GLOBAL ENVIRONMENT OUTLOOK

UNEP

GEO SIDS

SMALL ISLAND DEVELOPING STATES OUTLOOK





ISBN: 978-92-807-3405-8

Job Number: DEW/1828/NA

Disclaimers
The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of UNEP concerning the legal status of any country, territory or city or its authorities, or concerning the delimitation of its frontiers or boundaries. For general guidance on matters relating to the use of maps in publications please go to: http://www.un.org/Depts/Cartographic/english/htmain.htm

Mention of a commercial company or product in this publication does not imply endorsement by the United Nations Environment Programme.

Suggested citation
UNEP 2014. GEO Small Island Developing States Outlook. United Nations Environment Programme, Nairobi, Kenya.

Production
United Nations Environment Programme
Division of Early Warning and Assessment
P.O. Box 30552, Nairobi, 00100, Kenya
Tel: (+254) 20 762-1234; Fax: (+254) 20 762-3927
E-mail: uneppub@unep.org
Web: www.unep.org

Credits
© Maps, photos, and illustrations as specified.

Cover images (from left to right):
Front: howamo/Shutterstock; Logan Abassi/UN Photo; John Wollwerth/Shutterstock; Wollertz/Shutterstock; Guido Amrein, Switzerland/Shutterstock
Back: Martine Perret /UN Photo; Sophia Paris /UN Photo; Kamira/Shutterstock; Michelle D. Milliman/Shutterstock; bikeriderlondon/Shutterstock

This report in the form of eBook and PDF can be viewed and downloaded at
http://www.unep.org/publications/

Cover Design
Audrey Ringler, UNEP

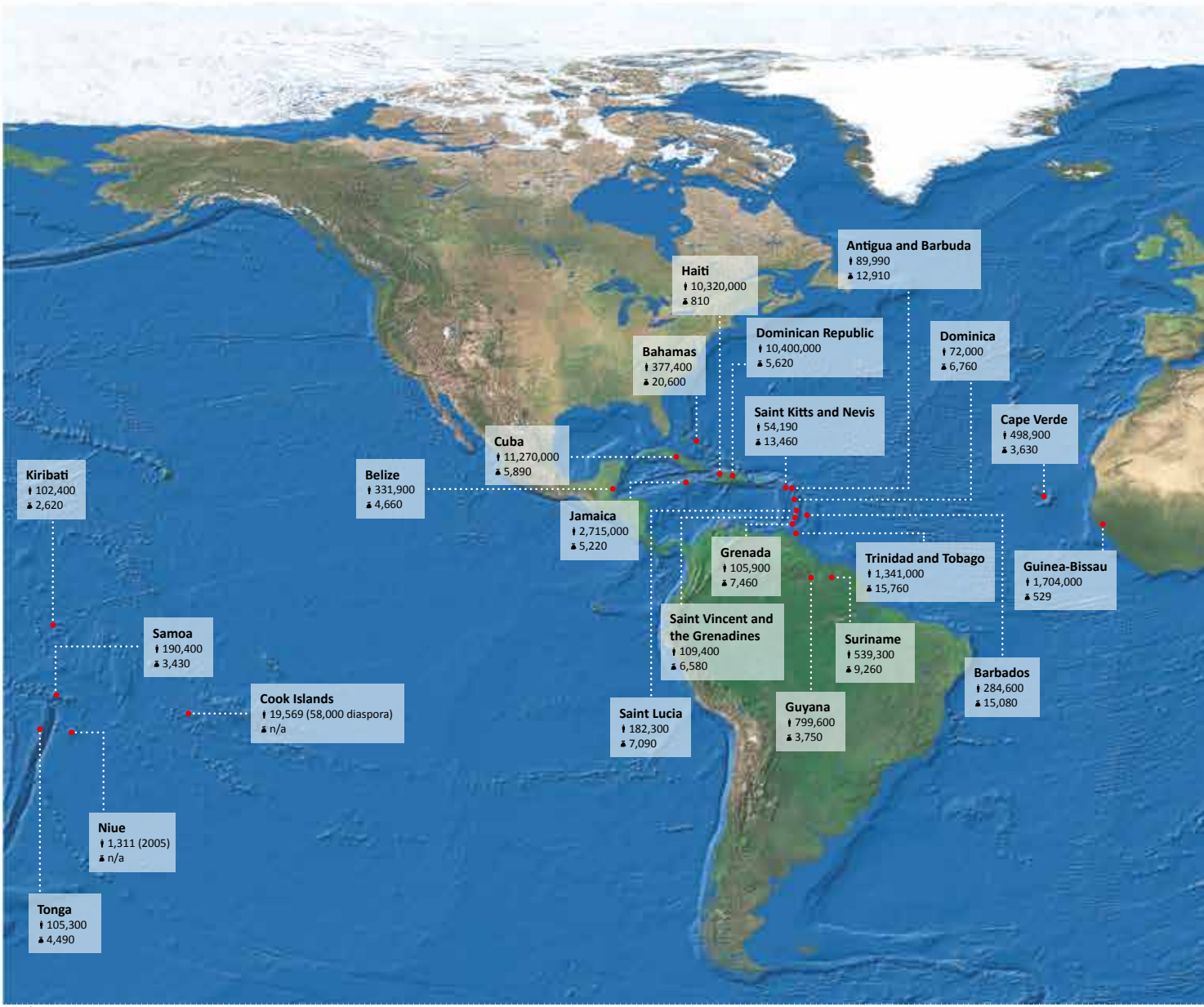
Layout and Printing
UNON/Publishing Services Section/Nairobi, ISO 14001:2004-Certified
D1 No: 14-01908/200 Copies/ August

GLOBAL ENVIRONMENT OUTLOOK

GEO SIDS

SMALL ISLAND DEVELOPING STATES OUTLOOK

UNEP



Source: World Bank

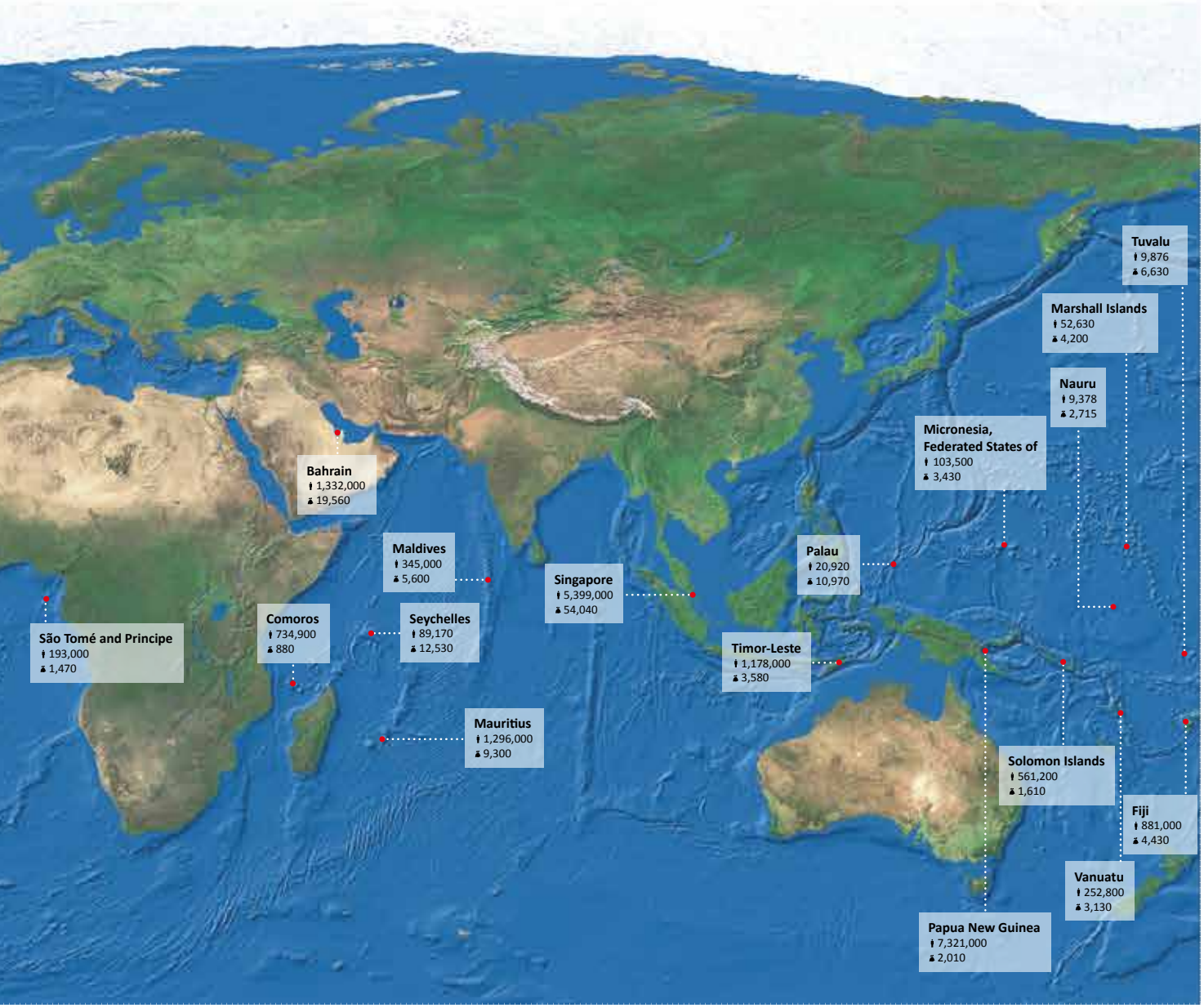
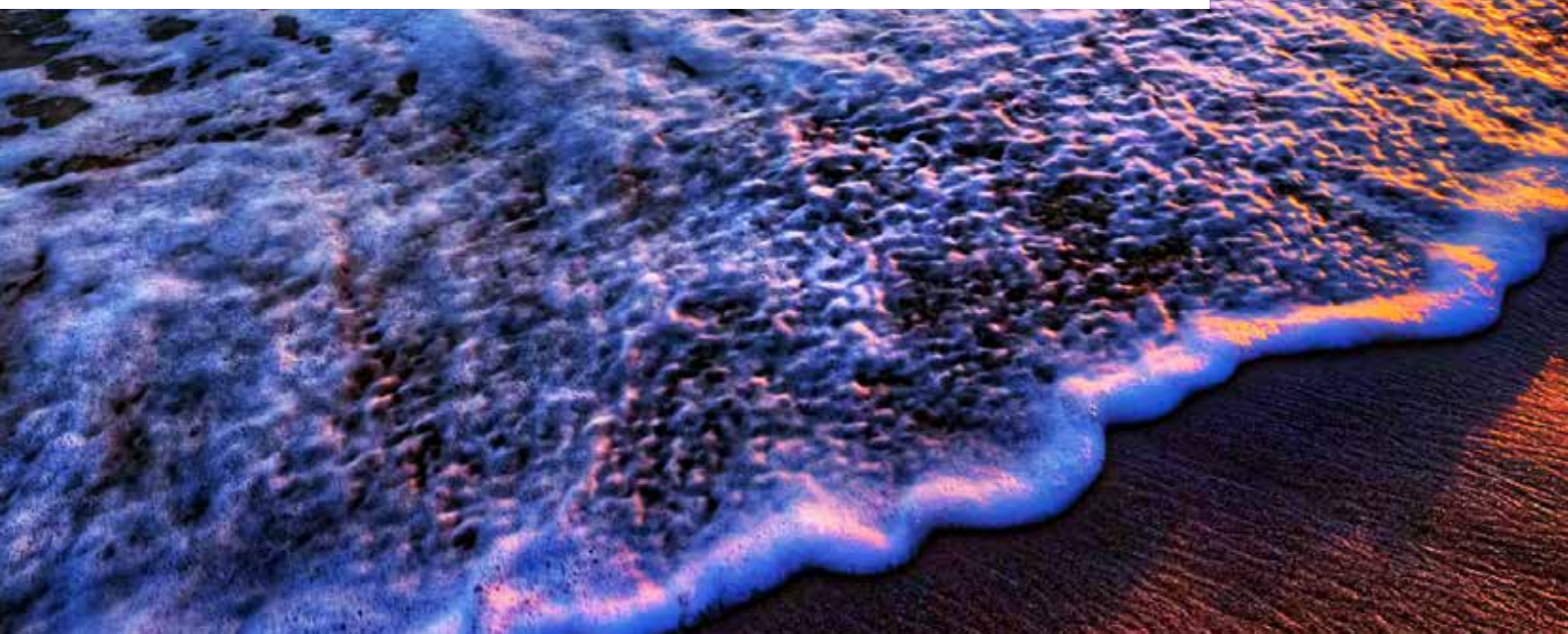

Tuvalu
9,876
6,630
Marshall Islands
52,630
4,200
Nauru
9,378
2,715
Micronesia, Federated States of
103,500
3,430
Bahrain
1,332,000
19,560
Maldives
345,000
5,600
Singapore
5,399,000
54,040
Palau
20,920
10,970
São Tomé and Principe
193,000
1,470
Comoros
734,900
880
Seychelles
89,170
12,530
Timor-Leste
1,178,000
3,580
Mauritius
1,296,000
9,300
Solomon Islands
561,200
1,610
Fiji
881,000
4,430
Vanuatu
252,800
3,130
Papua New Guinea
7,321,000
2,010

Table of Contents

Acronyms	v
Foreword	1
Chapter 1: SIDS State and Trends	2
Chapter 2: SIDS Outlook	16
Chapter 3: SIDS Policy Framework for Sustainability	38
References	47
Additional Information	49
Background to the Report	50
Acknowledgements	51



Acronyms

10YFP	10 Year Framework Programme
AIMS	Atlantic, Indian Ocean and South China Sea
AOSIS	Alliance of Small Island States
BPOA	Barbados Programme of Action
CBD	Convention on Biological Diversity
CCCCC	Caribbean Community Climate Change Centre
COPD	Chronic obstructive pulmonary disease
DC	Direct current
ECLAC	Economic Commission for Latin America and the Caribbean
EEZ	Exclusive Economic Zone
EM-DAT	Emergency Events Database
EV	Electric vehicles
FAESP	Framework for Action on Energy Security in the Pacific
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEO	Global Environment Outlook
GFN	Global Footprint Network
ICT	Information and Communications Technology
IPCC	Intergovernmental Panel on Climate Change
IT	Information Technology
ITA	International Tariff Agreement
ITU	International Telecommunication Union
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
MDGs	Millennium Development Goals
MPAs	Marine Protected Areas
MSI	Mauritius Strategy of Implementation
NCD	Non-communicable disease
PAs	Protected Areas
PCCP	Pacific Climate Change Portal
PET	Polyethylene terephthalate
PIFS	Pacific Islands Forum Secretariat
PI-GOOS	Pacific Islands Global Ocean Observing System
PNG	Pacific Network on Globalisation
REDD+	Reducing Emissions from Deforestation and Forest Degradation
REEF	Reef Environmental Education Foundation
SDGs	Sustainable Development Goals
SE4ALL	Sustainable Energy For All
SPREP	Secretariat of the Pacific regional environment programme
UN DESA	United Nations Department of Economic and Social Affairs
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
UN-OHRLLS	Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States

◄ Credit: Shutterstock/ West Coast Scapes

Foreword

The UNEP GEO SIDS Outlook is a follow-up to the UNEP/UN DESA Foresight Process report on Emerging Issues for Small Island Developing States helping to ensure that there is a SIDS voice in the UNEP Global Environment Outlook. It was developed as a contribution to the 2014 Third International UN Conference on SIDS and as input to the development of the post-2015 Sustainable Development Goals. At the core of the Outlook process was the UNEP Live Community of Practice on SIDS made up of government experts, scientists and policy-makers. An author group, drawn from the Community of Practice was invited to interpret what is known today about the state and trends in the SIDS environment and to articulate an ensemble of outlooks and policy choices options for the future.

The analyses show that SIDS have bountiful supplies of renewable resources and an island culture that is iconic of paradise. However, the challenges ahead are daunting. Isolation and remoteness coupled with climate change, natural disasters and out-migration means that even island life itself is being threatened. Global financial shocks and increasing fuel and food prices mean that even core economic sectors such as tourism will become vulnerable if a business-as-usual approach is adopted. While the future cannot be predicted, the development of plausible futures built on combinations of realistic outlooks can offer a basis for policy choices.

The UNEP GEO SIDS Outlook provides an ensemble of four island-centric futures: the blue-green economy; technology leapfrogging; priority to island community and culture; and reconnecting with nature. Elements of each can be combined to respond to the needs of a particular island or state. They are also not exhaustive, but have been developed to trigger the imagination and suggest lines for future reflection and consultation within and among SIDS policy-makers and wider groups of stakeholders. The report includes options for a SIDS sustainability policy framework, to help individual states consider future policies that best respond to their needs. Finally, a preliminary review of national submissions to the conference shows how much progress is already being made.

The report examines the diverse realities of island states and communities through an integrating approach, where environmental realities are woven into the future sustainable development fabric of SIDS. From the creation of local markets in electric vehicles to the use of social media to increase awareness of SIDS unique cultural heritage and ecosystem services, this report shows that there is much that SIDS can do proactively to anticipate environmental problems and their economic consequences or even avoid them through innovative planning and action. By developing just such an island voice in the global discourse, SIDS can ensure that they are not simply swept along by larger outside forces beyond their control. A boat adrift is in much greater danger than one underway with a tight helm.

I would like to extend my gratitude to the UNEP SIDS Community of Practice who contributed to this insightful report and to extend an invitation to all SIDS to engage with UNEP to help build the knowledge base that will be vital to making the blue-green economy a reality.

