Selected Application of Statistics to Support Policy Planning for Resilience in the Indian Ocean Region

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Statistics Mauritius

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Introduction

- The Indian Ocean Commission – a very brief introductions
- Selected applications of statistics to support policy planning
  - Indicators of Vulnerability and Resilience
  - Vulnerability Resilience Profiling (VRP) – with UNDESA
  - Ecosystems Natural Capital Account (ENCA) - Mauritius
Indian Ocean Commission

- An intergovernmental organization

- Brings together five countries: Union of the Comoros, Reunion, Madagascar, Mauritius, and the Seychelles.

- Four strategic objectives, which consist in developing for and within the region:
  - A political, diplomatic, and human development force,
  - A safe regional space where smart economic growth is promoted,
  - A common island and ocean environment that is resilient and sustainable, and
  - A strong identity.
Policy-induced Resilience in Island States

- Island states have inherent vulnerabilities (smallness, limited resource base, limited human capacity, trade openness, distance to markets, exposure to natural disasters/CC, ...),

- Island states should prioritize policies & strategies to build resilience against these vulnerabilities
Policy-induced Resilience in Island States

• ISLANDS project of the IOC has provided technical assistance to countries in the Indian Ocean Region to build resilience

• Use of statistics is critical to support policy-induced resilience building (3 selected examples are shown)
Indicators of Economic Vulnerability and Resilience
Meaning of Economic Vulnerability

- Economic vulnerability refers to inherent proneness of an economy to exogenous shocks.

- Such vulnerability arises from the fact that the economies of small states are, to a large extent, shaped by forces outside their control.

Economic vulnerability may be inherent or self-inflicted. In this study, vulnerability is considered at the result of inherent features which render an economy exposed to external shocks, as shown in the diagram. Policy-induced measures which exacerbate vulnerability are considered as self-inflicted, and therefore reduce the economic resilience of the economy, as discussed below.
Economic resilience refers to:

- the ability of an economy to recover quickly following adverse shocks: shock counteraction;
- The ability of an economy to withstand shocks: shock absorption.

Economic resilience is multifaceted and does not depend exclusively on economic variables. The most important economic variables relate to stability and flexibility, however social and political factors may also enable an economy to better withstand or counteract the effects of external economic shocks.
Juxtaposing vulnerability & resilience (risk of being harmed by shocks)

VULNERABILITY
EXPOSURE
of an economy to external shocks due to inherent economic features

RESILIENCE
COPING ABILITY
Enabling an economy to withstand or bounce back from the effects of external shocks

RISK
of an economy of being harmed by external shock

NATURE
Inherent and permanent and not subject to policy:
- Economic openness
- Export concentration
- Dependence on strategic imports

NURTURED
Can be built and subject to policy:
- Macroeconomic stability
- Market efficiency
- Social development
- Good political governance
Some results (EVI & ERI)

<table>
<thead>
<tr>
<th>Island states and country group</th>
<th>Trade openness</th>
<th>Strategic imports</th>
<th>Export concentration</th>
<th>EVI</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comoros</td>
<td>0.000</td>
<td>0.119</td>
<td>0.425</td>
<td>0.18</td>
<td>4</td>
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<tr>
<td>Madagascar</td>
<td>0.075</td>
<td>0.000</td>
<td>0.061</td>
<td>0.04</td>
<td>5</td>
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<tr>
<td>Mauritius</td>
<td>0.280</td>
<td>0.307</td>
<td>0.384</td>
<td>0.32</td>
<td>2</td>
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<tr>
<td>Seychelles</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.00</td>
<td>1</td>
</tr>
<tr>
<td>SIDS</td>
<td>0.234</td>
<td>0.345</td>
<td>0.000</td>
<td>0.19</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Island states and country group</th>
<th>Macroeconomic stability</th>
<th>Market efficiency</th>
<th>Social dev.</th>
<th>Good governance</th>
<th>Resilience index</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Debt ratio</td>
<td>Inflation</td>
<td>Current A/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comoros</td>
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<td>0.80</td>
<td>0.45</td>
<td>0.00</td>
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<td>Madagascar</td>
<td>1.00</td>
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<td>0.07</td>
<td>0.11</td>
<td>0.27</td>
<td>0.21</td>
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<tr>
<td>Mauritius</td>
<td>0.67</td>
<td>0.62</td>
<td>0.42</td>
<td>1.00</td>
<td>0.60</td>
<td>0.83</td>
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<tr>
<td>Seychelles</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.66</td>
<td>0.71</td>
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<tr>
<td>SIDS</td>
<td>0.47</td>
<td>0.67</td>
<td>0.28</td>
<td>0.47</td>
<td>0.26</td>
<td>0.60</td>
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</tbody>
</table>
Indicators of Environmental vulnerability and Resilience
Environment Vulnerability and Environment Resilience index

