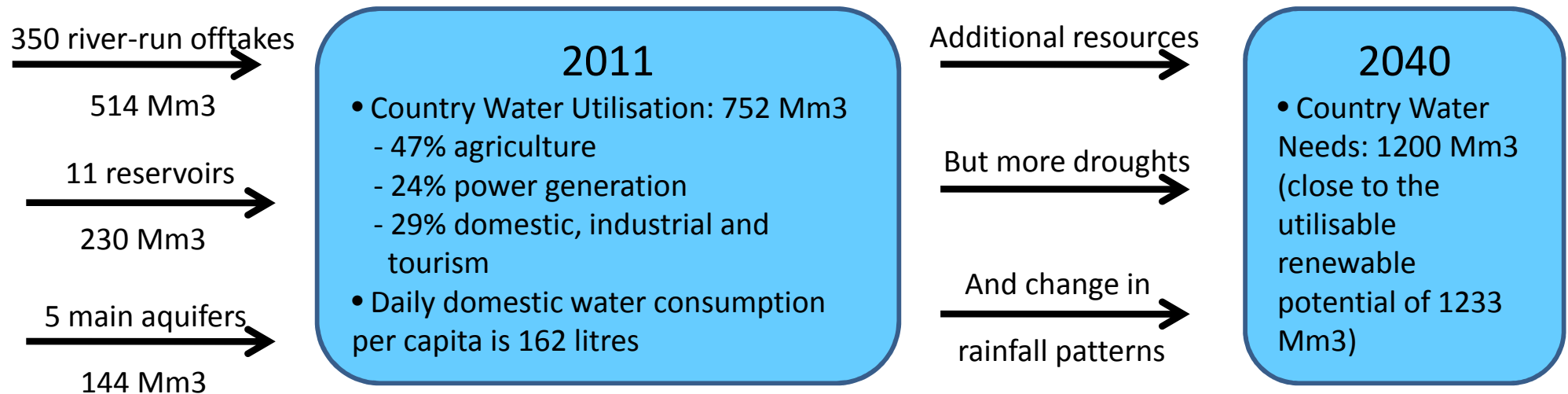
Indicator	Quantity
Total land area	196,900 ha
Forest area (as a % total land area)	25.6%
Irrigated area (as a % total land area)	10.7%
Land protected area (as a % total land area)	8%
Mean annual rainfall	1,945 mm
Daily domestic water consumption per capita	162 litres
Daily solid waste generated per capita	0.9 kg
Primary energy requirement per capita	1.1 toe
CO2 emissions per capita	2,800 ppm
Human Development Index (HDI)	0.728
Ecological footprint	4.26 Gha/person

- **Inherent challenges:** small size, low endowment in natural resources and remoteness from world markets
- **But meeting with most of the MDGs**
- **HDI** of 0.728 but **ecological footprint** of 4.26 Gha/person
- **Future challenge** is to maintain continual sustainable development with reduced environmental burden while preserving its ecosystem



Water Management Practices, Targets & Challenges

- **Water stressed country:** water scarcity posing a serious constraint for future sustainable development



- **Main sources of water pollution**

- ✓ Agricultural leaching and run-off from extensive use of agrochemicals....
- ✓ Industrial effluents
- ✓ Domestic wastewater (22% population connected to public sewer while others using septic tanks, absorption pits and cesspits)
- ✓ Dumping of solid waste in rivers



Water Management Practices, Targets & Challenges

- **Increasing water resources capacity:** new dams, new boreholes, pumping stations on rivers, review of the water rights legislation, seawater desalination (partial)
- **Institutional reform:** integration of water governing organisations (Water Resources Unit, Central Water Authority, Irrigation Authority and Wastewater Management Authority) into a single water governing entity to address the actual complexities & inefficiencies of fragmented water management.
- **Water management:** reduction of network losses (~35% Non-Revenue-Water), households water conservation programmes & optimum use in industries through sensitisation/tariffs/water pricing & efficient irrigation techniques
- **Protection of water resources:** preventing surface and groundwater pollution, sustainable watershed management, controlling activities/land use in common aquifers recharge zones & assessing the impacts of saltwater intrusion in the aquifers nearing coastal regions
- **Water reuse:** treated domestic wastewater for irrigation (actually 93,000 m³/day to 179,000 m³/day in 2015), hotel wastewater reuse



Soil & Land Management Practices, Targets & Challenges

- **Low natural fertility of soils:** requires N, P & K to grow crops economically, soil fertility also declines with increasing rainfall and age of the parent rock & thus not all crops can be grown
- **Competition for land use leading to unsustainable practices:** land under forestry decreased to 25.5%, agricultural area decreased to 43% while built-up areas increased to 28%
- **Need for preserving forestry:** watersheds protection, soil conservation, providing habitats for fauna and flora, flood control, carbon sequestration & for greening the country for ecotourism and the provision of leisure and recreation
- **Preservation of agricultural land for cane industry and food security:** the multifunctional role of the sugarcane industry (40% of country area) & need for food security (except vegetables 75% of the food items are imported)
- **Protection of the coastal environment:** rapid development of the tourism industry - built-up areas, unplanned construction, land reclamation and clearing - some 7 km of beaches are affected by erosion



Soil & Land Management Practices, Targets & Challenges

- **Integrated and sustainable land use planning:** protection of forest areas, prime agricultural land (targeted minimum area) and environmentally sensitive areas
- **Land use change:** Assessing the impacts of land use change - clear delimitations to be set and reinforced for residential, industrial and agricultural zonings including those on the coastal regions
- **Minimising contamination from agrochemicals/pesticides:** use of biological & non-chemical control methods, promoting agro-ecological farming through integrated nutrient and water management, integrated crop management, integrated pest and disease management, rainwater harvesting, crop rotation, use of organic products, green manuring and recycling of agricultural wastes/composting
- **Integrated Coastal Zone Management:** to abate the impacts of erosion in the coastal areas, ban sand extraction, provide coastal rehabilitation, promote coral reef and lagoonal water quality monitoring and the creation of Marine Protected Areas, among others.