Achim Steiner

United Nations Under-Secretary-General and
Executive Director, United Nations Environment Programme

CHAPTER 1

SIDS State and Trends

Governments and the world at large are being confronted by accelerating change and environmental challenges to their economies and society. For many SIDS, the experience is even more dramatic and is felt more rapidly because of their small physical scale, geographic isolation, unique biodiversity[1], exposure to natural hazards and disasters, high population growth coupled with out-migration and significant seasonal in-migration from tourism, limited resource base, remoteness from global markets and small economies of scale[2]. There are multiple drivers and pressures, beyond global economic stagnation and population growth, affecting the outlooks for SIDS. These include vulnerability to climate change, local access to water, nutrition and food security, energy and transport demand, exploitation of natural resources, local sectoral development, poor management of waste and pollution, coastal squeeze and loss of ecological resilience. SIDS are also threatened by a range of emerging issues[3], such as social disintegration, and in some instances the disappearance of their national territory.

Regional aspects

SIDS in the Atlantic, Indian Ocean and South China Sea region, range from the volcanic archipelago of Cape Verde with a semi-desert climate, the savannah and mangrove swamps of Guinea Bissau and the rugged volcanic rocks of São Tomé and Principe located off the west coast of Africa, to the coral islands of the Maldives in the Indian Ocean, to the urbanized-tropical rainforest mix of Singapore. All face significant threats from climate change, sea level rise and natural disasters such as volcanic eruptions, heavy rains, floods and drought. Many have globally high endemism, and are home to important marine resources including sea turtles and dugongs. With the exception of Singapore, these are among the poorest countries in the world.

The Caribbean SIDS region lies within a tropical hurricane belt, covers nearly 2 million km^2 , averages 2,200 m in depth plunging to 7,100 m in the Cayman trench, receives run-off from eight major river systems, contains well developed seasonally stratified marine waters, and at least one dead zone. The islands range in size from 91 km^2 (Anguilla) to 110,860 km^2 (Cuba) with highly varied topographies and geology, including low-lying limestone and coral reef atolls and volcanic outcrops, and flora and fauna. The coastal ecosystems are a mixture of mangrove, sea-grasses and coral reefs while the terrestrial ecosystems are made up of 34 ecoregions all with high levels of endemism. Freshwater supplies are highly varied with Barbados one of the world's top ten most arid countries.

The Pacific region has a combined EEZ of close to 30 million km^2, with a land area of just over 500,000 km^2, of which Papua New Guinea comprises 83%. There are three distinct sub-regions: Melanesia has the greatest proportion of land and land-based mineral resources; Micronesia occupies the greatest sea area with the largest tuna resources, and Polynesia combines agriculture and marine resources. The size and ecological diversity of the states decrease from southwest to northeast, going from the high, forested islands of Melanesia to many tiny, sparsely vegetated atolls scattered across the central Pacific. Despite having the world's highest proportion of endemic species per unit of land area, the biodiversity is among the most critically threatened. Smaller islands in particular are ecologically fragile and jeopardized by invasive alien species and pests.

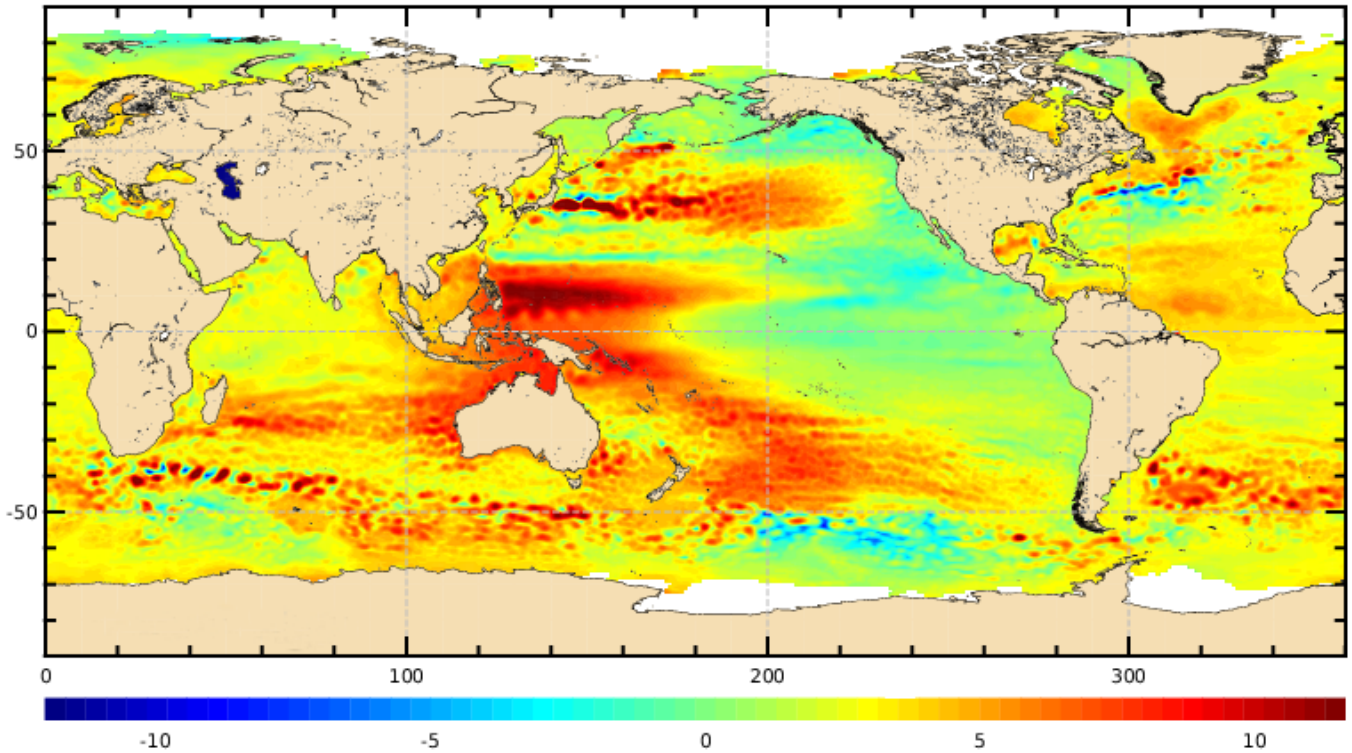
Climate change and variability

SIDS produce less than one percent of global greenhouse gases, yet they are among the planet's most vulnerable countries regarding climate change[4]. The threats include sea level rise, extreme storm events and droughts, coastal erosion, inundation, saltwater intrusion into groundwater systems in low-lying atolls, coral bleaching, ecosystem destruction, ocean acidification, adverse effects on crops and fisheries and increases in vector-borne diseases.

Climate change is already having a significant impact on SIDS which is unlikely to abate. The socio-economic implications of sea level rise in particular will have negative impacts on virtually all sectors including tourism, financial services, agriculture, fisheries, water supply and sanitation, infrastructure and ecosystem health[4].

◄ Credit: Shutterstock/ Igor Zh

Regional mean sea level trends from January 1993 to December 2013 (mm/year)



Source: CNES/ LEGOS/ CLS 2014
http://www.aviso.altimetry.fr/en/data/products/ocean-indicators-products/mean-sea-level/products-images.html

The climate outlook for SIDS differs considerably depending on their topography and location. Low-lying islands are highly vulnerable to extreme weather events and sea-level rise[5]. In the western Pacific, where the rates of sea-level rise on islands, such as Tuvalu and Funafuti, have been recorded as up to 3 times the global average of 2.8-3.6 mm/year, islands are also susceptible to extreme sea level events such as storm surges and tidal waves[6,7]. Under the latest IPCC scenarios for a global average temperature increase of approximately 4°C, sea level rise could be as much as one metre by 2100 and higher levels thereafter[4-8]. SIDS would be severely affected as almost 30% of the population lives in areas less than 5 metres above sea level[9].

Climate change is also having an impact on island ecosystems. Mangroves are undergoing seaward extension, because of increased sedimentary run-off and reefal accretion, as well as loss due to sea level rise[10]. Antigua and Barbuda are currently losing 1.5-2% of their mangrove ecosystems due to a 3-4 mm sea level rise; a projected sea level rise of 10 mm per year would mean the disappearance of mangroves by 2035[11]. Ocean warming is causing changes in fish migratory patterns because of shifts in ocean currents, with economic implications for key fisheries such as tuna[12]. Repeated thermal stress is causing widespread coral bleaching[13,14] and reduced reef calcification; and ocean acidification is affecting the viability of reef ecosystems[15]. Terrestrial systems are also widely affected by changes in rainfall patterns and increasing air temperatures, which are causing the loss of some of the world's most threatened ecosystems such as tropical montane cloud forests[16].

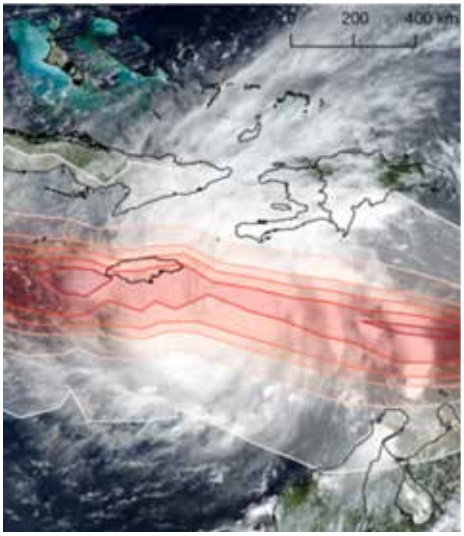
Beyond these direct impacts, island populations must cope with future climate uncertainties such as forced or voluntary displacement, the loss of access to their territory and territorial waters and the revenues they generated from them[17,18].

SIDS have taken significant steps over the past decade to address climate change through a variety of means; 38 SIDS have ratified the United Nations Framework Convention on Climate Change, and a range of regional activities and partnerships have been developed such as the South Pacific Sea Level and Climate Monitoring Project, the Pacific Islands Global Ocean Observing System (PI-GOOS), the Pacific Climate Change Portal, and the Caribbean Community Climate Change Centre (CCCCC).

Natural and environmental disasters

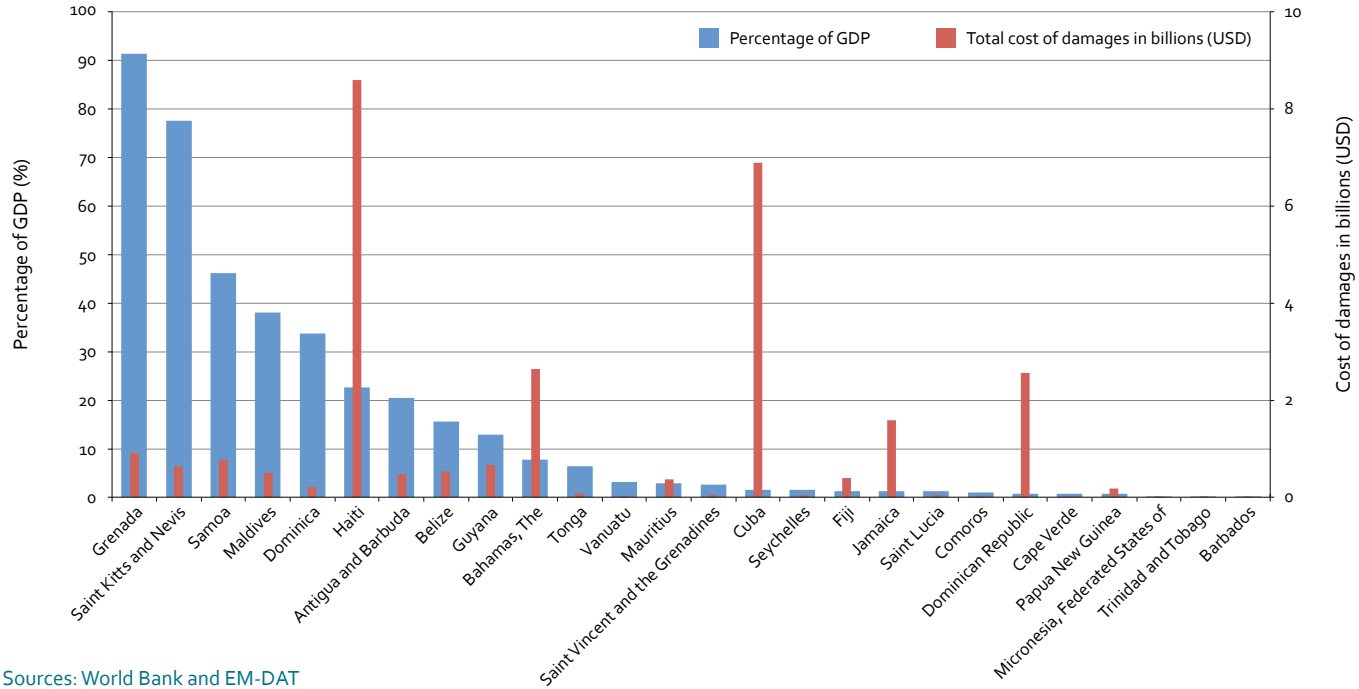
SIDS are disproportionately affected by natural disasters (e.g. earthquakes, volcanic eruptions, and landslides), and hazards due to the poor management of industrial activities

Satellite image of tropical cyclone Ivan on 10 September 2004



Source: UNEP/GRID-Geneva 2014 Saffir-Simpson categories http://preview.grid.unep.ch

Total cumulative costs of damage from natural disasters from 1990 to 2013 and as percentage of cumulative GDP



Sources: World Bank and EM-DAT

and disposal of chemicals, waste and pollutants because of their physical size and location. The overall costs of disasters to the SIDS economies are significant especially for smaller islands where the cumulative total cost over the past two decades can be as high as 90% of GDP, setting back economic development gains by several years.

The estimated average annual losses from tropical cyclones are significant, from more than USD12 million in Fiji to around USD60 million in the Dominican Republic[19]. Hurricane Tomas on Saint Lucia in October 2010 was estimated at 43.4% of GDP, nine times agricultural GDP, three times tourism GDP, 62% of exports of goods and services, 19% of gross domestic investment and 47% of public external debt[20]. It has been estimated that in the Caribbean, changes in annual hurricane frequency and intensity could result in additional annual losses of USD446 million by 2080, incurred mainly from business interruption to the tourism sector[21].

In the case of storms, islands are often at a distinct disadvantage, because the eye of the storm can exceed the size of a whole island. When Heta hit Niue, it covered the whole island, making it impossible for people to move out of its path. Half of Alofi's commercial sector was wiped out, taking with it the island's communication and power sources, as well as many stores of freshwater. In the wake of the winds, huge waves hit the island and washed away many of the islander's homes, and destroyed a hospital. Damage amounted to around USD110 to 150 million. Even for more developed islands such as Jamaica, the size of storms represent a significant risk to SIDS. Tropical cyclone Ivan which reached the maximum wind Saffir-Simpson category of V (corresponding to wind higher than 250 km/h) killed 17 people and left 18,000 people homeless, creating damage with a total cost of USD360 million; in Grenada it caused nearly USD1 billion of damages.

Natural resources

Overexploitation of local resources, changes in land use, coastal zone development, uncontrolled mining, land- and marine-based pollution and climate change are all driving changes such as the loss of endemic species; the spread of invasive alien species; deforestation; the loss of soil productivity; diminishing sources of freshwater; increased eutrophication; saline intrusion; coastal erosion through excessive sand extraction; and the spread of vector-bone diseases.

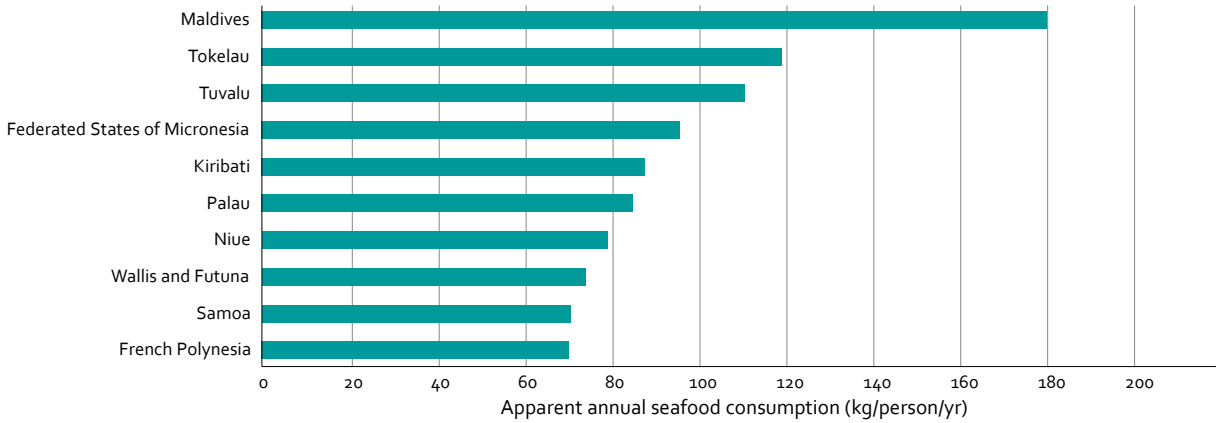
There is wide recognition of the importance of natural resources to livelihoods in many SIDS communities, compared with other parts of the world, and awareness of the critical role of ecosystem services in maintaining them is growing. SIDS have a unique biodiversity and high levels of endemism, however many species are vulnerable to change. The proportion of threatened species in AIMS is the highest of the SIDS regions with 17.5% of plant species and 20.4% of animal species; in the Caribbean, the level is 8% of plant species and 7% of animal species; and in the Pacific, 18.1% of animals are highly threatened and 8.9% of plants[22].

For many SIDS, the marine area within their EEZs far exceeds the land area. They hold important resources such as natural gas and minerals, and supports extensive fisheries. Of the world's ten countries most dependent on fish and seafood consumption, seven are SIDS[23].