Around 50 indicators are used to produce the index. It is based on 3 fundamental aspects – Hazard, Resistance and Damage and further subdivided into categories – Climate change, Biodiversity, Water, Agriculture and fisheries, Human health aspects, Desertification, and Exposure to natural disasters.
The data needed encompasses a range of environmental factors from meteorological data; sea surface temperature; geographical information; biological species and habitat data; reserves and human activities such as fishing, population, pollution, etc.
<table>
<thead>
<tr>
<th>Vulnerability</th>
<th>Resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. HIGH WINDS</td>
<td>11. LAND AREA</td>
</tr>
<tr>
<td>2. DRY PERIODS</td>
<td>12. COUNTRY DISPERSION</td>
</tr>
<tr>
<td>3. WET PERIODS</td>
<td>13. ISOLATION</td>
</tr>
<tr>
<td>4. HOT PERIODS</td>
<td>14. RELIEF</td>
</tr>
<tr>
<td>5. COLD PERIODS</td>
<td>15. LOWLANDS</td>
</tr>
<tr>
<td>6. SEA TEMPERATURES</td>
<td>16. BORDER</td>
</tr>
<tr>
<td>7. VOLCANOES</td>
<td>17. ECOSYSTEM IMBALANCE</td>
</tr>
<tr>
<td>8. EARTHQUAKES</td>
<td>18. ENVIRONMENTAL OPENNESS</td>
</tr>
<tr>
<td>9. TSUNAMIS</td>
<td>19. MIGRATIONS</td>
</tr>
<tr>
<td>10. SLIDES</td>
<td>20. ENDEMICS</td>
</tr>
<tr>
<td></td>
<td>21. POPULATION</td>
</tr>
<tr>
<td>22. ENDANGERED SPECIES</td>
<td>32. PESTICIDES</td>
</tr>
<tr>
<td>23. EXTINCTIONS</td>
<td>33. BIOTECHNOLOGY</td>
</tr>
<tr>
<td>24. VEGETATION COVER</td>
<td>34. PRODUCTIVITY OVERFISHING</td>
</tr>
<tr>
<td>25. LOSS OF COVER</td>
<td>35. FISHING EFFORT</td>
</tr>
<tr>
<td>26. HABITAT FRAGMENTATION</td>
<td>36. RENEWABLE WATER</td>
</tr>
<tr>
<td>27. DEGRADATION</td>
<td>37. SULPHUR DIOXIDE EMISSIONS</td>
</tr>
<tr>
<td>28. TERRESTRIAL RESERVES</td>
<td>38. WASTE PRODUCTION</td>
</tr>
<tr>
<td>29. MARINE RESERVES</td>
<td>39. WASTE TREATMENT AGREEMENTS</td>
</tr>
<tr>
<td>30. INTENSIVE FARMING</td>
<td>40. INDUSTRY</td>
</tr>
<tr>
<td>31. FERTILISERS</td>
<td>41. SPILLS</td>
</tr>
<tr>
<td>42. MINING</td>
<td>43. SANITATION</td>
</tr>
<tr>
<td>44. VEHICLES</td>
<td>45. Population</td>
</tr>
<tr>
<td>46. POPULATION GROWTH</td>
<td>47. TOURISTS</td>
</tr>
<tr>
<td>48. COASTAL SETTLEMENTS</td>
<td>49. ENVIRONMENTAL AGREEMENTS</td>
</tr>
<tr>
<td>50. CONFLICTS</td>
<td></td>
</tr>
</tbody>
</table>
Some results Environmental vulnerability index

<table>
<thead>
<tr>
<th>Vulnerability (Inherent)</th>
<th>Comoros</th>
<th>Madagascar</th>
<th>Mauritius</th>
<th>Seychelles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.95</td>
<td>2.52</td>
<td>3.11</td>
<td>3.42</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resilience (Policy induced)</th>
<th>Comoros</th>
<th>Madagascar</th>
<th>Mauritius</th>
<th>Seychelles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.50</td>
<td>3.00</td>
<td>4.21</td>
<td>3.71</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental Vul. Index</th>
<th>Comoros</th>
<th>Madagascar</th>
<th>Mauritius</th>
<th>Seychelles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.77</td>
<td>2.79</td>
<td>3.58</td>
<td>3.55</td>
</tr>
</tbody>
</table>

Vulnerability: Comoros - Vulnerable, Madagascar - Vulnerable, Mauritius - Highly Vulnerable, Seychelles - Highly Vulnerable