Waste Management Practices, Targets & Challenges

- **414,000 tonnes of MSW landfilled** and **7,000 tonnes composted** in 2011: MSW projected to increase to about 50% by 2030
- **Almost all waste collected by Local Authorities** (0.9 kg daily generation per capita)
- MSW mostly of **organic nature (>70%): composting practiced** at household scale (for gardening) and commercial scale (for agriculture)
- Little amount of waste do find their way in nature - accumulate and block drains causing **flooding during heavy rainfall** and ultimately reaching water bodies causing **water pollution**
- Other types of waste such as plastics (PET), glass and metals **are recycled or exported**
- **Industrial wastes are generally converted into useful end products:** sugarcane waste converted on commercial industrial scale to electricity and bioethanol while distillery waste converted to organic fertiliser
- **Agricultural wastes left in fields** but actually carrying practical potential to be collected for conversion to electricity



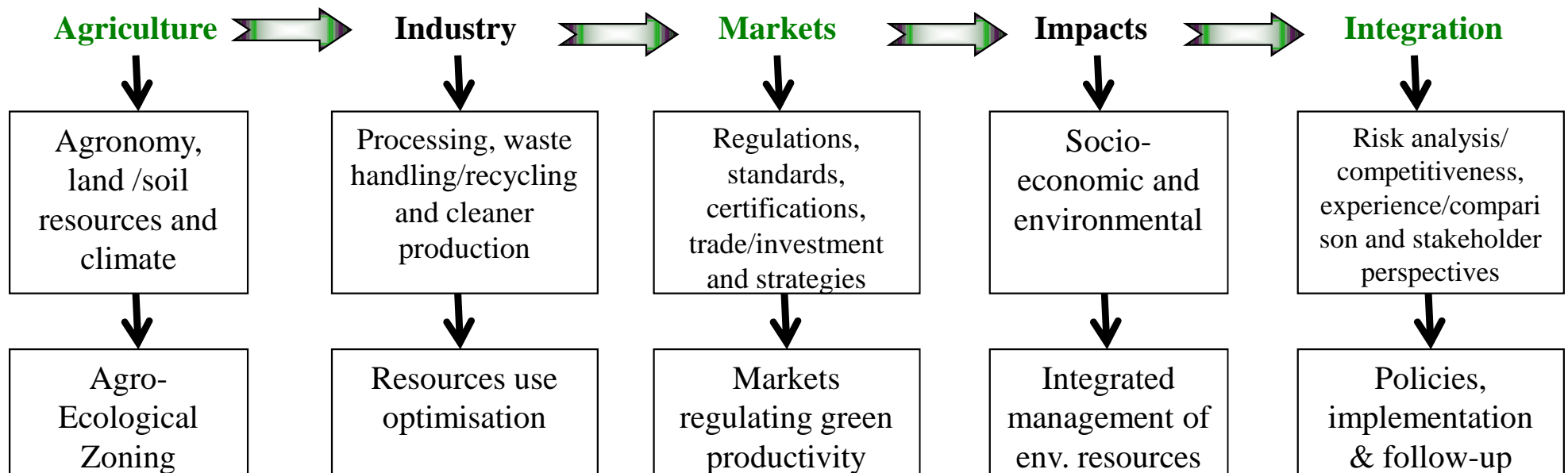
Waste Management Practices, Targets & Challenges

- **Landfill nearing saturation point** and no new site could be identified
- **Integrated Waste Management** focusing on waste reduction, reuse, sorting and recycling with the introduction of cost recovery mechanism promoted
- **40% recycle rate targeted by 2015** with emphasis on organic fertilizer production for agriculture
- **Household compost production (> 10,000 houses)** enables reduction of waste at source together with the subsequent collection, transportation and disposal costs
- Concept of '**cleaner production**' or '**industrial ecology**' promoted in process industries to favour low use of environmental resources and subsequently produce 'zero-waste' or relatively low quantities of waste
- **Anti-social behavior of littering and illegal dumping** in open areas like drains and rivers is being reduced through proper reinforcement of existing legislations.



Possible options for integrating management of water, soil and waste

- **Water, soil/land & waste management so far done independently** despite having common linkages that could enable their more efficient utilisation
- **Nexus approach** is however favoured with overall project development (economic as well as environmental and social considerations)
- **Agricultural or more wholly the agro-industrial sector** is the most appealing and important sector for demonstrating the integrated use and management of environmental resources





Possible options for integrating management of water, soil and waste

- To **assess the impact of land use change** for identifying suitable and available areas for food (fertile prime land) and biofuel production (arid/semi-arid/marginal land) – *currently stuck in the 'food versus fuel' debate!*
- For the **reallocation of water resources from** the primary sectors (e.g agriculture, power generation) to emerging ones that are likely to bring larger contribution to the economy (e.g industrial sector)
- For **developing proper waste management strategy** – organic nature of waste favours compost production that is highly beneficial to the soil and reduce the pressure on production/importation of chemical fertilisers
- Development of nexus approach however requires **adequate information about the respective environment/ecosystems and common indicators** (e.g soil/land or waste characteristics and trends) to monitor progress in facilitating integrated planning and implementation



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