The status of marine ecosystems around SIDS varies greatly, ranging from pristine to highly degraded. Overfishing and the depletion of stocks often occur where management and enforcement are insufficient. Reduced fish catches result in reduced incomes, exports, and food for local communities. Additionally, certain practices, such as trawling and dredging, may result in physical damage to fisheries, other non-target species, and marine habitats.

The Caribbean has experienced significant coral reef degradation, including from algal smothering due to the loss of herbivorous fishes, pollution, and destructive fishing practices[24]. While some Indo-Pacific reefs experience faster recovery rates following disturbances[25], they too exhibit signs of decline due to climate stressors and outbreaks of coral-eating starfish[26]. In all regions with coral reefs, sedimentation negatively impacts coral reef ecosystems.

Coral reef countries and territories with the highest fish and seafood consumption



Source: Burke et al. 2011
http://pdf.wri.org/reefs_at_risk_revisited.pdf

Marine invasive species have become a focus of concern in many SIDS. In less than a decade, the Indo-Pacific lionfish *(Pterois volitans)* has become widely established in the southeast United States and throughout the Caribbean. This highly predatory fish is spreading rapidly and reducing the abundance of key herbivores, thus altering fish communities in reefs. Lionfish occupy the same trophic position as economically important species (e.g. snapper and grouper) and may hamper stock rebuilding efforts and coral reef conservation measures. Longer-term impacts of lionfish abundance could be growth rate reduction of the wave-breaking reef crests, which help to protect coastlines from erosion. Across the Caribbean, people are being encouraged to consume lionfish as a means to lower their numbers.

Deep-sea environments, which are often beyond the reach of many SIDS, are highly sensitive to disturbance. Deep-sea mining can potentially damage habitats in ways that can require decades of recovery, assuming recovery is possible[27]. The potential impacts and risks of new and proposed energy exploitation devices, such as underwater turbines and wave-based generators, are also currently not well understood. Exploitation of deep-sea living and non-living resources in the near future will likely involve foreign operations, and therefore require (international) regulation and continuous evaluation.

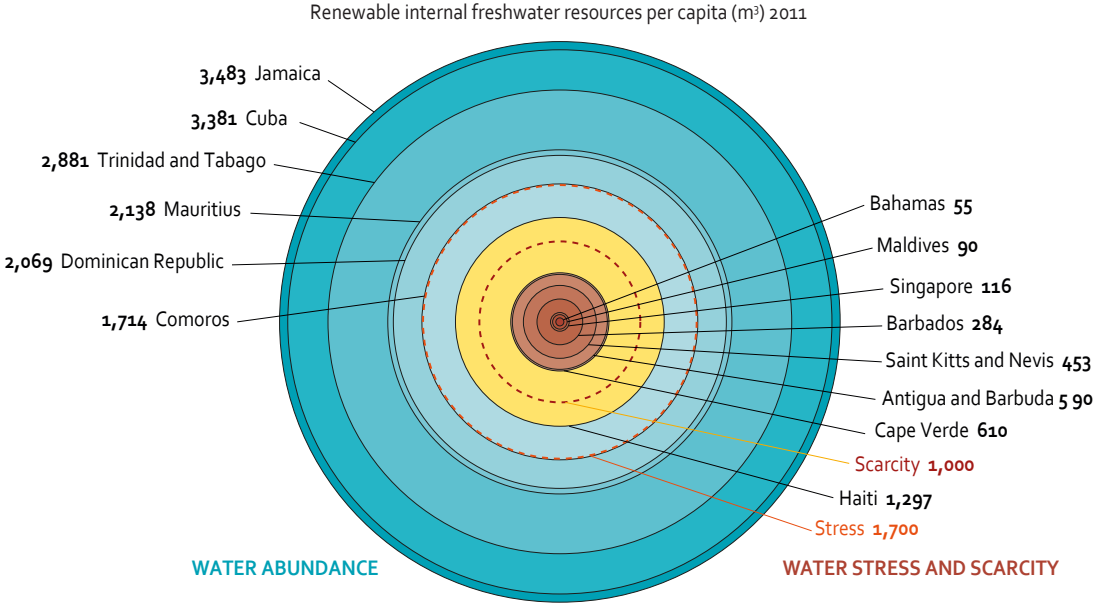
Land degradation is also a key concern in SIDS. Loss of productive areas for food production and forests is being driven by growing populations, displacement of settlements and land tenure conflicts, mining, and illegal logging.

Trade in high quality beach sands, both legal and illegal, has reduced the total size of some islands, e.g. Barbuda, impacting adjacent coastal areas and associated infrastructure. This threatens future tourist development. Unmitigated sand mining also results in increased turbidity that could smother marine organisms and ultimately lead to beach depletion[28].

Water

Most SIDS are experiencing increasing shortages of freshwater, poor water quality due to human and animal waste and limited capacity of waste management as well as climate change drivers and impacts. Some of the unique features of SIDS such as limited surface area, greater sensitivity to natural disasters, and highly permeable aquifers in close proximity to seawater, render their freshwater resources even more vulnerable[29-31].

SIDS freshwater availability



Source: World Bank statistical database

In 2007, the World Bank gave an estimate of the availability of freshwater in the SIDS: Jamaica was ranked as most abundant with 3,514 m³/person/year; Haiti, stressed at 1,338 m³/person/year while the Bahamas' freshwater was the scarcest at 60 m³/person/year. However, the 2014 World Bank statistics show a decline in the availability of freshwater: Jamaica, 3,483 m³/person/year ; Haiti, 1,297 m³/person/year and the Bahamas 55 m³/person/year [32].

Besides contamination by human and livestock wastes, deforestation, pollution from industrial and agricultural activities, losses from storage and delivery systems, over-abstraction, sand and gravel mining from freshwater source areas, saline intrusion from over-extraction and rising sea level contribute to water quality and quantity stress on SIDS. For example, in South Tarawa, Kiribati, where potable water is drawn exclusively from aquifers and harvested rainwater, contamination of the aquifers pose a threat to the quality of drinking water[33]. Deposition of air-borne contaminants from local and distant sources as well as drought flooding also affects surface and groundwater. This problem is expected to increase in response to demographic pressure and sea-level rise.

Declining water quality has adverse impacts on human well-being. For instance, the primary cause of 6% of deaths in Papua New Guinea was attributed to diarrhoea, which is often related to poor water quality. Furthermore, adequate freshwater is important for the continued growth of the tourism, agriculture and other sectors of the SIDS economies.

Progress towards the Millennium Development Goal of improving access to safe drinking water has been very poor in most SIDS regions. According to the 2013 Pacific region MDGs tracking report, only six of the 14 countries are on track to meet the region's target, while the AIMS region is lagging even further behind[34]. In fact, some countries, including Comoros, Maldives, and Samoa are showing a reverse trend[2].

Waste and pollution

In many SIDS, the disposal of growing levels of imports of non-biodegradable materials, and industrial and agricultural chemicals pose an increasing challenge. There remains a critical problem with the disposal of e-waste and non-degradable waste, and with managing pesticides and

other toxic chemicals, especially those accumulating from pollution on land and in the ocean.

Marine plastics, in the form of microplastics and beads, are of particular concern to SIDS; not only are they taken up into the food chain, but they are also a source of heavy metal contamination when deposited on beaches around the world[35].

As SIDS continue to improve their standard of living and develop their economies, consumption and disposal patterns will change. Consumer goods and products often generate significant amounts of waste of various forms. With under-developed infrastructure and inappropriate waste management, the risk of direct impacts on human and environmental health increases.

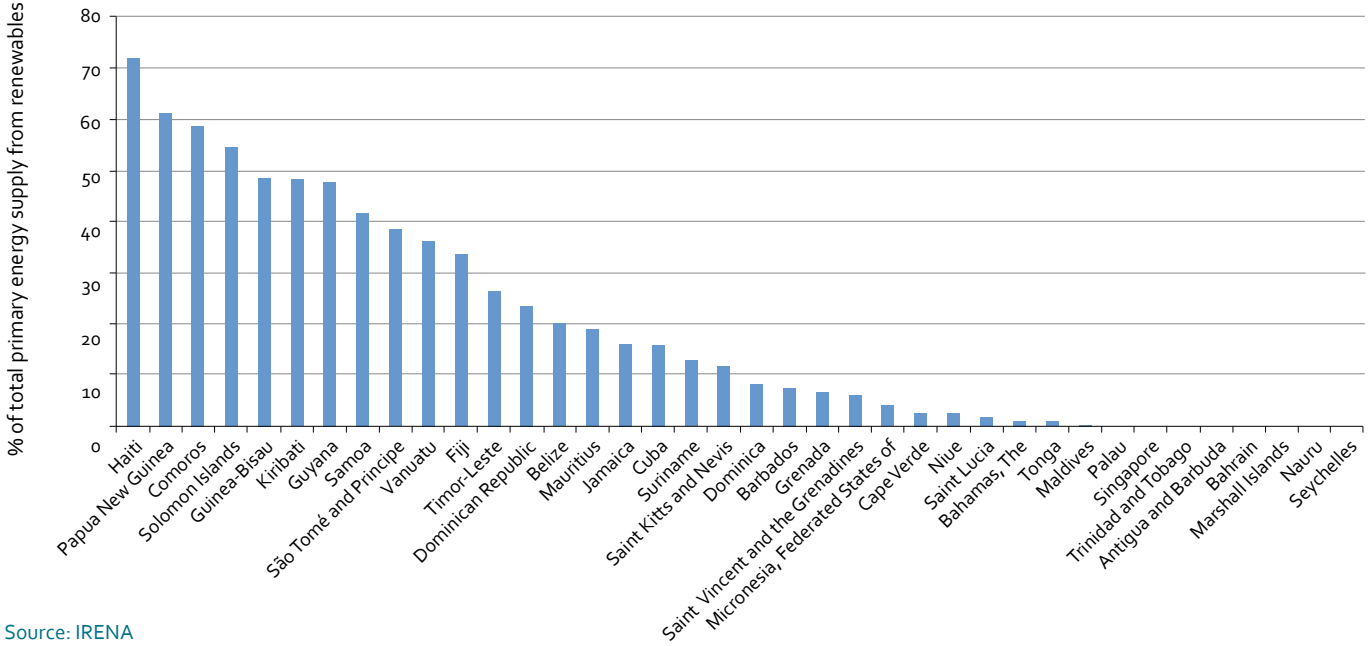
A strong driver of both consumption and waste production is tourism[36]. Major waste streams from this sector include waste and wastewater from cruise ships, yachts and hotels, packaging wastes especially from imported food and drinks, construction waste and e-waste from renovation of hotels. In the Caribbean, annual tourist numbers of more than 75 million night stays, are estimated to generate as much of 166 million tons of waste.

Recycling is generally not well developed in most SIDS because of the low levels of recyclable waste, a lack of a recyclables market, the need for expensive transportation for any recycled materials, the cost of recycling technologies, and limited human capacity. Only one in five Pacific countries surveyed recycle more than half their waste; two in five recycle 15% of their recyclable goods[37]. Remaining waste is often disposed or burned improperly.

Energy

The SIDS energy sector is characterised by long supply lines, price fluctuations, high energy cost to consumers, ageing energy infrastructure, as well as poor economies of scale. The main source of energy in SIDS for power generation,

Total primary energy supply from renewables, 2008-2010

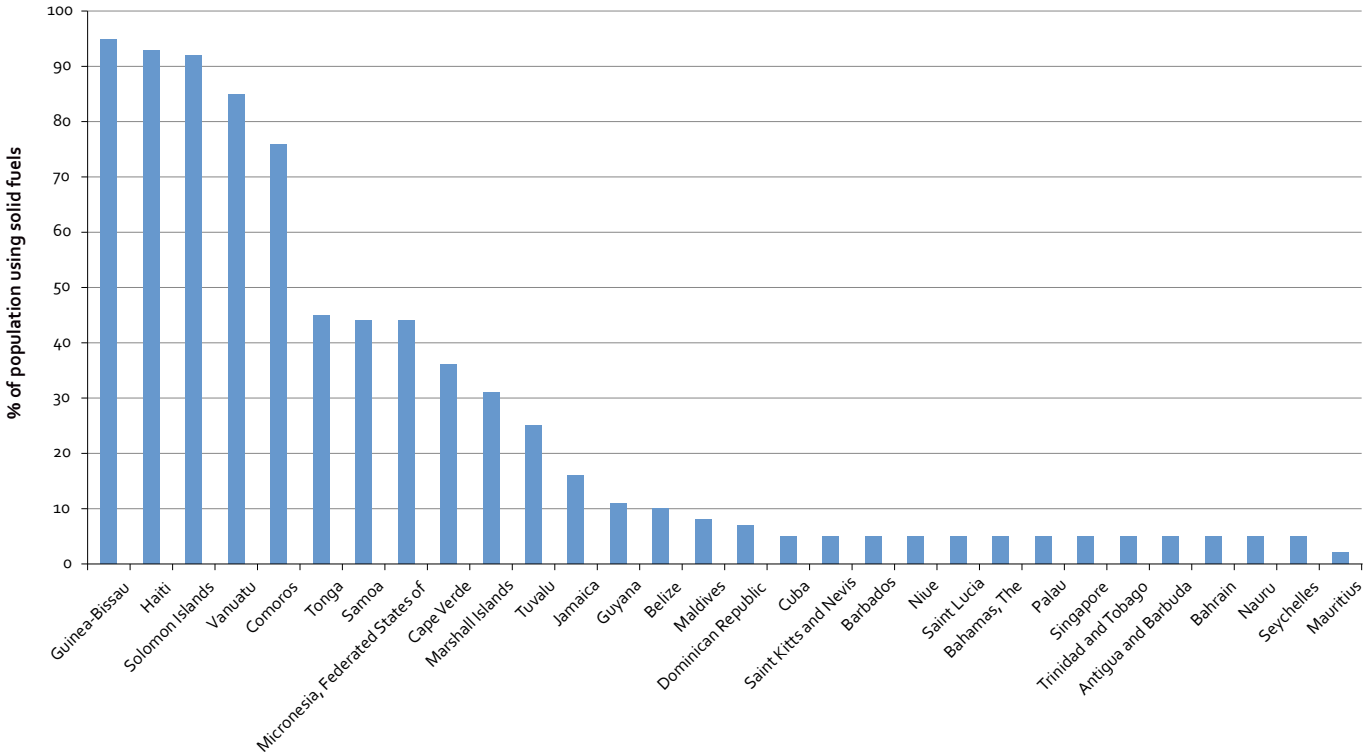


Source: IRENA

agriculture, and transport is fossil fuels, purchased from global energy markets. With the cost of oil imports and debt servicing reaching 60 to 70% of GDP, and a lack of access to concessionary international finance for most, SIDS remain highly vulnerable to fuel price fluctuations. Increases in petroleum prices between 2002 and 2008 cost most Pacific island countries about 10% of their gross national incomes, with impacts falling disproportionately on those with low incomes. On average, Pacific island households spend approximately 20% of their household income on energy[38].

Many SIDS are now pursuing domestic renewable energy sources, such as solar and wind for a more sustainable power production system. The Bahamas has a potential of more than 100 TWh per year with appropriate technologies, 47 times the present power demand of the island[39]. Through the Sustainable Energy For All (SE4ALL) initiative, many SIDS are undertaking expansion of their renewable energy sector and by 2030, they should increase the deployment, penetration, and efficiencies of renewable sources using existing cost effective technologies. Technological options include the increased use of solar, wind, and tidal sources, increasing efficiencies at all levels across the widest possible range and of utility and residential scales[40]. Technical solutions exist to increase energy conservation and energy efficiencies across all sectors in the economy and some have been deployed. Deployment of renewable options has significantly avoided emissions and their environmental impacts[41]. Taking advantage of smart technologies in the energy sector can form part of the solutions to address human well-being.

Share of population using solid fuels, 2008-2010



Source: IRENA

Summary table of SIDS energy issues

	High	Low	Comments
Fossil fuel dependence	✓		Most electricity is sourced from diesel-powered generators and transport is solely powered by fossil fuels
Biofuel use		✓	Limited capacity and involves significant risks for smaller SIDS as biofuel production could raise the price of energy crops, making them more vulnerable as import dependent countries
Access to electricity	✓		Increasing access for rural areas has been a significant development by SIDS over the last 20 years
Energy costs	✓		Pacific Islands spend on average up to 20% of their household incomes on energy needs
Total energy supplied by modern renewables		✓	With some exceptions in larger islands with hydroelectric capacity
Electrical transmission losses	✓		Aging infrastructure and maintenance are the predominant issues here
Potential for renewables	✓		Wind, solar, tidal, and geothermal have huge potential for SIDS
Investment and planning in renewables	✓		Most SIDS have policy objectives and are seeking investments to expand renewable energy and diversify supplies

Other options linking agriculture (e.g. bagasse, ethanol production from sugar cane), forestry, and the waste sector in waste-to-energy conversion technologies exist but are limited due to available land and financing. The use of biomass fuel in homes, mainly least developed countries, translates to increased morbidity, respiratory infections, lung cancer and chronic obstructive pulmonary disease (COPD).

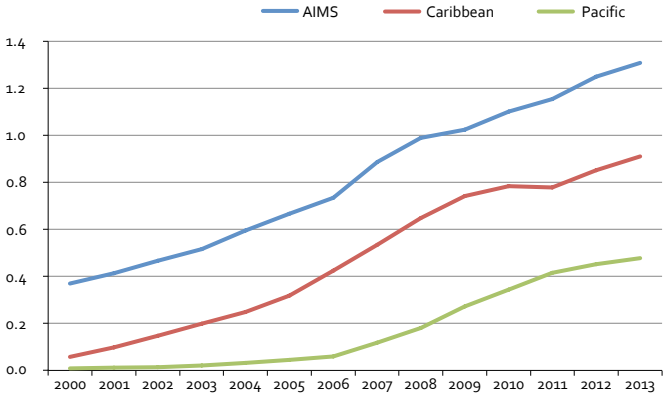
The challenges facing SIDS to advance renewable energy penetration further can be attributed to technical constraints (e.g. intermittence of supplies, meeting base load), finance and investment (e.g. high capital cost of investments, sunk investment in fossil fuel technologies), appropriate scales (e.g. smart technologies, waste-to-energy conversion technologies) and lack of enabling institutional frameworks.