Mostly inherent features: Comoros

Could be reversed by appropriate policy: Mauritius - Could be reversed by appropriate policy, Seychelles - Could be reversed by appropriate policy.
Vulnerability-Resilience Profile (with UNDESA and work in progress)
• An analytical framework to help Small Islands Developing States monitor and evaluate their progress towards building resilience in the context of the Barbados Plan of Action and its implementation through the Mauritius Strategy for implementation (MSI)
Vulnerability Resilience Profile, Methodology

● VRP methodology is based on a five steps systematic and participatory process

● The five steps are carried out using an inclusive process based on multi stakeholder and multi disciplinary consultations
### VRP framework/steps

**Preparatory Step**
Assembling for the VRP

Prepare a Baseline Report based on:

i. Stocktaking of national statistical systems to determine availability of and gaps in data sets required for identifying vulnerabilities and resilience of MSI thematic areas

ii. Capacity assessment of national statistical systems

Identify and assemble data sources and reports on MSI thematic areas

Identify training participants representing cross section of public, private and civil society organisations

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Selecting Priority Themes and Major Issues</td>
</tr>
<tr>
<td></td>
<td>Rank the 19 priority themes in the MSI</td>
</tr>
<tr>
<td></td>
<td>Identify and select economic, social and environmental issues/concerns facing the country for each of the identified themes</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Selecting criteria for determining vulnerability and resilience</td>
</tr>
<tr>
<td></td>
<td>Develop economic, social and environmental criteria for determining vulnerability and resilience of identified themes in step 1.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Selection of Indicators</td>
</tr>
<tr>
<td></td>
<td>Select indicators for the criteria identified in Step 2</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Assessment and Rating</td>
</tr>
<tr>
<td></td>
<td>Develop and rating vulnerability and resilience scores using the criteria and indicators developed in Steps 2 and 3</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Mapping and Justification</td>
</tr>
<tr>
<td></td>
<td>Map the vulnerability and resilience scores using an Excel scatter chart</td>
</tr>
<tr>
<td></td>
<td>Create a country vulnerability-resilience profile for the selected MSI themes and formulate a narrative to justify the vulnerability and resilience scores and to formulate a VRP based on the overall scores</td>
</tr>
</tbody>
</table>
Scope of required statistics
(will change in light of the SAMOA Pathway)

<table>
<thead>
<tr>
<th>Box 1: The 19 Priority Themes of the MSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Climate change and sea-level rise</td>
</tr>
<tr>
<td>- Natural and environmental disasters</td>
</tr>
<tr>
<td>- Management of wastes</td>
</tr>
<tr>
<td>- Coastal and marine resources</td>
</tr>
<tr>
<td>- Freshwater resources</td>
</tr>
<tr>
<td>- Land resources</td>
</tr>
<tr>
<td>- Energy resources</td>
</tr>
<tr>
<td>- Tourism resources</td>
</tr>
<tr>
<td>- Biodiversity resources</td>
</tr>
<tr>
<td>- Transport and communication</td>
</tr>
<tr>
<td>- Science and technology</td>
</tr>
<tr>
<td>- Graduation from least developed</td>
</tr>
<tr>
<td>country status</td>
</tr>
<tr>
<td>- Trade: globalization and trade</td>
</tr>
<tr>
<td>liberalization</td>
</tr>
<tr>
<td>- Sustainable capacity development</td>
</tr>
<tr>
<td>and education for sustainable</td>
</tr>
<tr>
<td>development</td>
</tr>
<tr>
<td>- Sustainable production and</td>
</tr>
<tr>
<td>consumption</td>
</tr>
<tr>
<td>- National and regional enabling</td>
</tr>
<tr>
<td>environments</td>
</tr>
<tr>
<td>- Health</td>
</tr>
<tr>
<td>- Knowledge management and</td>
</tr>
<tr>
<td>information for decision-making</td>
</tr>
<tr>
<td>- Culture</td>
</tr>
</tbody>
</table>
### Example for CC & SLR (Issues & Dimensions)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Issues</th>
<th>Economic</th>
<th>Social</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land degradation and desertification</td>
<td>Size of arable land</td>
<td>Displacement of</td>
<td>Ecological balance affected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reduced</td>
<td>settlements</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Impact on rural livelihoods</td>
<td>Impact on rural</td>
<td>Increase in level of</td>
<td>Loss of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>livelihoods</td>
<td>indigence</td>
<td>indigenous</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>plants and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>animals</td>
</tr>
<tr>
<td>3</td>
<td>Loss in Agricultural productivity</td>
<td>Loss in Agricultural</td>
<td>Food</td>
<td>Reduction in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>productivity</td>
<td>consumption/calorie</td>
<td>forest cover</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>intake per capita</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>in affected areas</td>
<td></td>
</tr>
</tbody>
</table>
## Example for CC & SLR (Indicators)