Sustainable economic development

At the macro-economic level, SIDS are often highly dependent on a limited number of sectors including agriculture, fisheries, forestry, mining and tourism[42]. The isolation of SIDS increases costs and distance from markets, and on some islands the large seasonal influxes of tourists place significant stresses on local infrastructure and resources. SIDS are highly dependent on air transport and shipping services to support their economies. However, these capabilities are deteriorating because of inappropriate and ageing ships, the ever-increasing concentration of liner shipping companies and the expansion of hub ports that require trans-shipment services[43].

Preferential export regimes, inherited from historical times, are being phased out, and global product standards are creating new trade barriers. Some SIDS have established offshore tax havens and shipping registries to diversify their economies and are developing opportunities by creating financial services in new global or niche markets. Few have

Mobile-cellular telephone subscriptions per capita

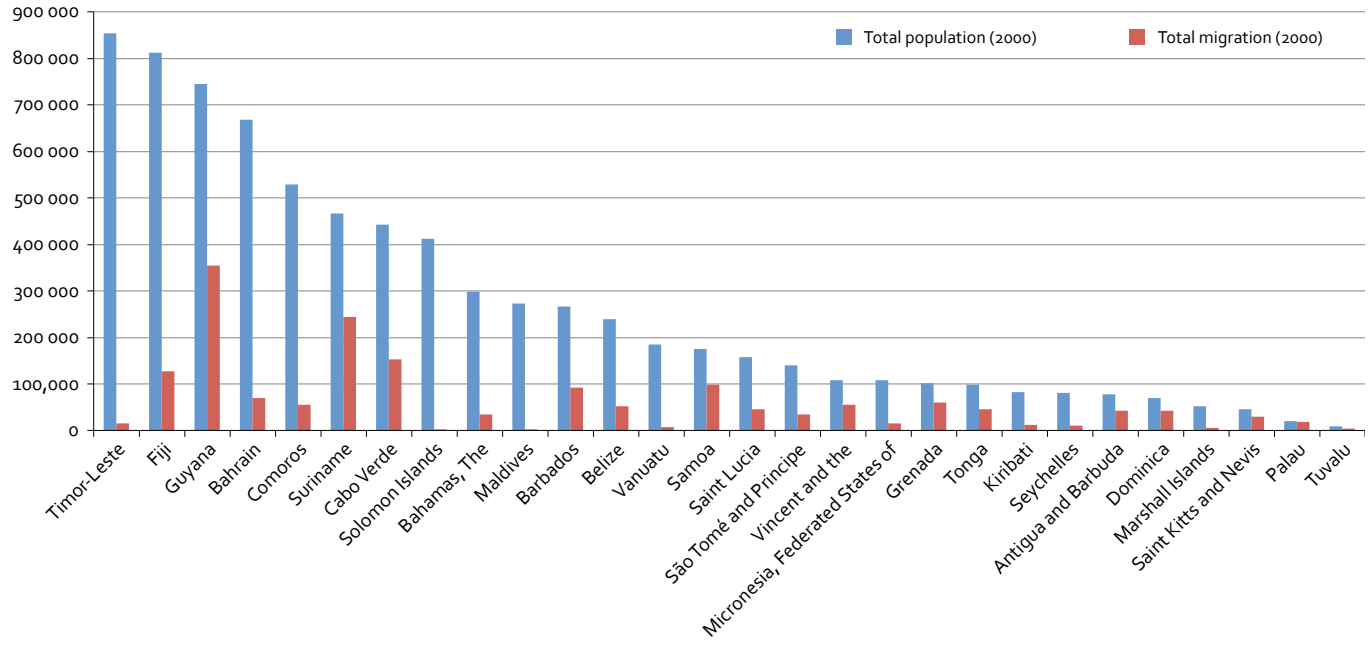


Source: ITU 2014. Core indicators on access to and use of ICT by households and individuals

a sustainable economic structure, some are highly indebted, and most are dependent on external aid and remittances.

Most SIDS lack economies of scale to face the increasing numbers of global competitors. They import products and technologies that may be inappropriate in small communities, and which often present problems for waste disposal leading to unacceptable risks to human health and the environment. Since 1970, growth in the SIDS economies has lagged behind the world average in most years. The customary use of GDP as a measure of progress, however, is particularly inappropriate for islands with large subsistence sectors, traditional cultures, and large externalities. For example, the ecological footprint which measures an island's global consumption through land use ranges from 5.3 global hectares per capita for Singapore to 0.7 for Haiti[44].

Comparison between total population and out-migration in the SIDS



Source: World Bank and Global Bilateral Migration

A number of SIDS are now considering the use of natural capital accounting as a more appropriate way of estimating the value of their ecosystems in their economies[45]. The limited export opportunities in most SIDS means that the maintenance of diversified informal sectors, along with emerging limited commercial sectors, is seen as a means of poverty prevention and of providing resilience against environmental, economic and social change, especially in rural, outer islands and growing peri-urban areas[46]. Several initiatives are currently ongoing to develop appropriate measurements of progress in the context of SIDS that take into consideration their ecological, cultural, and socio-economic characteristics[2].

SIDS often lag behind in the adoption of new technologies and innovation, and the lack of qualified human resources makes introduction and maintenance of such technologies problematic. While islands have potential renewable energy resources, they have been slow in exploiting these to replace imported fossil fuels. This is due to the high cost to local economies, existing investment in fossil fuel-based infrastructure, and lack of appropriate policy, legislation and regulations to facilitate renewable energy development. They do, nevertheless, have indigenous technologies and innovations that should be documented and shared, and generally need smart technologies appropriate to small and isolated islands. A good example of a SIDS-wide technology trend, is the spread of social media, as evidenced through the usage of mobile phones, to provide connectivity across islands and social cohesion amongst the various diaspora.

Health

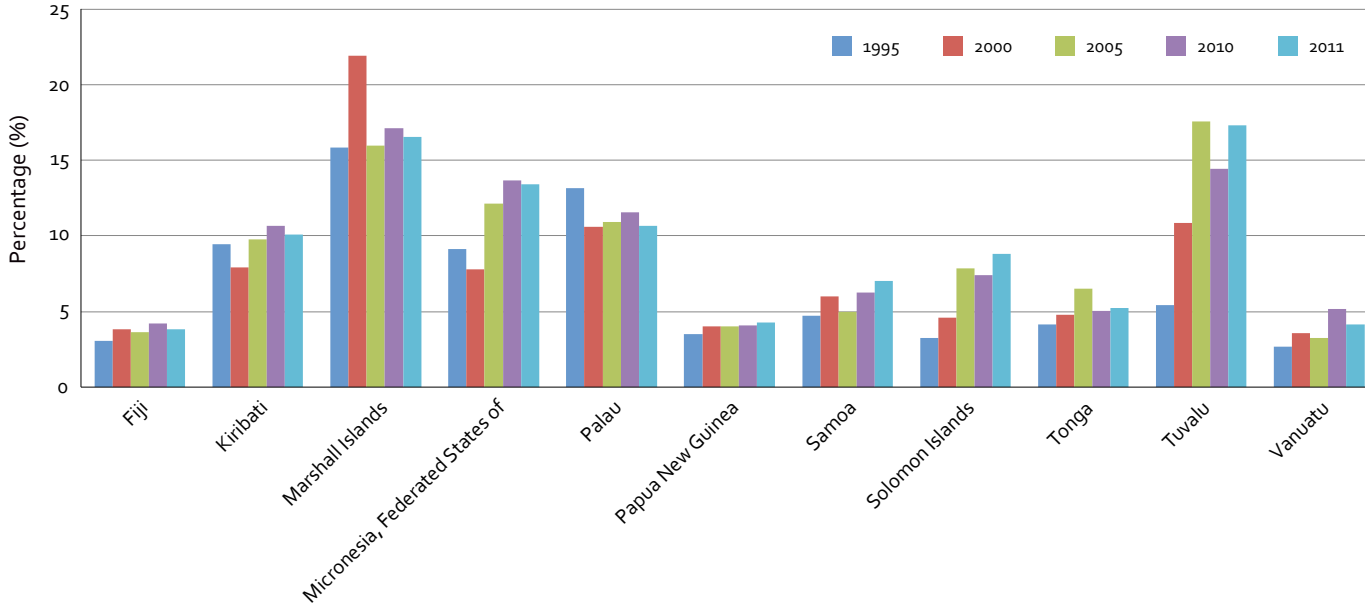
The demographic balance in certain SIDS is a serious issue, with a lack of family planning leading to high population growth rates[47]. This is partially balanced by out-migration to urban centres and non-SIDS, leaving predominantly the elderly and children on outer islands and in rural areas. The loss of young workers and the brain drain reduce local capacity since the lack of opportunity pushes the best and brightest to look elsewhere[2].

Human well-being on islands has been much higher in the past than standard economic statistics would suggest, but globalization is bringing new challenges for human health and welfare in island communities. Health expenditures have been broadly maintained but range across the SIDS; in 2011, health expenditures ranged from 4-17% of GDP, with the highest levels being in the Pacific region.

Non-communicable diseases (NCD) and obesity are rising along with the adoption of western diets and lifestyles. Traditional concepts of social acceptance and well-being are eroding as media and marketing sell the global consumer society. Growing populations, concentrated in urban areas,

Credit: UN Photo/Martine Perret

Health expenditures as % of GDP - Pacific

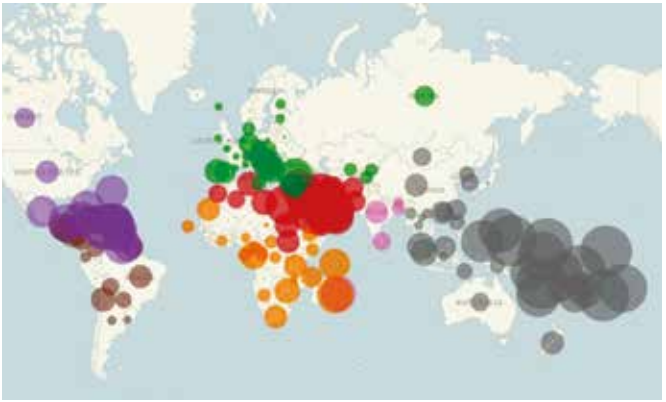


Source: World Bank, World Development Indicators

are putting stress on island resources and the health effects of unsafe water, poor sanitation and diets[48] increase. For example, over the past three decades, many Pacific SIDS have developed among the world's highest and most rapidly increasing incidences of nutrition-related NCDs, such as diabetes.

Nearly all of the SIDS lie within the top 60 countries in terms of the prevalence of diabetes with up to one third of the population in some cases being affected. This has led to premature mortality from diabetes, cardiovascular disease, obesity and some forms of cancer, which are related to dietary change from a nutrient-rich traditional diet to a diet of highly processed imported foods and a sedentary lifestyle[49].

Comparative prevalence (%) of diabetes (20-79 years) by International Diabetes Federation regions, 2013

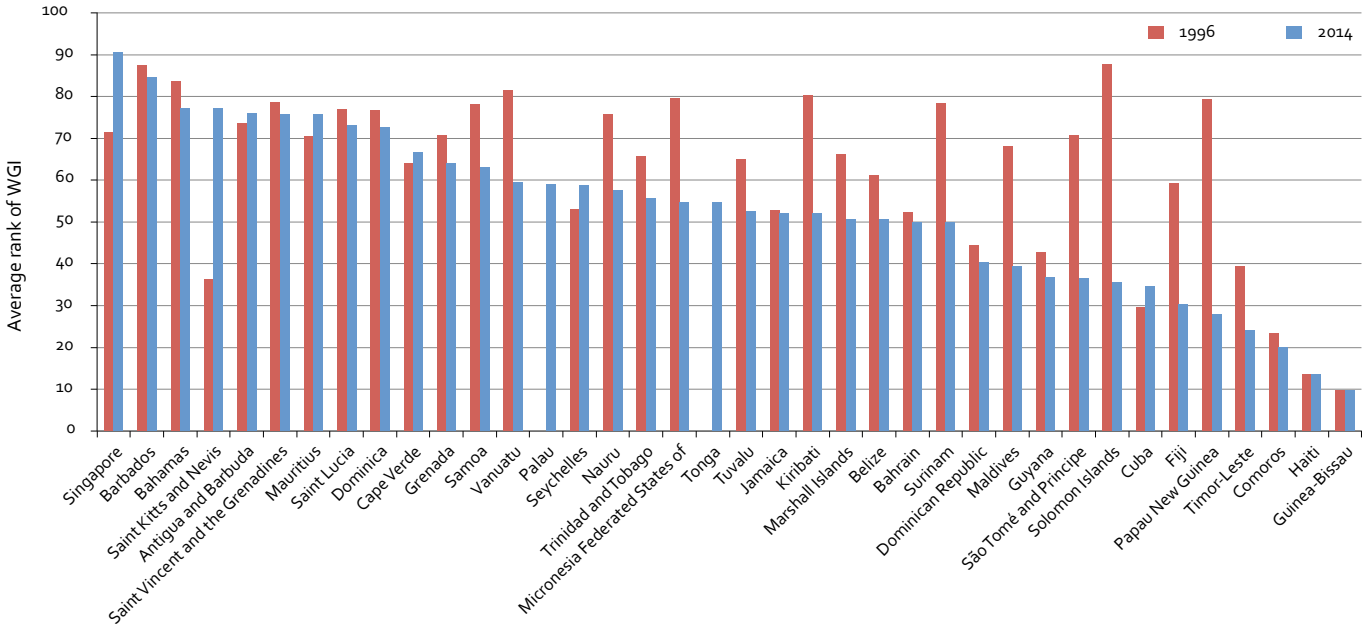


Source: International Diabetes Federation
http://www.idf.org/diabetesatlas/data-visualisations

Institutional capacity

Governance is an enormous challenge amongst SIDS, with small populations often scattered over many islands trying to maintain areas of competence, such as foreign affairs, health, education, agriculture, and fisheries. A recent global study by the World Bank across six domains of governance (voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption) shows how the situation in SIDS has changed[50]. The reasons are varied. Fragmentation, typical of the SIDS, not only hinders communication, community building and participatory engagement in development issues, but also restricts governmental activities at island and national levels, including infrastructure supply. With few highly educated staff and elevated staff turnover, governments have limited capacity and resilience. They also face global change issues to which they can only react to, rather than plan for.

Worldwide governance indicators



Source: Worldwide Governance Indicators
http://www.govindcators.org

CHAPTER 2

SIDS Outlook

The challenges facing SIDS cannot be underestimated or considered in isolation from the global setting. Each island is part of a complex, integrated system binding human society with nature and the economy. The isolation and biophysical limits of islands are very clear, yet their small size means that managing island resources can occur on a more tractable scale. So whilst climate change threatens to disrupt island life and reduce the resilience of island economies and societies, many SIDS are working to diversify their economies to avoid the downturn in there local situation. However, there is a urgent need for SIDS to increase their resilience to climate change and other shocks by investing in climate adapted infrastructure, developing affordable renewable energy, improving water and waste management. As the vice-president of Seychelles remarked in a recent General Assembly debate, SIDS could become ideal locations for pilot projects in a range of technological areas, that could subsequently be scaled up in other parts of the world.

SIDS are clearly showing leadership in building partnerships to support conservation efforts. Partnerships are deeply rooted in island culture, and are an important way of increasing resilience and adaptability through shared institutions, geographical similarities, and economic challenges. Examples include the Caribbean Biological Corridor and the Artibonito Aquifer management arrangements, Pacific Oceanscape which incorporates some of the largest Marine Protected Areas in the world, and SIDS DOCK™ which aims to facilitate the development of a sustainable energy economy via access to international financing, carbon markets and technical expertise.

SIDS are also making gains in some areas of health and education and are actively involved in shaping the post-2015 development agenda. However, the scale of human and financial resources needed to bring about the necessary changes are often insufficient, and will require interventions from larger states through new approaches to debt relief and climate insurance. For example, the prospect of entire communities and countries having to relocate as a result of climate change has yet to be anticipated in an international legal framework, nor have the institutional responsibilities to cover such environmental displacements been defined.

Islanders need to have greater control over the decisions affecting them, by establishing an *island voice* in the global discourse so that they are not simply swept along by larger outside forces beyond their control. A boat adrift is in much greater danger than one underway with a tight helm.

While the future cannot be predicted, the development of plausible futures built on combinations of realistic outlooks can offer a basis for policy choices. A *business-as-usual* perspective will not deliver sustainable solutions; instead it will threaten SIDS through the decline in their resource base, social disintegration, high and unsustainable levels of debt and economic stagnation. A *business-as-usual* outlook represents a future in which islands are left farther behind in a globalized economy where size means power. A new ensemble of island-centric outlook elements are therefore needed.

A SIDS Outlook that outlines an alternative future and which is illustrated through case studies, can help individual SIDS consider the future that best responds to the needs of its people, the resources and limits of its particular island context and offer pathways to a sustainable future. SIDS have many possible futures: there is the world of contrast where SIDS remain relatively isolated from the rest of the world; a world of harmony where SIDS develop an island-centric global community; a world of structure in which SIDS develop their economies through clustered networks; a world of innovation which responds to niche consumer demands; and a world of cohesion where there is extensive bi-directional migration between the islands and the diaspora.