<table>
<thead>
<tr>
<th>Thematic Area: Climate Change and Sea Level Rise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimension</strong></td>
</tr>
<tr>
<td><strong>Economic</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
What would the results look like?

e.g. VRP (Jamaica)
Ecosystems Natural Capital Account (ENCA) - Mauritius
Two possible approaches to ecosystem accounting

Ecosystem capital productivity & resilience
- Balance, Sustainable Use Index
- Health Index

Physical ecosystem
- Natural & modified inland socio-ecosystems. Sea, Atmosphere
- Ecosystem Stocks & Flows, Extent & Condition
- Ecosystem carbon, biomass
- Ecosystem water
- Bundle of intangible functional services (indirect measurement)

Ecosystem services
- Ecosystem services & valuation, Market and shadow prices, Costs-Benefits analysis
- Wealth assessments

Integrity of ecosystem structures & functions (public goods)

Maintenance, restoration, Ecological Taxes, Mitigation banking/ Offset Certificates ...

Total Ecosystem Capability (in physical unit-equivalent)

Degradation / Enhancement

Sustainability of ecosystem services delivery

Service a: e.g. Food provision
Service b: e.g. Timber provision
Service c: e.g. Fresh water provision/ blue water
Service d: e.g. Fresh water provision/ green water
Service e: e.g. Nutrient cycling
Service f: e.g. Pollination
Service g: e.g. Water regulation/ purification
Service h: e.g. Water regulation/ floods
Service i: e.g. Recreation
Service j: e.g. Tourism inputs
Service k: e.g. Symbolic values
Service l: e.g. Non-use values

Service a $ valuation
Service b $ valuation
Service c $ valuation
Service d $ valuation
Service e $ valuation
Service f $ valuation
Service g $ valuation
Service h $ valuation
Service i $ valuation
Service j $ valuation
Service k $ valuation
Service l $ valuation
Two possible approaches to ecosystem accounting

**Ecosystem capital**
- Productivity
- Resilience

**Physical ecosystem**
- Natural & modified inland socio-ecosystems. Sea, Atmosphere

**Ecosystem Stocks & Flows, Extent & Condition**
- Service a: e.g. Food provision
- Service b: e.g. Timber provision
- Service c: e.g. Fresh water provision/ blue water
- Service d: e.g. Fresh water provision/ green water
- Service e: e.g. Nutrient cycling
- Service f: e.g. Pollination
- Service g: e.g. Water regulation/ purification
- Service h: e.g. Water regulation/ floods
- Service i: e.g. Recreation

**Total Ecosystem Capability**
- (in physical unit-equivalent)
- Degradation / Enhancement

**Integrity of ecosystem structures & functions**
- (public goods)
- Sustainability of ecosystem services delivery

**Ecosystem services**
- Ecosystem services & valuation,
- Market and shadow prices,
- Costs-Benefits analysis
- Wealth assessments

**Focus on marine & inland coast**
- (recreation, tourism, fisheries, coral reefs...)

Maintenance, restoration,
Ecological Taxes,
Mitigation banking/ Offset Certificates ...
Main data flows to compile ecosystem natural capital accounts

Data input
- Socio-economic statistics by regions
- Monitoring data, rasters
- Monitoring data, samples
- Standard coefficients

Data assimilation (1 ha or 1 km² grid)
- Disaggregate & map
- Aggregate & map
- Extrapolate
- Multiply

Accounts integration, analysis and reporting
SEEA-ENCA Mauritius preliminary results:

Creation of Ecosystem Accounting Units

A land cover map has been produced from the start for:
1. Defining statistical units for accounting (EAU) and
2. Computing the land cover account (next slide)

Dominant land cover types (>50%)

River sub-basins

Socio-ecological landscape units (SELU) & Marine Coastal Units (MCU)
SEEA-ENCA Mauritius preliminary results: Land cover and change from 2000 to 2010

The land cover data are stored using geographical datasets which use grids (10m x 10m and 100m x 100m) at the most detailed level.

Urban sprawl 2000 - 2010 by Districts

These grids allow computing statistics and producing ecosystems/natural capital accounts for various statistical units such as municipal and village council areas, districts, coastal zones, river basins, socio-ecological landscape units and any relevant zoning.
Simplified bio-carbon accounts by districts, 2010

<table>
<thead>
<tr>
<th>District</th>
<th>Tons of carbon</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rivière du Rempart</td>
<td>1457955</td>
<td>2101934</td>
</tr>
<tr>
<td>Pamplemousses</td>
<td>4135543</td>
<td>6156512</td>
</tr>
<tr>
<td>Flacq</td>
<td>3421227</td>
<td>5165365</td>
</tr>
<tr>
<td>Grand Port</td>
<td>3227114</td>
<td>4327187</td>
</tr>
<tr>
<td>Black River</td>
<td>317857</td>
<td>432317</td>
</tr>
<tr>
<td>Savanne</td>
<td>3199601</td>
<td>483132</td>
</tr>
<tr>
<td>Port Louis</td>
<td>24845808</td>
<td>3424354</td>
</tr>
</tbody>
</table>