As part of the SIDS Outlook process, an ensemble of four island-centric elements have been developed: the *blue-green economy; technology leapfrogging; priority to island community and culture; and reconnecting with nature.* These elements are not mutually exclusive; they can be combined to respond to the needs of a particular island or state. They are also not exhaustive, but have been developed to trigger the imagination and suggest lines for future reflection and consultation within and among SIDS policy-makers and wider groups of stakeholders.

◄ Credit: Shutterstock/ Ethan Daniels

Blue-green economy

SIDS can build new sustainable directions for their economies based on a comparative advantage that emphasizes sustainable tourism in harmony with island capacity and resources, increased energy efficiency and investment in renewable energy, maintenance of island ecosystem services, integration with the world economy through information technologies, production and export of sustainably produced products, and the development of dynamic careers for islanders both on and off island.

A blue-green economy outlook offers the prospect of sustained, environmentally-sound, socially inclusive economic growth that has a lower level of indebtedness, transparent financial systems, strong environmental policies, food security, enhanced disaster preparedness, empowers both men and women to reskill into new economic sectors, and provides opportunities for youth to become entrepreneurs.

The hallmarks of a blue-green economy includes: economic diversification based on a strong domestic financial system and partnerships to build up resilience to withstand natural

Case study

Barbados: Innovative policies and good practices to support sustainable tourism and adaptation to climate change

Coastal tourism is vital to the economic survival of Barbados. In 2008, it accounted for nearly 40 - 47 of the island's GDP, 50% of total export earnings and employed 44% of the labour force. Several threats were jeopardizing the very existence of this industry. These included beach erosion, which was of the order of 15 m per 100 years for the entire coastline, as a consequence of unsustainable coastal development practices and serious fringing reefs degradation affecting almost 80% of the coral reefs, due to inadequately treated sewage and contamination from fertilisers and pesticides.

Barbados has taken some bold measures over the last two decades to ensure the sustainability of the tourism industry. The distance for coastal setback required to control development has been revised and determined on the basis of coastal characteristics. A setback of 10 m from the toe of a cliff undercut for cliff top developments to 30m from the high water mark for beachfront developments is now in force. The accommodation approach within the framework of climate change adaptation strategies has been applied to undeveloped locations on the east coast of the island. Beach protection and enhancement have been implemented on the more highly developed southwest and west coasts. These include "hard options" such as sea walls, revetments, gabions and breakwaters, "softened" by integrating landscaping to help the beaches look more natural in appearance with visually pleasing boardwalks and landscaping.

Measures have been taken to protect coral reefs. The implementation of a coral reef transplantation project has proved very successful. A 44 km central sewer system capturing wastewater flows (11,300 m^3 per day) has been built on the south coast and a 119 km long sewerage treatment facility will soon be in operation on the west coast. Water conservation policies, volumetric-based water charges and tax incentives for hotels to install water-saving devices have been enforced to discourage water wastage and high consumption levels.

Source: Mycoo M. 2014. Sustainable tourism, climate change and sea level rise adaptation policies in Barbados Special Issue: Small Island Developing States, vol. 38: 47–57

and socio-economic shocks; economic approaches to improve the management of biodiversity; open data policies providing easy access to information; resource efficiency and product innovation; sustainable consumption and production and effective waste management.

Economic diversification to create greater economic independence and resilience

A blue-green economic strategy, that targets resource efficiency and clean technology, is carbon neutral and socially inclusive, will stimulate economic stability, facilitate job creation, provide a clean and healthy environment and help conserve resources. By focussing on balanced development and the linkages between small-scale fisheries and aquaculture, water, tourism, renewable energy and waste, some of the most critical challenges facing SIDS, such as land and water scarcity, dependence on imported energy, high costs of waste management and the vulnerability of the key sectors, can be addressed. For example, the mariculture of seaweeds, molluscs, edible echinoderms, pearls and fish could provide alternative livelihoods, offer high quality local supplies to the tourist sector and help to reduce pressure on fish stocks. Putting in place sustainable management plans would help prevent ecological damage and collapse of mariculture production and reduce conflicts through growing competition for coastal and marine space for energy, mining, and recreation.

Transitional policy instruments will be needed to establish the conditions for a blue-green economy. An enabling agenda, focussed on increased public investment and spending, development of market-based instruments and fiscal instruments, encouragement of private sector involvement, integrated planning and management of island resources based on social equity and poverty alleviation, revision of the legislative and regulatory framework and enhancement of institutional capacities, could be considered.

A well-functioning financial system would produce and process information about possible investments and capital based allocations, monitor individuals and firms and exert corporate governance; facilitate the trading, diversification, and management of risk; mobilize savings; and ease the exchange of goods, services and financial instruments. In a blue-green economy, there is strong domestic public financing; this can help provide affordable public goods, and tackle an eroding tax base, due to trade liberalization, debt distress and debt sustainability and a high dependence on remittances, by looking at trade taxation, environmental fiscal reform and market based instruments for generating tax revenue.

Economic tools to improve the management of biodiversity and using indigenous and local knowledge in decision making and monitoring

The blue-green economy sees the growing use of integrative and innovative economic tools such as the UN System of Environmental and Economic Accounting, natural capital accounting, payment for ecosystem services and carbon trading schemes. Novel ways of establishing the "right" market prices for resources that enhance the maintenance of ecosystem functions are being explored as part of island conservation activities; examples of this include the development of pearl cultivation to support remediation of coastal waters and development of medical products and a capture fishery and restaurant trade for the invasive alien species of lionfish.

Credit: Shutterstock/ Guido Amrein, Switzerland

Case study

Pacific islands: Pearl farming as a sustainable development path

Today, cultured pearl farming in the Pacific offers an economic activity in which sound environmental management and conservation are prerequisites to economic success. Pearl oysters are remarkably sensitive organisms and environmental deterioration or sudden ecological changes affect the oyster and hamper its potential for producing a high-quality pearl. Estimates suggest that 95% of a pearl farm's income comes from only 2% of its pearls. The more pristine an environment, the healthier the oysters are and the higher the likelihood of harvesting valuable, high-quality pearls.

Pearl farming can be one of the most profitable forms of mariculture and can be carried out in isolated islands where there are otherwise very limited economic opportunities. Cultured pearls have become important economic pillars in French Polynesia and the Cook Islands as a major source of export revenue. In French Polynesia, pearl farming has reduced pressure on fish stocks, stemmed outer-island emigration, and provided economic alternatives for an economy otherwise heavily reliant on French financial assistance and tourism. At its peak in 2000, the pearl sector provided employment to 7,000 people in French Polynesia. In the Cook Islands, black pearl production is carried out within existing forms of indigenous socio-economic organization.

Small-scale pearl farming contributes so effectively to ecosystem health that it has been sanctioned inside of marine protected areas, such as off Pakin in the Federated States of Micronesia. Now a new integrated marine plan is being implemented in which pearl farming is compensating for the lost income that artisanal reef fishing communities have incurred due to the introduction of no-fishing zones and marine protected areas. This new source of income has created an incentive for conservation by reducing pressure on reef fish stocks, and is increasing the resilience of these communities in the face of climate change.

With the effects of the 2008 global economic crisis, issues of high production and changing demand, fragmentation both at a supply and distribution level, a fourfold reduction in the export price and rising competition from freshwater cultured pearls, the marine cultured pearl industry finds itself in a difficult business environment, and a number of pearl farmers have gone out of business. However, research has shown that prices for large, high-quality cultured pearls have not dropped. A pearl farm with a focus on quality pearls produced through responsible farming practices still very much has its place in the international market. Cultured pearls could be marketed as a sustainable alternative in an increasingly ecologically conscious jewellery market, particularly to luxury consumers.

The revenue streams of pearl farmers are also diversifying in response to demand from ecotourism which allows for direct purchase of raw pearl, jewellery, and culinary products, for furniture and ornamental purposes, in medicinal products to relieve osteoporosis, as bone replacement therapy, and as a source of calcium for dietary supplements and in beauty products. The oyster's outer, organic-rich layer of shell has even been investigated for military and maritime uses. Adductor muscle meat of pearl oysters is frequently sold for human consumption and the dried meat of the oyster is being used to enrich soils in certain countries. Pearl oysters are also the filter-feeding marine organisms with the highest clearance rates and could therefore be used to assist in the removal of pollutants from coastal waters while producing commercially viable cultured pearls. Other ecosystem services being provided by pearl farmers include a growing role in the management of "blue carbon", for example in the Federated States of Micronesia coastal mangrove ecosystems are

Contd...

Contd...

protected by the pearl farmers because their oysters are dependent on the nutrients provided by the mangroves. Such pearl farms would be ideal candidates to qualify for funding from a future blue-carbon credit-trading scheme.

Given that pearls are a saleable good themselves, their price could be calibrated to account for the services they provide. Such an approach provides a means of internalizing a market for ecosystem services through a particular product, thus circumventing the usual "market absence" critique of payment for ecosystem services approaches.

As a model of private entrepreneurship in SIDS (e.g. Fiji, the Federated States of Micronesia, and French Polynesia) pearl farming has modestly emerged as an economic activity that can offer many valuable lessons for development opportunities in remote coastal communities. It also provides evidence that marine conservation can be integrated within a viable economic activity leading to sustainable long-term growth in vulnerable Pacific environments.

Source: Laurent Cartier and Saleem Ali (summarised from http://www.thesolutionsjournal.com/node/1139)
More information on the authors' research project can be found at www.sustainablepearls.org

Indigenous and local knowledge is recognised as a core part of an island-centric future. Mapping these knowledge systems, whether in written format or through documentary films and media becomes an important part of any partnership or co-operative agreement. Resilience-building, that is primarily based on science and technology, is enriched by taking into account local traditions and know-how around fisheries, agriculture and conservation.

Developing software systems to attract young people, and running public education and training programmes will ensure that in the future, citizens are more systematically involved in gathering information about the state of the islands natural resources. Policies on open access to data ensure that islanders are able to monitor the health of their resources and have the knowledge to be able to participate in their management.

Increased awareness of resource efficiency and innovative eco-product design

In a blue-green economy, there is increasing awareness of resource efficiency and the impacts of waste on the environment. These issues are captured through eco-design policies that "design out" waste and involve innovation throughout the value chain, rather than relying solely on solutions at the end of a product's life. These policies encourage light-weighting and efficiency to reduce the quantity of materials required to deliver a particular service; improving durability and lengthening the useful life of products; and substitution of materials that are hazardous or difficult to recycle in products and production processes.

An important starting-point for SIDS is the design of production processes, products and services on the islands. In a blue-green economy, existing products are redesigned to meet the growing global demand for eco-products and eco-innovation. Local products are designed to be used for a longer time, repaired, upgraded, remanufactured and eventually recycled, instead of being thrown away, and production processes are based more on the reusability of products and raw materials, and the restorative capacity of natural resources. Innovative business models emerge based on a new relationship between companies and consumers, that takes into consideration the impact on environment and human health.

Fostering sustainable consumption and production patterns and integrated waste management strategies

In a blue-green economy, islanders are encouraged to make more sustainable consumer choices through renting, lending or sharing services as an alternative to owning products and consumer interests are safeguarded in terms of costs, protection, information, contract terms, and insurance aspects. Policies are implemented to incentivise and support waste avoidance, reduction and high-quality separation by islanders; to put in place collection systems that minimise the costs of recycling and reuse; to develop island maintenance and repair services; to encourage industrial symbiosis by facilitating the clustering of activities that prevent by-products from becoming wastes; to create markets for secondary raw materials based on standards; public procurement; and to promote eco-designed products that are easier to maintain, repair, upgrade, remanufacture or recycle.

Given that significant amounts of solid wastes are plastic, e.g. packaging materials and PET bottles, SIDS could look into the possibility of collective bargaining to get producers to look into holistic sustainable product innovation covering design for sustainability, environmentally-friendly raw materials and packaging material selection. Both supply and demand side strategies should aim for zero or low emission and impact on the SIDS environment. Waste reduction,

Saint Lucia: Efficient waste management for a healthier environment

Solid waste recycling and its multiple benefits for SIDS is presented in an example of a small Saint Lucia based enterprise. Landfill waste amounts are being reduced considerably by separating and shipping recyclable waste materials; employment is generated and the environment protected.
https://www.youtube.com/watch?v=yeq-HNFHw-k&feature=youtu.be

reuse, and recycle (3R) relies heavily on infrastructure and practices, e.g. collection and segregation facilities. As island transportation and centralization can be costly on SIDS, integrated waste management schemes, including sanitary landfills, controlled dumpsites, small-scale incinerators and wastewater treatments on a local level will be needed. Conversion of waste to resource (e.g. organic waste to fertilizer) or waste-to-energy (e.g. biodigester) are typically designed for large-scale systems so SIDS should initially seek options that manage waste at smaller scales.

In a blue-green economy the management of e-waste and associated hazardous waste streams is tackled successfully. Policies for greening the waste sector in SIDS are also in place, by turning waste into opportunities and shifting national waste management strategies, which still focus on end-of-life solutions, with most of the waste collected being disposed of in sanitary landfills, towards reducing, reusing, and recycling using SIDS-appropriate technologies.

Particular types of waste need specialised facilities that many SIDS countries may not have within their borders, e.g. e-waste, toxic and hazardous chemicals. Safe storage and shipping for off-island management is thus the preferred option. Strategic partnerships and regional cooperation are therefore explored to mobilize investments and technology transfer to develop central waste management facilities and to strengthen technical and human capacity to operate them.

Technology leapfrogging

Within the context of technological leapfrogging, SIDS can envisage rapid technological innovation, especially in information and communications technologies, that will help to overcome island isolation, create new ways of maintaining social and cultural ties across the island diaspora and help evolve new economic activities. Integrated environmental and sustainability information is empowering local communities and resource users to manage their local resources, participate in governance, and be active participants in adaptive management. The educational system is re-oriented to prepare islanders for a more connected life while maintaining the environmental quality of island life and ecosystems. SIDS are able to improve their economic sustainability by making investments in new, clean and scale-appropriate technologies that reduce their dependence on fossil fuels.

Some of the hallmarks of technological leapfrogging in the context of SIDS include Information and Communications Technology (ICT) enablement for the benefit of society; phasing out of inefficient technologies and increasing the penetration of renewable sources of energy and materials; and the use of traditional knowledge to create scale-appropriate technologies.

Credit: Shutterstock/ imagesef

Case study

Eastern Caribbean: Geospatial Data Sharing for disaster risk management

A key component to disaster risk management strategies is geospatial data, which are important for the risk assessment required to inform local decisions related to public infrastructure, engineering designs, physical development, and land use management.

Four island nations, Dominica, Grenada, Saint Lucia, and Saint Vincent and the Grenadines, participated in a Pilot Program for Climate Resilience, funded by the World Bank in 2011. In order to address the data sharing and management challenges, these countries have integrated geovisualization platforms (using the GeoNode free software) into their national data management strategies, which were developed through local and regional stakeholder consultations. The initiative included capacity development for Geographic Information System (GIS) analysts, land surveyors, and IT participants from related ministries, including physical development, environment, and public works.

The project has contributed to important milestones in the development of geospatial information in the Caribbean. For instance, in Saint Lucia, the use of metadata was previously not a common practice. Saint Lucia officers agreed to use meta-data guidelines that are based on the formats of the International Standard Organization, namely: a) Jamaica metadata guidelines and b) internal World Bank geospatial data guidelines.

Saint Lucia has also observed the potential for increased collaboration and data sharing between public agencies and private companies. One such example is a local telephone company that could easily access and directly use public maps and information created by the Ministry of Physical Development and Planning, with substantial cost savings from not having to create base maps.

Other countries, including Antigua and Barbuda, Belize and Guyana, and institutions like the University of West Indies, have also developed GeoNode platforms recently, making data not only available nationally, but also regionally and globally through international data catalogs such as GeoSur (www.geosur.info).

National platforms can be accessed through the following links:

Saint Lucia http://sling.gosl.gov.lc/maps/3/view
Dominica http://www.dominode.net/
Antigua and Barbuda http://geonode.data.gov.ag/
Belize City http://geoserver.bnsdi.gov.bz/maps/2/view
Guyana http://www.geoserver.ggmc.gov.gy/
University of West Indies http://cariska.mona.uwi.edu/

Some of the main issues in using and sharing geospatial data in the Eastern Caribbean remain technical, e.g. data formats and interoperability. However strengthening the institutional basis for the sustainability of the platforms is the key action that will lead to policy-level commitments on open data and access. This will be relevant in the future, when new tools that could replace the GeoNode technology become available.

Source: Mycoo M. 2014. Sustainable tourism, climate change and sea level rise adaptation policies in Barbados Special Issue: Small Island Developing States, vol. 38: 47–57

ICT enabled benefits for SIDS

Digital technologies have enormous potential to benefit everyday life in SIDS and to tackle disaster risk management and a variety of social challenges. A digital agenda, focused on ICT capabilities to support social cohesion and connectivity, will help improve access to information, reduce energy consumption, support citizens' lives, revolutionise health services and deliver better public services and drive forward a wider knowledge globally about SIDS cultural heritage. Tariff-free trade for IT under the International Tariff Agreement has offered certain SIDS the opportunity to grow by entering global ICT production networks. As technology evolves and goods become increasingly multifunctional, SIDS may want a greater involvement in the updating of the ITA to take into account the evolution of technology.

Creating local markets for new technologies

In developing local markets, a series of demand-side policy tools and measures, are needed; for example legislation that increases consumer confidence in innovations, safety regulations, standards, labels and public procurement of innovations. At the same time, supply-side innovation policy instruments, such as tax credits and loans, are needed to complement research and development grants and other public funding schemes, to enable or increase the uptake of innovations and establish local markets.

For example, the small scale of the road infrastructure on many islands means that schemes to encourage the use of electric vehicles (EV) as a way to shift from fossil fuel mobility to electric are likely to be very successful, and would not have to address range anxiety. However, EV drivers demand a new business model based on wide accessibility to charging stops with DC charging stations.

Fostering policy interventions and open markets to phase out inefficient technologies and encourage private sector participation in renewable energy and resource technologies

SIDS can begin to compete globally to attract inward investments by developing policies and instruments that encourage technological incubation and the phasing out of inefficient technologies, for example by shifting taxes from labour to resources while improving competitiveness and energy efficiency, and preserving fiscal revenues, taxing pollution and developing payments for ecosystems services. The majority of SIDS provide locations that are socially and economically safe and a local environment that is very appealing.

Use of traditional knowledge to create scale-appropriate technologies

SIDS will continue to face many challenges when dealing with climate change. Some will require very high levels of skills and education to deal with; so policies encouraging "brain circulation" – those that emigrate returning to share their skills and expertise with islanders who come from the same cultural perspective could help address this problem. This is especially true for areas such as extreme weather forecasting, early warning systems and the management of critical resources, such as water and land. For example, developments in improving soil productivity through access to up-to-date soil moisture and nutrient mapping can enable small-scale farmers to increase productivity.

In other areas, innovative ways of combing traditional activities such as fishing are being combined with other sectors to create new business opportunities. For example, across the Caribbean, people are being encouraged to consume lionfish, a highly predatory invasive species that is having a significant impact on many reef communities, as a means to reduce their numbers. Fishermen require training in how to handle this poisonous fish, and deliver it into a growing consumer market. The Reef Environmental Education Foundation publishes the Lionfish Cookbook and hosts a series of "Lionfish Derbies" offering prize money for certain catches.

Case study

Mauritius and Bora Bora: Deep ocean water as the best alternative source for air conditioning and other goods and services

Most SIDS are located in regions with high tropical temperature; as a consequence they consume about 40 % of total electrical output on air conditioning, derived in most part from fossil fuel energy production.[a] This could increase ten times by 2050[b]. Many of the islands are surrounded by cold deep sea water, with a temperature of about 5ºC at a 1000 m depth; this constitutes an immense opportunity as the best alternative source of renewable energy for air cooling compared to a more conventional split[c]. It is eco-friendly, available continuously and even the most ambitious projects are unlikely to significantly disturb the fundamental role of the ocean in regulating climate.

The concept is already being applied serving a luxury resort on Bora Bora Island in the Pacific, thus saving nearly 90% of the electricity that would have been required for conventional cooling[d]. Other projects are springing up all over the world[e].

Mauritius is moving ahead on the utilisation of the pure, nutrient-rich and cold deep sea water to develop Deep Ocean Water Application projects to power the cooling of large buildings, which currently use energy produced from fossil fuels[f]. Development of a large range of downstream business activities including aquaculture, seaweed and algal culture, cosmetics and pharmaceuticals, agrochemicals, water bottling and thalassotherapy also looks very promising. In the long term this will reduce considerably the country's dependency on fossil fuels and cut down on carbon emissions and pollution from energy generating plants. Unpolluted fresh-water, derived as a by-product at relatively low cost without adding to global warming, is another valuable product.

Two upstream projects are planned for implementation as from 2015. The first one will be in the capital, Port Louis whereby about 20MW energy production is expected in the short term for the cooling of offices and industrial buildings. Downstream activities will follow in a second phase. The other one will be implemented in the south of the island, in the vicinity of the international airport. It is considering simultaneously developing green cooling for data centres and office buildings as well as downstream activities, particularly aquaculture, cosmetics and freshwater bottling.

a) Hurd D (2012). The high cost of air conditioning. Small Islands States Foundation. http://www.smallislandstates.org/the-high-cost-of-air-conditioning/
b) Isaac M. and Van Vuuren D.P. (2009). Modeling global residential sector energy demand for heating and air conditioning in the context of climate change. Energy policy vol.37, Issue 2 pp 507–521
c) Barrero E.M and Gómez F. S. (2012). Comparison of a conventional split cooling system with sea water district cooling and solar cold triple absorption cycle systems. Master's Thesis in Energy Systems http://franciscosantamaria.com/Energyengineering/Thesisfranciscoandelena.pdf
d) YouTube (2011). Bora Bora Deep Sea Water Air Conditioning. https://www.youtube.com/watch?v=6LmmlUxYTCc
e) Institute of science in society (2014).The Blue Revolution: Air Conditioning and Energy from Deep Waters of Lakes and Oceans http://www.i-sis.org.uk/DeepWaterEnergy.php
f) Government of Mauritius (2013).The Ocean Economy. A Roadmap for Mauritius, pp 34-37

Priority to island community and culture

There is great potential amongst SIDS to encourage a healthy island culture combining traditional and modern elements, evolving with the times while maintaining roots in the best of island heritage. To be sustainable, this would sometimes involve choosing simpler material lifestyles, and emphasizing growth in social and family relationships, science, arts and culture. The educational system would prepare for island life, not just for emigration. Traditional resource management would be restored and extended through greater community participation, as with locally-managed marine protected areas in the Pacific. Each island community and culture would select what it wants from globalization within island limits, without being passive consumers swept along in the current thereby promoting community participation in decision-making. SIDS cultural industries and initiatives as an asset to sustainable development can be an economic opportunity for national and regional development, and a way of diversifying SIDS' economies.

The characteristics of giving priority to island community and culture includes the promotion of participatory community and indigenous conservation and management; communities that are climate resilient; widespread examples of collective action and partnership and development of an

Dominican Republic: Lionfish story from La Caleta

The video highlights the socio economic opportunities arising from an unprecedented environmental pressure, the invasion and spreading of lionfish into the Caribbean. By building local markets for this new alien species numbers can be managed and benefits generated.

island-centric demand side in the global market-place; and education that has sustainability and environment at its core.

Participatory approaches based on awareness and transparent decision-making

In all areas of life, SIDS promote the cultural importance of participation in island decision making, celebrating and maximising aspects of what makes SIDS unique. Decisions are made to emphasise the authentic value that traditional, village level discussions can play in developing co-operation and partnerships. There is investment in civil society to support leadership training and formal and informal education of youth to encourage young people to become change agents for sustainability within their own communities. Social media and technology can play an important role in ensuring participation in decision making given the remoteness and small population pool, by ensuring that knowledge is accessible to all. Policies that promote open data and on-line journalism also help to enlist a wide variety of stakeholders and raise awareness of the issues and opportunities facing islanders.

Building community resilience to climate change and awareness of the risks and opportunities

Hazard and risk management is critical for SIDS and their communities. There are good examples of policies and plans that can help reduce vulnerability, enhance resilience, improve risk knowledge and island resource management

Barbados: Responsible fisheries

Fisheries are intrinsic to Barbados' culture. The video features the national multi-stakeholder effort to conduct sustainable and responsible fisheries based on the FAO Code of Conduct for Responsible Fisheries. The Conset Bay Pilot Project is a collaboration of UNEP and the Ministry of Environment and Drainage of Barbados, in conjunction with The University of the West Indies.
https://www.youtube.com/watch?v=zwiMSRr-rDI

and improve livelihoods. Community involvement can also help avoid maladaptation. For example the development of tourism in Fiji involved stakeholders in each step of the process to assist different destinations in implementing adaptation interventions.

However, because the SIDS do not have uniform climate change risk profiles, policies and operational plans need to distinguish between the different drivers of change. Slow onset events (e.g. sea level rise, ocean acidification, coral bleaching) will require very different responses compared to rapid extreme events (e.g. cyclones, storm surges). In addressing such hazards, spatial and temporal climate risk mapping is critical for the emergency management cycle, including disaster preparedness, early warning systems, and disaster management and recovery. Slow onset events, however, have to be addressed on a longer time frame and include the impact of future hazardous events and cumulative effects. Such long-term planning requires adaptive management, an understanding of planetary scale tipping points, and how to handle the uncertainty associated with climate change. Adaptation to climate change especially for small islands can generate larger benefits and greater resilience when combined with disaster risk reduction and community-based approaches to development.

Many SIDS rely on international funding for adaption and disaster reduction measures, including planned retreat and protection of the coast. SIDS' vulnerability to climate change and sea-level rise is magnified due to their relatively small land masses, population concentrations, and high dependence on coastal ecosystems for food, livelihoods, security and protection against extreme events. On the other hand, given their small size, solutions embedded in community concepts and multi-actor interactions for adaptation are more likely to succeed. Even partial or temporary migration from SIDS has benefits such as improved access to financial capital, and reduced pressure on natural resources, especially for atoll islands.

Building community resilience is a key element in successful climate change adaptation and management of risk. There are four critical strategies for building community resilience:

(a) building coping capacities to withstand and counteract shocks (including climate-proofed infrastructure development, improved building and planning codes, and poverty reduction)
(b) strengthening existing and developing new early warning systems to alert population and authorities to impending events and allow timely actions
(c) strengthening disaster risk reduction capacity in SIDS, for example, through ecosystem-based adaptation (such as restoring beaches, mangrove restoration, watershed management), and
(d) actively engaging the international community in reducing the anthropogenic causes of the increased frequency of extreme events, including global warming and environmental degradation.

Credit: Shutterstock/ howamo

Increasing social and economic resilience may require targeted support for existing livelihoods, including income diversification and the incorporation of results from differential vulnerability assessments.

There is an indisputable financial cost of adaptation to climate and environmental change: under *business-as-usual* models, the capital cost of sea-level rise in the Caribbean Community countries alone is estimated at USD 187 billion by 2080. In parallel to the global processes underway, a comprehensive package at national or regional level should be developed that outlines agreed mitigation, adaptive, technological, and cooperative measures.

Given the multiple demands on SIDS to respond to the complex challenge of adaptation posed by climate change, institutional strengthening in many islands will be critical to reducing risk and preparing effective responses. Pre-conditions to effective action include knowledge of the risk, widespread and effective technical monitoring and warning services, dissemination of meaningful warnings to at-risk groups, and greater public awareness. Preparation can save lives, reduce risks, and minimize damage.

Many communities in SIDS are protected from waves by terraced coral reefs, which may reduce wave power by approximately 97%. Stresses, such as overfishing and pollution, can tip the balance in coral reef substrate processes from net accretion to net erosion, underlining the need for proper management.

To cope with islands floods, building structures can be elevated on pilings or resting on floats. The existence of stilt and floating traditional communities, piling-based reef resorts, and the construction of small islands on Okinotorishima Atoll demonstrate the technical, if not economic, feasibility of these approaches. Without strong coral reefs, these options will become less feasible.

Case study

ARKive: crowd sourcing knowledge

ARKive lies at the centre of crowd sourced knowledge generation on key topics of biodiversity, geomorphology, climate change impacts. As a non for profit organization of the charity Wildscreen, ARKive works with broad support from various institutions in academia and nature conservation as well as from the information technology sector, to feature a broad kaleidoscope of life on Earth, status, perspectives and threats. ARKive currently contains multimedia content on the islands in the Indian and Pacific Oceans (e.g. www.arkive.org/habitats/islands/indian-ocean-islands/image-H261).

ARKive covers a number of thematic areas relevant to SIDS: coral reef conservation, ocean acidification, geological and biodiversity facts on islands and specific characteristics of individual islands and island groups.

While ARKive works with well-known and inspiration filmmakers and photographers, one of its core activities is to build a community and get people namely younger people actively involved. Their site contains a wide variety of image and video material that provided high level and well-tailored material for education purposes for all ages. Schoolchildren can contribute photos and reports and ARKive offers various licenses to makes its materials available for use in other websites through APIs.

http://www.arkive.org/habitats/islands/

Sustainability education

Creating a wider understanding of the role of local and indigenous knowledge in building up resilience and sustainability is critical. This can be done in many ways, including education programmes, and a wide variety of multi-media. Building up capacities to be able to monitor the environment through citizen science programmes, and helping islanders of all ages to participate in education programmes that combine traditional knowledge with science and technology, also ensures that environmental aspects of sustainability are included. Education policies that help to strengthen inclusive and culturally-rooted knowledge in environmental curricula, can also help to foster social cohesion and cultural heritage and identity in sustainable development.

Credit: Shutterstock/Nolte Lourens

Reconnecting with nature

Connections with nature have long been important to island peoples. Indigenous island cultures in the Pacific were based on strong physical, cultural and spiritual bonds between man and nature. Island populations with strong religious traditions have learned stewardship and respect for nature. In this scenario, priority is given to re-establishing these connections while respecting island ecosystems. Appropriate agricultural techniques, sustainable forestry and fishing technologies would rebuild and even enhance the natural productivity of the islands. Traditional knowledge of the environment would be combined with modern science to increase the integration and harvestable capacity of island ecosystems and restore biodiversity. Coral reef growth would be maintained by careful management and supported by citizen science and community monitoring at rates that might be able to keep up with sea level rise. Managed emigration would ensure a demographic balance and keep the island population from exceeding the local carrying capacity.

Promotion and implementation of community or indigenous conservation and management of areas

A number of SIDS (e.g. Fiji, Kiribati, Solomon Islands, Palau) have emphasized improving management and expansion of protected areas as a strategy for dealing with biodiversity loss. Between 1990 and 2009, however only 4 SIDS showed an increase of over 4% in protected areas (Palau, Jamaica, Timor- Leste, Suriname and Guinea-Bissau). A similar strategy is the promotion and implementation of community or indigenous conservation and management areas. These areas respect and incorporate local and indigenous knowledge and they can potentially be combined with more traditional protected areas. Empowering local communities to manage and restore forested areas has proven effective in places like Palau and Vanuatu.

Case study

Palau: Marine Protected Areas

Biosphere reserves are community-based initiatives that explore and demonstrate approaches to conservation of land, water and atmosphere, balancing conservation with sustainable human use on a regional scale, while ensuring the continued healthy growth of the local economy. In June 2005, the UNESCO Man and Biosphere program approved the first two biosphere reserves in Pacific island countries: he Utwe Biosphere Reserve and the Ngaremeduu Biosphere Reserve.

The Ngaremeduu Bay region lies on the west coast of the Babeldaob Island, the largest island of Palau, located in the south pacific. The Biosphere Reserve incorporates the largest estuary in Micronesia, freshwater marshes, Pandanus grass and shrub savanna, one of the largest stretches of mangroves on the small Pacific islands, as well as extensive coral reefs and seagrass beds.

The area has a rich biodiversity with a range of both marine and terrestrial species. There are approximately 200 species of stony corals in the reef habitats and the total number of corals can exceed 100 species per site when combined with soft corals. The stretches of mangroves comprise 18 different mangrove species. Ngaremeduu Bay provides a habitat for several endangered and threatened species such as the dugong, salt-water crocodile, and sea turtles.

The three core areas correspond to a fish conservation area, a clam conservation area and a mangrove crab conservation area that have been established by community members. This type of management is traditionally known as a "bul" in Palauan, that is, when traditional leaders decide to protect a certain area to allow a species to recover from being over-harvested. By allowing traditional management, the Biosphere Reserve promotes socio-culturally sustainable conservation practices.

Since the core areas and buffer zones are mostly marine areas, there are only some 60 people living in the Biosphere Reserve itself. Most of the Palauans in the villages still depend on subsistence fisheries and farming. There are over 80 cultural and historical sites within or around the Biosphere Reserve, including traditional villages consisting of stone platforms, stone paths, monoliths, burials, stone piles and docks. Income-generating projects include aquaculture (milkfish ponds) and ecotourism with adventure kayak tours, nature trails and visits of historical culture sites.

The Management Plan of the Biosphere Reserve provides the framework to achieve biodiversity conservation and sustainable development through a community participatory approach. The Conservation Area Coordinating Committee is the decision-making body that oversees the management of the overall Ngaremeduu Conservation Area and Biosphere Reserve.

http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/asia-and-the-pacific/palau/ngaremeduu/

Increasing self-sufficiency in food and water

Agriculture is an important part of the SIDS economies, and contributes critically to the local food security. Central to food security are land-use policies because of the high demand for space on most islands. In future, ecosystem based approaches can help to address not only an adequate food supply but also the provision of high quality, safe, nutritious food produced by small-scale and subsistence farmers using low-input, organic methods, adapted to local conditions.

Organic agricultural policies which are based on participation and public-private partnerships, can help ensure that smallholders are integrated into markets. Moreover, the diversity of food cultures, traditional knowledge and nutritional security are safeguarded by organic agriculture. Cuba's transition to organic agriculture has had a positive impact on people's livelihoods by guaranteeing a steady income for a significant proportion of the population. The lack of pesticides for agricultural production is likely to have a positive long-term impact on Cubans' wellbeing since such chemicals are often associated with various negative health implications including certain forms of cancer.

Another contribution to food security can come from agritourism, which connects sustainable agriculture with tourism. AgroSandals, in Jamaica, aims for sustainable agriculture while linking agriculture with tourism and culture, in association with the private sector, community members and government agencies. Programmes so far have reported good returns: in Jamaica, for example, farmers' sales income increased more than 55 times in the first three years of the initiative, from USD 60 000 to USD 3.3 million.

Credit: UN Photo/ Logan Abassi

Access to clean drinking water and sanitation is a priority in island life. Increasing the availability and efficiency of wastewater treatment facilities; encouraging the reuse and recycling of wastewater; developing water purification and rainwater harvesting schemes; ensuring that septic systems are maintained and designed properly; implementing stormwater planning and gaining access to desalination plants powered by renewable energy are all key elements of an island based approach to water management. Many SIDS are successfully investing money in improving and developing water and wastewater treatment infrastructure, e.g. Fiji, Marshall Islands, Tonga, and the increase in access to improved sanitation and drinking water is a reflection of this. However, additional funding is still needed.

Integrated water management, including innovative approaches to water recycling will be key. In particular, some SIDS can share best practices in recycling gray water as well as their success in education campaigns to support water conservation. The starting point will be to reduce the anthropogenic degradation and loss of freshwater resources through technical measures that target the reduction of wastage, seek to reduce chemical contamination from agricultural sources, reduce losses through deforestation, reducing leakage from storage and delivery systems through regular maintenance, and discouraging over-abstraction. As an alternative to costly wastewater treatment facilities, SIDS can consider low-cost options such as artificial wetlands. This has been implemented in some islands, for example, Saint Lucia in the Caribbean through the Integrated Watershed and Coastal Areas Management.