Initial stock 2010

| Woody biomass  | 873403         | 1137222    |
| Topsoil organic carbon | 584551 | 964712    |

Flows/inputs

| Primary Production | 335582         | 417954     |
| Net Primary Production | 335582 | 417954     |

Flows/outputs and decrease

| Woody biomass | 3421227 | 3227114 |
| Topsoil organic carbon | 313857 | 3139601 |

Removals, harvests

| Sugar cane harvest | 63718 | 86585 |
| Food crops | 1727 | 3259 |

Other crops

| Wood removals | 0 |
| Decrease due to land use change | 4102 |
| Other decrease (fire, erosion...) | 14580 |
| Soil/decomposers respiration | 265016 |

Net Ecosystem Carbon Balance 1 (flows)

| Statistical adjustment | 16097 | 28379 |
| Net Ecosystem Carbon Balance 2 (stocks) | 3035 |

Final Stock 2010

| Woody biomass | 876438 |
| Topsoil organic carbon | 584551 |

Net accessible bio-carbon resource 2010

| Change in NPP/ tons of C | 265136 |
| Flows/inputs (+) | 335582 |
| Soil/decomposers respiration v2 (-) | 265016 |

Index of intensity of use of bio-carbon 2010

| 112 | 92 | 80 | 91 | 125 | 85 | 99 | 111 | 87 | 100 |
### SEEA-ENCA Mauritius preliminary results:

#### The ecosystem water account

The ecosystem water accounts follow the SEEA Water methodology and use preliminary results of the national water accounts. They are detailed by river basins and sub-basins where the hydrological system can be described consistently. Stocks of water are mainly aquifers and lakes/reservoirs, which play an important role in Mauritius. Data have been provided by the meteorological and water agencies. Water use by sub-basins is estimated from population census data and irrigation maps. Satellite products have been used for evapotranspiration. The outcome is the calculation of the water really accessible for use and of an index of stress from water use intensity.

#### Accessible water, mean amount by ha, 10³ m³

Water use intensity stress index (stress when <100)