Other response options could include reducing the degradation and loss of freshwater resources through

technical measures, rainwater harvesting, water reuse/recycling, building synergies between the water and energy sectors such as deep-water cooling, low-cost wastewater treatment facilities such as artificial wetlands, and integrated water and land management. Rainwater harvesting is mandated in some islands, where it is now compulsory for all new buildings to harvest enough rainwater to meet the needs of their residents. Rainwater harvesting is also being practised in the Turks and Caicos Islands and in the Seychelles.

Although desalination is expensive due to its high energy demand, desalination and abstraction of water from deep aquifers are also measures for increasing the availability of good quality water. Successful water management policies seek to balance the need for innovative management approaches to deliver a public service with the need for investment through privatization or commoditisation of water.

Case study

Republic of Seychelles: A school rainwater harvesting project promotes adoption at community and national level

The Republic of Seychelles is a water scarce country where drastic changes in rainfall patterns with short periods of heavy rainfall during the rainy season and severe droughts during the dry season frequently occur. Increased school population and the local educational campaign to green school grounds have led to an increased demand for water, resulting in high water bills. To assist schools to reduce their water bills as well as demonstrate adaptation to climate change, a UNEP/UNDP rainwater harvesting project with financial support from the Danish International Development Agency was implemented with the participation of the public sector and non-governmental-organisations.

The objectives were to harvest rain water from school roofs so as to meet the needs of selected schools, reduce the cost of water bills and educate school children on the impact of climate change on water resources. The project enabled the schools for the first time to make a monthly saving of USD 250 on water bills. The water harvested is being used for school gardens, clean ups and toilets. It is proving quite valuable especially during the dry seasons. The saving is being invested to improve the school environment and infrastructures. It is being extended to other schools. Over 400 teachers have been trained.

The success of the project has created opportunities for other climate change adaptation initiatives. It is being used as a model to sensitize and educate the general public on climate change impacts on water resources promoting rain water harvesting at the community level. It is also being extended to cover some public institutions. Rainwater harvesting has now been incorporated into the new national climate change strategy and the new Environment Management Plan of the Seychelles.

The project is one of the projects selected in 2011 for the UNFCCC/Momentum for Change award which is organized annually to reward projects which are the most practical, scalable and replicable examples of what people, businesses, governments and industries are doing to tackle climate change. The simplicity of this project ensures that it can be upscaled easily in other areas and in other countries.

Source: UNFCCC/Momentum for Change. Spurring Climate change adaptation in Seychelles schools through rainwater harvesting. http://unfccc.int/secretariat/momentum_for_change/items/7159.php

Improved approaches to marine and coastal zone planning and management

As part of the outlook, SIDS place themselves at the forefront of sound coastal zone management policies, by deploying a wide range of instruments and approaches. These include the banning of sand mining to reduce beach erosion and effective land-use planning to avoid coastal squeeze. Ecosystem based management policies, ranging from mangrove propagation to the reduction of toxic chemicals and pesticides, support coastal ecosystem recovery and the replenishment of calcareous marine organisms.

SIDS also possess as yet unexploited resources in their coastal and EEZs, including deep sea minerals, hydrocarbons, potential pharmaceutical products, as well as a range of sources of marine energy. As licencing rounds for exploration are established, regulatory frameworks for offshore and shoreside infrastructure will be needed, along with comprehensive environmental monitoring and management and human and technological resources.

Several promising international initiatives, rooted in participatory integrated coastal management, have been initiated to improve management of coral reefs and associated shallow-water ecosystems, e.g. the Coral Triangle Initiative (eastern Southeast Asia), the Micronesia Challenge (Pacific), and the Caribbean Challenge Initiative. Marine protected areas and corridors (e.g. the Caribbean Biological Corridor between Cuba, Haiti, and the Dominican Republic) are often used for coastal marine management and can contribute to fisheries management efforts. Coordinated regional fisheries management is required due to the migratory nature of certain target species. It will also lead to economies of scale in areas such as stock assessment, enforcement, and capacity building.

Case study

Cuba, Haiti, Dominican Republic: Caribbean Biological Corridor

The Caribbean Biological Corridor is a framework for cooperation between Cuba, the Dominican Republic and Haiti. Pressure on biological resources in these countries has been aggravated in recent years due to the poverty of their inhabitants, and sometimes uncontrolled use of ecosystems because of the lack of alternative livelihoods for many communities. Because the area of the Biological Corridor is characterized by a high density of inhabitants per square km, the destructive effect of human activity on biodiversity was intensified.

The Caribbean Biological Corridor combines high-level political commitment (2007 Declaration of Santo Domingo, 2009 Plan of Action, and a draft Implementation Agreement between the key partners in each government) with implementation, including through a UNEP-supported, European Commission funded project. The specific project objectives include the demarcation of the Caribbean Biological Corridor in the Dominican Republic, Haiti and Cuba; strengthening the Network of Protected Areas for the Island of Hispaniola (Haiti and Dominican Republic); mitigating threats to protected areas as well as rehabilitation of degraded areas; identification and implementation of alternative livelihoods for communities; and public awareness and education. A Tri-National Coordination Structure was established to support the implementation of the Caribbean Biological Corridor.

South-South cooperation is a cornerstone of the project, in particular through the transfer of knowledge and successful experiences from Cuba to Haiti and the Dominican Republic on the management of natural resources and protected areas. Other countries and regions in the Caribbean have expressed interest to join the Caribbean Biological Corridor partnership.

Further information: http://www.cbcpnuma.org

Addressing Sustainable Energy Development in Saint Lucia through Effective Partnerships

"Access to affordable energy is critical for sustainable development. Unfortunately, Saint Lucia is wholly dependent on imported fossil fuels for electricity, which makes it vulnerable to volatile world oil prices. Electricity costs in Saint Lucia are high and this restricts growth in the main economic sectors. Consequently, the government has embarked on a sustainable energy programme, with targets of 35% renewable energy generation and 20% reduction in energy consumption in the public sector by the year 2020.

A multi-pronged approach is being used to facilitate the development of our renewable energy resources, primarily in the areas of solar, wind and geothermal. The success of these initiatives requires a range of strategic interventions in policy and regulation, as well as technical capacity in energy planning and assessments, which do not typically reside in the national energy unit of a SIDS. Therefore, the government has cultivated strategic partnerships with several development partners such as the Organization of American States and the European Union delegation. Additionally, organizations like the Carbon War Room are providing invaluable assistance in the development of Request for Proposals for renewable energy plants.

Geothermal energy has the greatest potential to significantly transform the domestic energy landscape. However, it presents high risks, is costly to develop and requires specialized skills. Fortunately, assistance from the World Bank and the Government of New Zealand, negotiations backstopping from the Clinton Climate Initiative and initial grant funding from the GEF and SIDS DOCK™ have facilitated progress in the development of our geothermal resource.

Energy efficiency is an important component of our sustainable energy programme and the government has embarked on an ambitious plan to convert all of the street lights on the island to light emitting diodes (LED) fixtures and to retrofit public buildings with energy-efficient lighting and cooling. Again, in this area partnerships are vital.

There is much more that needs to be done and Government looks forward to greater support from international partners in our drive to reduce our island's carbon footprint and increase its global competitiveness."

H.E. James Fletcher, Minister for the Public Service, Sustainable Development, Energy, Science and Technology, Saint Lucia

▶ Credit: Shutterstock/ Gyuszko-Photo

CHAPTER 3

SIDS Policy Framework for Sustainability

To achieve a diversified, island-centric blue-green economy, as described in the SIDS Outlook, decision-makers will need to pursue long-term integrated policy planning, based on transparent and inclusive governance. Regional co-operation, partnerships and sharing of best practices can also lead to progress in establishing the enabling environments for SIDS to attract new investments and industries, particularly in renewable energy, resource conservation and cultural heritage. Whether it be through education, community programmes or entrepreneurial activities, cultural industries, such as the performing arts, visual and media arts training, museums, festivals and film, can be powerful employment and economic drivers. Overall, diversifying the economies of SIDS will only be successful with adequate investment coupled with clearly articulated, integrated policies.

The SAMOA Pathway draft outcome document[51] calls for efforts to establish national regulatory and policy frameworks and actions to enable business and industry to advance sustainable development initiatives, taking into account national development priorities and individual country circumstances and legislation. The frameworks should ensure partnerships which focus on SIDS priorities, identify new opportunities to advance the sustainable development of SIDS, and ensure the full implementation of the BPOA, MSI and SAMOA (SIDS Accelerated Modalities of Action) Pathway.

Building on these and the SIDS Outlook, the following are suggestions for elements of a SIDS policy framework for sustainability within the larger global framework of the post-2015 agenda and future Sustainable Development Goals (SDGs).

A preliminary review of national submissions made to the Third International UN Conference on SIDS provides an overview of where SIDS countries have made significant progress, with the possibility for replication in other countries. It also indicates those areas requiring more efforts, and SIDS countries are therefore encouraged to work with UNEP and other partners to develop the frameworks and enabling conditions to ensure the success of the SAMOA Pathway.

Macro-economy, technology and globalization

Sustainable energy, tourism, transport, and waste management

- Develop energy strategies that target energy efficiency, the use and storage of renewable energy in all its forms and create an enabling environment for investment, and support SIDS-SIDS co-operation on innovative technologies and best practice
- Develop and implement the governance and management of sustainable tourism inclusive of all peoples in SIDS and work with international initiatives and UN bodies to ensure that island culture and the environment is taken into account
- Develop environmentally safe, sound, and affordable integrated transport
- Enhance technical co-operation on the management of chemicals and waste, including hazardous waste, from ships, air transport and marine sources, under international conventions

Food security

- Explore multiple strategies for food security that increase rural livelihoods and end malnutrition, through sustainable agricultural, fisheries and aquaculture practices, that enhance resilience towards climate change and support production and export of organic, sustainably produced and locally grown products

Disaster risk reduction

- Promote co-operation in disaster risk reduction actions such as early warning systems, disaster preparedness and risk management and implement the Hyogo Framework for Action

◄ Credit: Shutterstock/ Ozphotoguy

Information and Communications Technology

- Improve ICT national legislation, infrastructure and training to increase connectivity and use of information throughout the economy
- Develop alternative indicators of appropriate SIDS development and valuation of natural and social capital
- Establish a SIDS Sustainable Development Statistics and Information Programme and open access data policies

Fiscal reform

- Develop market mechanisms and fiscal policies to remove environmentally harmful subsidies and ensure payment for ecosystems services and environmental goods
- Establish multilevel partnerships to address economies of scale, and compensation for fragmentation

Youth

- Focus on creating opportunities for youth on and off island, with dynamic careers and decent jobs at least partly island-based

Social sustainability, demographic balance, cultural heritage and governance

Cultural heritage

- Develop national mechanisms to conserve and promote, protect and preserve cultural heritage practices and traditional knowledge of SIDS and enhance the protection of cultural heritage through regional initiatives and international conventions, in particular those of UNESCO

Social cohesion

- Rethink SIDS governance and its role in social cohesion of the island diaspora

Island education

- Redesign island educational systems to respond to local needs

Health

- Encourage SIDS co-operation on health promotion and disease control, especially with regard to levels of non-communicable diseases

Achieving environmental sustainability at the island level

Sustainable resource management

- Develop comprehensive fisheries and aquaculture management strategies, based on holistic and integrated approaches to sustainable use, local conservation solutions and international initiatives to promote legal trade of sustainably harvested fisheries products
- Develop comprehensive integrated management strategies for water resources and related ecosystems, that enhance institutional capacities, provide appropriate facilities and infrastructure for drinking water, sanitation and waste water management
- Develop comprehensive forest management strategies, based on holistic and integrated approaches to sustainable use, local conservation solutions and international initiatives to promote legal trade of sustainably harvested forest products
- Develop comprehensive waste prevention and management strategies, based on reduce, reuse, recycle, recover and return approaches, combining local solutions and substitution, national and regional help with difficult wastes, import restrictions, and joint action on producer responsibility

Traditional knowledge

- Integrate traditional knowledge and modern approaches into a SIDS-relevant science

Ecosystem services

- Monitor and maintain island carrying capacity and ecosystem services, supported by community science and monitoring

Invasive species

- Deal proactively with invasive alien species eradication through multi-sector collaboration at national, regional and international levels and increased public awareness

Genetic resources

- Develop equitable sharing of the benefits arising out of the utilization of genetic resources

Anticipating climate change impacts

Climate change

- Deal proactively with coming threats including sea level rise, extreme storm events and ocean acidification and human migration, through ecosystem based adaptation programmes and investment initiatives, such as REDD+, that help build resilience

Climate insurance

- Develop insurance solutions to respond to SIDS vulnerabilities, linked to the global response to loss and damages

Loss of territory

- Consider the point of no return between adaptation and evacuation for specific island situations

International enabling environment for SIDS

- Continue to strengthen the rule of environmental law at the national and regional levels
- Ensure that international law on migration and sovereignty over sea areas and the resources within EEZs, adequately addresses the needs of SIDS populations in the context of any future resettlement
- Continue to establish global SIDS collaborations on major threats such as climate change mitigation, ocean acidification, over exploitation of marine resources and economic exploitation
- Ensure that there is a coordinated SIDS voice on the environment at international and regional intergovernmental fora, and ensure increased synergy between meetings, so that issues are discussed and agreed on by governments at meetings are reflected and built on at future intergovernmental meetings
- Support SIDS in their efforts to develop and implement the 10 YFP to deliver Sustainable Consumption and Production with an emphasis on island-scale entrepreneurship, food and nutrition, sustainable tourism, waste management, and supply chains that support rural development
- Continue to develop sustainable sources of international finance that are needed for responsibilities beyond what islands can reasonably cover themselves
- Coordinate action on environmental crime and financial crime
- Share good models for appropriate contracting and procurement to protect island interests when engaging with external partners
- Ensure investment on monitoring and environmental data generation and information management systems for improved decision making,[52] through the relevant regional bodies

Preliminary review of national policies, actions and initiatives

Macro-economy, technology and globalisation

	SUSTAINABLE ENERGY, TOURISM, TRANSPORT, AND WASTE MANAGEMENT[a]	FOOD SECURITY[b]	DISASTER RISK[c] REDUCTION	ICT[d]	FISCAL REFORM[e]	YOUTH[f]
Atlantic, Indian Ocean and South China Sea Region						
Cape Verde	✓ Energy, tourism			✓		
Comoros	✓ Energy	✓		✓		
Mauritius	✓ Energy	✓	✓	✓		
Sao Tome and Principe	✓ Energy, tourism, waste		✓			
Seychelles	✓ All			✓		
Caribbean Region						
Antigua and Barbuda	✓ Energy; tourism		✓			
Barbados	✓ Energy, tourism, waste	✓	✓	✓	✓	✓
Grenada	✓ Energy	✓	✓			✓
Guyana	✓ All	✓	✓			✓
Jamaica	✓ Energy, tourism, waste					✓
Saint Kitts and Nevis	✓ All	✓			✓	✓
Saint Vincent and the Grenadines	✓ Energy, tourism, waste					✓
Trinidad and Tobago	✓ Energy	✓		✓		✓
Pacific Region						
Fiji	✓ Energy, tourism, transport	✓	✓			✓
Kiribati	✓ Energy, tourism, waste		✓			
Marshall Islands	✓ Energy		✓			✓
Nauru	✓ Energy, waste	✓	✓			
Palau	✓ Energy	✓	✓			
Samoa	✓ Energy, transport	✓	✓	✓		✓
Solomon Islands	✓ Energy	✓				
Tonga	✓ Energy	✓				✓
Tuvalu	✓ Energy					
Vanuatu	✓ Tourism	✓				

Countries are encouraged to provide further information on the table by contacting UNEP Live at uneplive@unep.org

Preliminary review of national policies, actions and initiatives

Social sustainability, demographic balance and governance

	CULTURAL HERITAGE[a]	SOCIAL COHESION[b]	ISLAND EDUCATION[c]	HEALTH[d]
Atlantic, Indian Ocean and South China Sea Region				
Cape Verde	✓		✓	
Comoros			✓	
Mauritius		✓	✓	
Sao Tome and Principe	✓		✓	
Seychelles			✓	✓
Caribbean Region				
Antigua and Barbuda			✓	
Barbados	✓	✓	✓	
Grenada			✓	
Guyana	✓		✓	
Jamaica		✓	✓	
Saint Kitts and Nevis	✓		✓	
Saint Vincent and the Grenadines	✓		✓	
Trinidad and Tobago		✓		
Pacific Region				
Fiji	✓		✓	
Kiribati	✓		✓	
Marshall Islands	✓		✓	
Nauru	✓		✓	
Palau	✓		✓	
Samoa			✓	
Solomon Islands			✓	
Tonga	✓		✓	
Tuvalu			✓	
Vanuatu	✓		✓	

Countries are encouraged to provide further information on the table by contacting UNEP Live at uneplive@unep.org