### Simplified water accounts by Districts, 2010

<table>
<thead>
<tr>
<th>District</th>
<th>Rivière du Rempart</th>
<th>Pamplemousses</th>
<th>Flacq</th>
<th>Moka</th>
<th>Grand Port</th>
<th>Plains Willem</th>
<th>Black River</th>
<th>Savanne</th>
<th>Port Louis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA, ha</td>
<td>14703</td>
<td>18019</td>
<td>29826</td>
<td>23512</td>
<td>19839</td>
<td>25558</td>
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<td>881</td>
<td>186325</td>
<td>183325</td>
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<tr>
<td>Boreholes_nb</td>
<td>105</td>
<td>164</td>
<td>100</td>
<td>83</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>710</td>
<td>881</td>
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<td>River runoff districts coeff</td>
<td>35</td>
<td>20</td>
<td>150</td>
<td>150</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>75</td>
<td>755</td>
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<tr>
<td>Lake 2010 ha</td>
<td>0</td>
<td>103</td>
<td>0</td>
<td>468</td>
<td>41</td>
<td>517</td>
<td>441</td>
<td>441</td>
<td>1251</td>
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<tr>
<td>Stocks</td>
<td>3345</td>
<td>5231</td>
<td>3189</td>
<td>2681</td>
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<td>4687</td>
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<td>383</td>
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<td>Aquifers</td>
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<td>5222</td>
<td>3184</td>
<td>2643</td>
<td>3503</td>
<td>4649</td>
<td>4171</td>
<td>4171</td>
<td>28052</td>
<td>28052</td>
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<td>0</td>
<td>7</td>
<td>0</td>
<td>32</td>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>32</td>
<td>32</td>
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<tr>
<td>Soil/vegetation</td>
<td>75</td>
<td>176</td>
<td>292</td>
<td>342</td>
<td>355</td>
<td>293</td>
<td>155</td>
<td>155</td>
<td>1200</td>
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<tr>
<td>Net Inflows</td>
<td>173</td>
<td>236</td>
<td>579</td>
<td>638</td>
<td>629</td>
<td>484</td>
<td>302</td>
<td>603</td>
<td>49</td>
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<td>199</td>
<td>367</td>
<td>290</td>
<td>338</td>
<td>224</td>
<td>302</td>
<td>526</td>
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<td>EvapoTranspiration (actual), total</td>
<td>109</td>
<td>119</td>
<td>310</td>
<td>268</td>
<td>294</td>
<td>203</td>
<td>167</td>
<td>269</td>
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<td>1779</td>
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<td>Net transfers surface - groundwater</td>
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<td>14</td>
<td>18</td>
<td>20</td>
<td>15</td>
<td>19</td>
<td>13</td>
<td>143</td>
<td></td>
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<tr>
<td>Transfers between basins</td>
<td>41</td>
<td>-41</td>
<td></td>
<td></td>
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<td>Abstraction and Uses</td>
<td>63</td>
<td>109</td>
<td>80</td>
<td>36</td>
<td>63</td>
<td>83</td>
<td>152</td>
<td>69</td>
<td>23</td>
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<tr>
<td>Municipal Water Production</td>
<td>17</td>
<td>23</td>
<td>23</td>
<td>13</td>
<td>18</td>
<td>64</td>
<td>11</td>
<td>31</td>
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<td>Use of water</td>
<td>8</td>
<td>12</td>
<td>11</td>
<td>7</td>
<td>9</td>
<td>32</td>
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<td>11</td>
<td>101</td>
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<td>Loss of water in distribution</td>
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<td>12</td>
<td>11</td>
<td>7</td>
<td>9</td>
<td>32</td>
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<td>6</td>
<td>11</td>
<td>101</td>
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<td>85</td>
<td>57</td>
<td>22</td>
<td>44</td>
<td>17</td>
<td>141</td>
<td>57</td>
<td>0</td>
<td>468</td>
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<td>Other</td>
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<td>5</td>
<td>1</td>
<td>1</td>
<td>3</td>
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<td>0</td>
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<td>8</td>
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<tr>
<td>Waste water to rivers</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>22</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>70</td>
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<tr>
<td>Outflow to the sea</td>
<td>78</td>
<td>46</td>
<td>324</td>
<td>318</td>
<td>217</td>
<td>212</td>
<td>172</td>
<td>213</td>
<td>50</td>
<td>1632</td>
</tr>
<tr>
<td>Rivers runoff</td>
<td>74</td>
<td>42</td>
<td>318</td>
<td>318</td>
<td>212</td>
<td>212</td>
<td>170</td>
<td>212</td>
<td>42</td>
<td>1602</td>
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<tr>
<td>Waste water to the sea</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>Induced ETA, Evaporation</td>
<td>46</td>
<td>85</td>
<td>57</td>
<td>22</td>
<td>44</td>
<td>17</td>
<td>141</td>
<td>57</td>
<td>0</td>
<td>468</td>
</tr>
<tr>
<td>Net Flows</td>
<td>103</td>
<td>19</td>
<td>-16</td>
<td>19</td>
<td>-16</td>
<td>19</td>
<td>-16</td>
<td>19</td>
<td>-16</td>
<td>19</td>
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<tr>
<td>Closing stocks</td>
<td>3242</td>
<td>5179</td>
<td>3034</td>
<td>2652</td>
<td>3551</td>
<td>4690</td>
<td>3879</td>
<td>980</td>
<td>337</td>
<td>27544</td>
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<tr>
<td>Accessible renewable water</td>
<td>83</td>
<td>124</td>
<td>217</td>
<td>200</td>
<td>219</td>
<td>187</td>
<td>228</td>
<td>213</td>
<td>36</td>
<td>1507</td>
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</tbody>
</table>

#### Water use intensity (1): Average/ha

<table>
<thead>
<tr>
<th>District</th>
<th>Rivière du Rempart</th>
<th>Pamplemousses</th>
<th>Flacq</th>
<th>Moka</th>
<th>Grand Port</th>
<th>Plains Willem</th>
<th>Black River</th>
<th>Savanne</th>
<th>Port Louis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water use intensity (1): Average/ha</td>
<td>132</td>
<td>114</td>
<td>270</td>
<td>561</td>
<td>345</td>
<td>224</td>
<td>150</td>
<td>310</td>
<td>155</td>
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</tr>
</tbody>
</table>

#### Water use intensity (2): 1st decile

<table>
<thead>
<tr>
<th>District</th>
<th>Rivière du Rempart</th>
<th>Pamplemousses</th>
<th>Flacq</th>
<th>Moka</th>
<th>Grand Port</th>
<th>Plains Willem</th>
<th>Black River</th>
<th>Savanne</th>
<th>Port Louis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water use intensity (2): 1st decile</td>
<td>90</td>
<td>90</td>
<td>118</td>
<td>203</td>
<td>148</td>
<td>114</td>
<td>110</td>
<td>122</td>
<td>143</td>
<td></td>
</tr>
</tbody>
</table>
The biodiversity of systems and species account is made of two accounts which describe the state of ecosystems green infrastructure (landscapes, rivers and sea coastal zones) on the one hand and changes in species biodiversity on the other hand.

The NLEP index combines the green character of ecosystems and their fragmentation by roads which may alter their good functioning. Land cover is then weighted with NLEP. Highest NLEP values can be found where forests, shrubs, grass and natural habitats are predominant, in particular in mountainous and land coastal areas. Low NLEP values correspond to urbanised areas and intermediate score reflect agriculture dominated catchments.

### Green Infrastructure Accounts

**Provisional**

<table>
<thead>
<tr>
<th>AREA_ha</th>
<th>Riviere du Rempart</th>
<th>Pamplemousses</th>
<th>Flacq</th>
<th>Moka</th>
<th>Grand Port</th>
<th>Rivieres Verrines</th>
<th>Black River</th>
<th>Savanne</th>
<th>Port Louis</th>
<th>Total / Mean values</th>
</tr>
</thead>
<tbody>
<tr>
<td>14703</td>
<td>18019</td>
<td>29826</td>
<td>23512</td>
<td>26134</td>
<td>19839</td>
<td>25558</td>
<td>24758</td>
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**Indexes (0-100 value per ha)**

<table>
<thead>
<tr>
<th>GBL 2000 index</th>
<th>43.4</th>
<th>41.7</th>
<th>49.7</th>
<th>55.6</th>
<th>50.1</th>
<th>53.4</th>
<th>61.0</th>
<th>53.7</th>
<th>58.6</th>
<th>51.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmentation index</td>
<td>8.6</td>
<td>9.8</td>
<td>7.3</td>
<td>6.2</td>
<td>6.9</td>
<td>7.9</td>
<td>5.1</td>
<td>5.1</td>
<td>6.9</td>
<td>6.9</td>
</tr>
<tr>
<td>nLEP 2000 index</td>
<td>39.7</td>
<td>37.6</td>
<td>46.0</td>
<td>52.1</td>
<td>46.6</td>
<td>49.2</td>
<td>57.9</td>
<td>51.0</td>
<td>54.5</td>
<td>48.4</td>
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</table>

**Green Infrastructure Account**

<table>
<thead>
<tr>
<th>GBL 2000 / weighted ha</th>
<th>638105</th>
<th>751152</th>
<th>1481482</th>
<th>1307506</th>
<th>1309039</th>
<th>1060139</th>
<th>1559660</th>
<th>1330151</th>
<th>232911</th>
<th>9670145</th>
</tr>
</thead>
<tbody>
<tr>
<td>nLEP 2000 / weighted ha</td>
<td>583021</td>
<td>677761</td>
<td>1373059</td>
<td>1226033</td>
<td>1218167</td>
<td>976061</td>
<td>1479992</td>
<td>1262700</td>
<td>216271</td>
<td>9013521</td>
</tr>
</tbody>
</table>

**Indexes (0-100 value per ha)**

<table>
<thead>
<tr>
<th>GBL 2010 index</th>
<th>42.0</th>
<th>40.6</th>
<th>49.2</th>
<th>55.1</th>
<th>49.8</th>
<th>52.4</th>
<th>60.5</th>
<th>53.5</th>
<th>50.7</th>
<th>51.1</th>
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<tbody>
<tr>
<td>Fragmentation index</td>
<td>8.6</td>
<td>9.8</td>
<td>7.3</td>
<td>6.2</td>
<td>6.9</td>
<td>7.9</td>
<td>5.1</td>
<td>5.1</td>
<td>6.9</td>
<td>6.9</td>
</tr>
<tr>
<td>nLEP 2010 index</td>
<td>38.4</td>
<td>36.7</td>
<td>45.6</td>
<td>51.6</td>
<td>46.4</td>
<td>48.2</td>
<td>57.4</td>
<td>50.8</td>
<td>47.2</td>
<td>47.7</td>
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</table>

**Green Infrastructure Account**

<table>
<thead>
<tr>
<th>GBL 2010 / weighted ha</th>
<th>617999</th>
<th>732184</th>
<th>1468542</th>
<th>1294945</th>
<th>1301938</th>
<th>1059660</th>
<th>1547086</th>
<th>1324150</th>
<th>201600</th>
<th>9527900</th>
</tr>
</thead>
<tbody>
<tr>
<td>nLEP 2010 / weighted ha</td>
<td>564651</td>
<td>660647</td>
<td>1361066</td>
<td>1214254</td>
<td>1211558</td>
<td>956963</td>
<td>1468060</td>
<td>1257003</td>
<td>187648</td>
<td>8881851</td>
</tr>
</tbody>
</table>

**Change in nLEP 2000-2010**

| -18370 | -17114 | -11993 | -11779 | -6608 | -19097 | -11932 | -5697 | -29079 | -131670 |

**Change in nLEP index % 2000-2011**

| -3.2 | -2.5 | -0.9 | -1.0 | -0.5 | -2.0 | -0.8 | -0.5 | -13.4 | -1.5 |

### Net Landscape Ecosystem Potential (NLEP) 2010 by

- SELU [a], River basins [b] and Districts [c]
Coastal ecosystems play important role in Mauritius and a test has been done in a domain where little practical accounting experience exists. The methodology for land ecosystems has been extended to the lagoons for which ecosystem accounting units (EAU) have been defined and mapped. A test account of been produced using the inventory of “Environmentally Sensitive Areas”, using the indicator of coral reefs vulnerability, on the one hand and urban pressure on coastal ecosystems on the other hand. The conclusion is that the SEEA-ENCA methodology can be implemented in full.

**Table B - Sea Ecosystem Coastal Units / Only for test with coral reefs vulnerability index; 2000 = 100.**

<table>
<thead>
<tr>
<th>Coastal reef index</th>
<th>2002</th>
<th>65%</th>
<th>2010</th>
<th>No coast</th>
<th>2157</th>
<th>No coast</th>
<th>1821</th>
<th>814</th>
<th>No reef</th>
<th>9154</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional coral reef stock (bio-carbon not available) (ha x 10)</td>
<td>2220</td>
<td>658</td>
<td>1472</td>
<td>No coast</td>
<td>2167</td>
<td>No coast</td>
<td>1821</td>
<td>814</td>
<td>No reef</td>
<td>9154</td>
</tr>
<tr>
<td>SECU/Lagoons area ha</td>
<td>6109</td>
<td>1324</td>
<td>45083</td>
<td>No coast</td>
<td>45136</td>
<td>No coast</td>
<td>45952</td>
<td>14540</td>
<td>537</td>
<td>226901</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>No coast</td>
<td>100</td>
<td>No coast</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Coral reefs index 2010</td>
<td>92</td>
<td>87</td>
<td>88</td>
<td>No coast</td>
<td>91</td>
<td>No coast</td>
<td>91</td>
<td>91</td>
<td>100</td>
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</tr>
<tr>
<td>SECU/Lagoons capability/coral reefs, 2000</td>
<td>222000</td>
<td>65800</td>
<td>1472000</td>
<td>No coast</td>
<td>216700</td>
<td>No coast</td>
<td>182100</td>
<td>81400</td>
<td>No reef</td>
<td>9154000</td>
</tr>
<tr>
<td>SECU/Lagoons capability, coral reefs 2010</td>
<td>2080327</td>
<td>570745.8</td>
<td>1251775.3</td>
<td>197581.6</td>
<td>1653196.5</td>
<td>765009.99</td>
<td>8307927</td>
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<tr>
<td>Net change in lagoons ecosystem capability 2000-2010, in ECU, vol</td>
<td>-171673</td>
<td>-87254</td>
<td>-180225</td>
<td>0</td>
<td>-191316</td>
<td>0</td>
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<td>-47795</td>
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<tr>
<td>Net change in lagoons ecosystem capability 2000-2010, in ECU, % v</td>
<td>-7.7</td>
<td>-13.3</td>
<td>-12.2</td>
<td>-8.8</td>
<td>-9.2</td>
<td>-5.9</td>
<td>-9.2</td>
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</tr>
</tbody>
</table>

**Provisional**
Ecosystem capital capability and change

Ecosystem Capital Capability:
ECU value by Socio-Ecological Landscape Units, 2010

Ecosystem Capital Capability (inland):
Change in ECU value, % by Socio-Ecological Landscape Units, 2000-2010

Provisional
Total Ecosystem Capital
Capability
= One resource (e.g. biocarbon) x ECU-price

Composite index of ecosystem capability (ECU-Price)

Calculation of ecosystem’s ecological value in ECU

NON ADDITIVE

Accessible Basic Resource (tons, joules)

Stocks, Supply & Use

Sustainable use index

Change in health index (incl. stability of carbon pools)

Sustainable use index

Change in health index (incl. pollution)

Sustainable use index

Change in health index (incl. biodiversity, diseases...)

Stocks, Supply & Use

Accessible Basic Resource (m3, joules)

Stocks, Supply & Use

Accessible Basic Resource (weighted ha or km)

Stocks, Formation & Consumption,

Accessible Basic Resource
(weighted ha or km)

Biomass/Carbon

Biodiversity/Functional Services

Water
Conclusions

• We hope to have demonstrated the critical need and usefulness of statistics (e.g. socio-economic and environmental) to frame and support policy decision making in order to build the resilience of island states

• The focus of the presentation was not on the generation of statistical data but rather on their application

• Please contact the IOC (christophe.legrand@coi-ioc.org) or SM (for ENCA-Mauritius) for details of these studies.

THANK YOU