Preliminary review of national policies, actions and initiatives

Achieving environmental sustainability at the island level

	SUSTAINABLE RESOURCE MANAGEMENT[a]	TRADITIONAL KNOWLEDGE[b]	ECOSYSTEM SERVICES[c]	INVASIVE SPECIES[d]	GENETIC RESOURCES[c]
Atlantic, Indian Ocean and South China Sea Region					
Cape Verde	✓ Water resources; waste				
Comoros	✓ All				
Mauritius	✓ All		✓	✓	
Sao Tome and Principe	✓ Fisheries, water resources, forests and waste				
Seychelles	✓ Water resources, waste				
Caribbean Region					
Antigua and Barbuda	✓ Fisheries		✓		
Barbados	✓ Fisheries, water resources				
Grenada	✓ Water resources, forests, waste				
Guyana	✓ Fisheries, aquaculture, forests	✓			✓
Jamaica	✓ Water resources, waste				
Saint Kitts and Nevis	✓ Fisheries, aquaculture, water resources, waste				
Saint Vincent and the Grenadines	✓ Fisheries, aquaculture	✓	✓	✓	✓
Trinidad and Tobago	✓ Water resources				
Pacific Region					
Fiji	✓ All	✓		✓	
Kiribati	✓ Fisheries, waste	✓	✓		
Marshall Islands	✓ Fisheries				
Nauru	✓ Water resources, waste				
Palau	✓ Water resources		✓		
Samoa	✓ Fisheries, water resources, forests			✓	
Solomon Islands					
Tonga	✓ All	✓			
Tuvalu	✓ Fisheries				
Vanuatu	✓ Fisheries, water resources				

Countries are encouraged to provide further information on the table by contacting UNEP Live at uneplive@unep.org

Preliminary review of national policies, actions and initiatives

Anticipating climate change impacts

	CLIMATE CHANGE[a]	CLIMATE INSURANCE[b]	LOSS OF TERRITORY[c]
Atlantic, Indian Ocean and South China Sea Region			
Cape Verde	✓		
Comoros	✓		
Mauritius	✓		
Sao Tome and Principe	✓		
Seychelles	✓		
Caribbean Region			
Antigua and Barbuda			
Barbados	✓		
Grenada	✓		
Guyana	✓		
Jamaica	✓	✓	
Saint Kitts and Nevis	✓		
Saint Vincent and the Grenadines	✓		
Trinidad and Tobago	✓		
Pacific Region			
Fiji	✓		✓
Kiribati	✓	✓	
Marshall Islands	✓		
Nauru	✓		
Palau	✓		
Samoa	✓		
Solomon Islands	✓		
Tonga	✓		
Tuvalu	✓		
Vanuatu	✓		

Countries are encouraged to provide further information on the table by contacting UNEP Live at uneplive@unep.org

Notes to the tables

Macro-economy, technology and globalisation

a) **Sustainable energy, tourism, transport, and waste management:** Develop strategies for renewable energy and energy efficiency, inclusive sustainable tourism, chemicals and waste management and integrated transport.
b) **Food security:** Explore multiple strategies for food security that increase rural livelihoods and enhance resilience towards climate change.
c) **Disaster risk reduction:** Promote co-operation in disaster risk reduction actions, such as early warning systems, disaster preparedness and risk management.
d) **ICT:** Improve national ICT legislation and infrastructure; and establish a SIDS sustainable development statistics programme and open access data policies.
e) **Fiscal reform:** Develop market mechanisms and fiscal policies to remove environmentally harmful subsidies, and ensure payment for ecosystems services.
f) **Youth:** Create opportunities for youth on and off island, with dynamic careers and decent jobs at least partly island-based.

Social sustainability, demographic balance and governance

a) **Cultural heritage:** Develop mechanisms to conserve and promote, protect and preserve cultural heritage practices and traditional knowledge of SIDS.
b) **Social cohesion:** Rethink SIDS governance and its role in social cohesion of the island diaspora.
c) **Island education:** Redesign island educational systems to respond to local economic, social and environmental needs.
d) **Health:** Encourage SIDS co-operation on health promotion and disease control, especially with regard to levels of non-communicable diseases.

Achieving environmental sustainability at the island level

a) **Sustainable resource management:** Develop comprehensive management strategies for fisheries and aquaculture, forest, water resources, coastal and marine, and waste.
b) **Traditional knowledge:** Integrate traditional knowledge and modern approaches in a SIDS-relevant science.
c) **Ecosystem services:** Monitor and maintain island carrying capacity and ecosystem services, supported by community science and monitoring.
d) **Invasive alien species:** Proactively address the issue of invasive alien species through multi-sector collaboration at all levels and increased public awareness.
e) **Genetic resources:** Develop equitable sharing of the benefits arising out of the utilization of genetic resources.

Anticipating climate change impacts

a) **Climate change:** Proactively address threats from climate change through, for example, ecosystem-based adaptation programmes and investment initiatives.
b) **Climate insurance:** Develop insurance solutions to respond to SIDS vulnerabilities, linked to the global response to loss and damages.
c) **Loss of territory:** Consider the point of no return between adaptation and evacuation for specific island situations.

References

1. CBD 2014, *Island Biodiversity — Island Bright Spots in Conservation & Sustainability,* Convention on Biological Diversity, Quebec, Canada.
2. UNDESA 2010, *Trends in Sustainable Development: Small Island Developing States (SIDS),* Department of Economic and Social Affairs of the United Nations, New York.
3. UNEP 2014a, *Emerging issues for Small Island Developing States: Results of the UNEP Foresight process*, United Nations Environment Programme (UNEP), Nairobi, Kenya.
4. IPCC 2014, 'Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change', in C.B. Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea & L.L. White (eds) Cambridge University Press, Cambridge, UK.
5. Woodroffe, C.D. 2008, 'Reef-island topography and the vulnerability of atolls to sea-level rise', *Global and Planetary Change*, vol. 62, no. 1–2, pp. 77-96.
6. Yamano, H., Kayanne, H., Yamaguchi, T., Kuwahara, Y., Yokoki, H., Shimazaki, H. & Chikamori, M. 2007, 'Atoll island vulnerability to flooding and inundation revealed by historical reconstruction: Fongafale Islet, Funafuti Atoll, Tuvalu', *Global and Planetary Change*, vol. 57, no. 3–4, pp. 407-16.
7. Becker, M., Meyssignac, B., Letetrel, C., Llovel, W., Cazenave, A. & Delcroix, T. 2012, 'Sea level variations at tropical Pacific islands since 1950', *Global and Planetary Change*, vol. 80–81, no. 0, pp. 85-98.
8. Bismarck Ramu Group: Pacific Conference of Churches and the Pacific Network on Globalisation 2014, 'Pacific CSOs raise concern on accelerated seabed mining developments in the region', *Pacific Network on Globalisation*.
9. FAO 2014, Report of the *High-Level Forum on 'Climate Change and Food Security in the Landlocked Developing Countries and Small Island Developing States in Asia and the Pacific Region"*, Food and Agriculture Organization of the United Nations,, Ulaan Baatar, Mongolia.
10. Waycott, M., McKenzie, L.J., Mellors, J.E., Ellison, J.C., Sheaves, M.T., Collier, C., Schwarz, A.-M., Webb, A., Johnson, J.E. & Payri, C.E. 2011, 'Vulnerability of mangroves, seagrasses and intertidal flats in the tropical Pacific to climate change', in J. Bell, J. Johnson & A. Hobday (eds), *Vulnerability of Tropical Pacific Fisheries and Aquaculture to Climate Change*, Secretariat of the Pacific Community, Noumea, New Caledonia, pp. 299-368.
11. UNFCCC 2005, *Climate change, Small Island Developing States*, Climate Change Secretariat (UNFCCC), Bonn, Germany.
12. Matear, R.J., Chamberlain, M.A., Sun, C. & Feng, M. 2014, 'Climate change projection for the western tropical Pacific Ocean using a high-resolution ocean model: Implications for tuna fisheries', *Deep Sea Research Part II: Topical Studies in Oceanography.*
13. Oxenford, H., Roach, R., Brathwaite, A., Nurse, L., Goodridge, R., Hinds, F., Baldwin, K. & Finney, C. 2008, 'Quantitative observations of a major coral bleaching event in Barbados, Southeastern Caribbean', *Climatic Change*, vol. 87, no. 3-4, pp. 435-49.
14. Eakin, C.M., Lough, J.M. & Heron, S.F. 2009, 'Climate Variability and Change: Monitoring Data and Evidence for Increased Coral Bleaching Stress', in M.H. van Oppen & J. Lough (eds), *Coral Bleaching*, vol. 205, Springer Berlin Heidelberg, pp. 41-67.
15. Hoegh-Guldberg, O., Mumby, P.J., Hooten, A.J., Steneck, R.S., Greenfield, P., Gomez, E., Harvell, C.D., Sale, P.F., Edwards, A.J., Caldeira, K., Knowlton, N., Eakin, C.M., Iglesias-Prieto, R., Muthiga, N., Bradbury, R.H., Dubi, A. & Hatziolos, M.E. 2007, 'Coral Reefs Under Rapid Climate Change and Ocean Acidification', Science, vol. 318, no. 5857, pp. 1737-42.
16. Ponce-Reyes, R., Nicholson, E., Baxter, P.W.J., Fuller, R.A. & Possingham, H. 2013, 'Extinction risk in cloud forest fragments under climate change and habitat loss', *Diversity and Distributions*, vol. 19, no. 5-6, pp. 518-29.
17. Yamamoto, L. & Esteban, M. 2011, *Atoll Island States and Climate Change: Sovereignty Implications*. UNU-IAS Working Paper #166, United Nations University, Tokyo, Japan.
18. Yamamoto, L. & Esteban, M. 2010, 'Vanishing Island States and sovereignty', *Ocean & Coastal Management*, vol. 53, no. 1, pp. 1-9.
19. -OHRLLS & UNISDR 2013, *Strengthening Partnerships towards Disaster Risk Reduction for Small Island Developing States. Fourth Session*, UN-OHRLLS and UNISDR, Geneva, Switzerland.
20. UNECLAC 2011, *Saint Lucia Macro Socio-Economic and Environmental Assessment of the Damage and Losses Caused by Hurricane Tomas: A Geo-Environmental Disaster: Towards Resilience*, Economic Commission for Latin America and the Caribbean, Port of Spain, Trinidad and Tobago.
21. UNISDR & OHRLLS 2013, *Addressing Risk, Harnessing Opportunity: Building Disaster Resilience in SIDS*, UNISDR and OHRLLS, Geneva, Switzerland.
22. IUCN 2014, *The IUCN Red List of Threatened Species*, International Union for Conservation of Nature, Washington, DC.
23. Burke, L., Reytar, K., Spalding, M. & Perry, A. 2011, *Reefs at Risk Revisited*, World Resources Institute, Washington, DC.
24. Gardner, T.A., Côté, I.M., Gill, J.A., Grant, A. & Watkinson, A.R. 2003, 'Long-Term Region-Wide Declines in Caribbean Corals', *Science*, vol. 301, no. 5635, pp. 958-60.
25. Roff, G. & Mumby, P.J. 2012, 'Global disparity in the resilience of coral reefs', *Trends in Ecology & Evolution*, vol. 27, no. 7, pp. 404-13.
26. Jackson, J.B.C., Donovan, M.K., Cramer, K.L. & Lam, V.V. 2014, *Status and Trends of Caribbean Coral Reefs*: 1970-2012, Global Coral Reef Monitoring Network, IUCN, Gland, Switzerland.
27. Bismarck Ramu Group: Pacific Conference of Churches and the Pacific Network on Globalisation 2014, 'Pacific CSOs raise concern on accelerated seabed mining developments in the region', *Pacific Network on Globalisation*.
28. Young, R. & Griffith, A. 2009, *Documenting the global impacts of beach sand mining*, Cullowhee, NC, United States.
29. Terry, J. & Falkland, A. 2010, 'Responses of atoll freshwater lenses to storm-surge overwash in the Northern Cook Islands', *Hydrogeology Journal*, vol. 18, no. 3, pp. 749-59.
30. UNEP 2012, *Integrated Watershed and Coastal Areas Management (IWCAM) Atlas*, United Nations Environment Programme, Global Environment Facility (GEF), Nairobi, Kenya, Accesssed on August 21, 2014 at http://www.iwcam.org/documents/gef-iwcam-atlas-2012.pdf/at_download/file.
31. Thaman, R.R. 2013, 'Mai Veikau: A Call for Action, Not Wonder: A book review', *The South Pacific Journal of Natural and Applied Sciences*, vol. 30, no. 1, pp. 77-8.
32. World Bank 2013, 'Renewable internal freshwater resources per capita (cubic meters)', in World Bank (ed.)Washington, DC.
33. McIver, L., Woodward, A., Davies, S., Tibwe, T. & Iddings, S. 2014, 'Assessment of the Health Impacts of Climate Change in Kiribati', *International journal of environmental research and public health*, vol. 11, no. 5, pp. 5224-40.
34. PIFS 2013, *Pacific Regional Millennium Development Goals Tracking Report*, Pacific Islands Forum Secretariat (PIFS), Suva, Fiji.

35. UNEP 2014b, *UNEP Year Book 2014: Emerging Issues in our Global Environment*, United Nations Environment Programme, Nairobi, Kenya.
36. Nicholson-Doty, B. 2013, *State of the Industry Report*, Paper presented at the Caribbean Tourism Organisation headquarters on February 14, 2013.
37. JICA 2013, *Data Collection Survey on Reverse Logistics in the Pacific Islands*, Japan International Cooperation Agency, Tokyo, Japan.
38. SPC Energy Programme 2009, *Framework for Action on Energy Security in the Pacific (FAESP)*: country reports 2009, SPC Energy Programme.
39. Ole, L. 2010, *Promoting Sustainable Energy in The Bahamas*, Fichtner, Stuttgart, German.
40. NEPC 2010, *Second Report of the National Energy Policy Committee*, National Energy Policy Committee, Nassau, Bahamas.
41. Jensen, T.L. 2000, *Renewable Energy on Small Islands*, Forum for Energy and Development, Stuttgart, German.
42. UNEP/UNDESA/FAO 2012, SIDS-Focused: *Green Economy: An Analysis of Challenges and Opportunities*, United Nations Environment Programme, Nairobi, Kenya.
43. UN 1996, *Commission on Sustainable Development: Economic and Social Council: Fourth session*, United Nations, New York.
44. GFN 2014, *Global Footprint Network*, Global Footprint Network, Accessed on August 21, 2014 at http://www.footprintnetwork.org.
45. Dickson, B., Blaney, R., Miles, L., Regan, E., van Soesbergen, A., Väänänen, E., Blyth, S., Harfoot, M., Martin, C.S., McOwen, C., Newbold, T. & van Bochove, J. 2014, *Towards a global map of natural capital: key ecosystem assets* United Nations Environment Programme, Nairobi, Kenya.
46. Thaman, R.R. 2009, 'Sustainability', in R. Gillespie (ed.), *Encyclopedia of Islands*, University of California Press, Berkeley, pp. 888-96.
47. Engelman, R. 2011, 'An End to Population Growth: Why Family Planning Is Key to a Sustainable Future', *Solutions*, vol. 2, no. 3, pp. 32-41.
48. Thaman, R.R. 1988, 'Health and nutrition in the Pacific islands: Development or underdevelopment?', *GeoJournal*, vol. 16, no. 2, pp. 211-27.
49. IDF 2014, *International Diabetes Atlas: Sixth Edition*, International Diabetes Federation, Accessed on August 21, 2014 at http://www.idf.org/diabetesatlas.
50. World Bank 2014, 'Worldwide Goverance Indicators', in W. Bank (ed.)Washington, DC, Accessed on August 21, 2014 at http://info.worldbank.org/governance/wgi/index.aspx#home
51. UN 2014, A/CONF.223/3: *Draft Outcome Document of the Third International Conference on Small Island Developing States.*, United Nations General Assembly, New York.
52. UNOHRLLS 2013, *Small Island Developing States in numbers*, United Nations, New York.

Additional Information

UNEP 2010, GEO Latin America and the Caribbean Environment Outlook 2000.

SPREP/UNEP 2010, Outlook Report on the State of the Marine Biodiversity in the Pacific Islands Region.

UNEP 2005, Atlantic and Indian Ocean Environment Outlook: special edition for the international meeting for the 10-year review of the Barbados programme of action.

UNEP 2005, Caribbean Environment Outlook: special edition for the International Meeting for the 10-year Review of the Barbados Programme of Action.

UNEP Regional Seas Programme: http://www.unep.org/regionalseas/

UNEP Caribbean Environment Programme: http://www.cep.unep.org/

Further resources: http://www.unep.org/uneplive

Background to the Report

The UNEP GEO SIDS Outlook is a follow-up to the UNEP/UN DESA Foresight Process report on Emerging Issues for Small Island Developing States. It is a part of the ongoing UNEP GEO process, helping to ensure that there is a SIDS voice at the global assessment level. It has been developed as a contribution to the 2014 Third International UN Conference on SIDS in Samoa and as input to the development of the post-2015 Sustainable Development Goals.

The UNEP SIDS Foresight Process identified 22 emerging environmental issues and 15 socio-economic issues. The environmental issues comprised of three cross-cutting issues (beyond GDP; unique human capacities for island sustainability and synergising indigenous and local knowledge and modern science as a basis for sustainable island development) and 19 others covering rehabilitation of biodiversity and ecosystem services; sustainable use of natural resources; managing threats from chemicals and waste and climate change and its impacts. The report demonstrated the potential leading role that SIDS can play in defining and implementing holistic models of sustainability and human well-being.

The next step has been to undertake a SIDS Outlook process, based on the key issues identified in the Foresight Report and raised by SIDS in their submissions to the UN Conference on SIDS.

At the core of the SIDS Outlook process was the UNEP Live Community of Practice on SIDS made up of government experts, scientists and policy-makers. An author group, drawn from the Community of Practice was invited to interpret what is known today about the state and trends in the SIDS environment and to articulate an ensemble of outlooks and policy choices options for the future.

The Community of Practice developed a shared understanding of the key attributes that would be needed to develop future sustainable development pathways for SIDS, referring to the six themes of the SIDS conference in Samoa and the latest set of draft Sustainable Development Goals. During a book sprint, the author group made reference to the latest information provided in the national reports submitted to the Third UN SIDS International Conference, international scientific analyses, such as the Fifth Assessment Report of the IPCC, research reports, emerging issues facing SIDS, case studies on good practice and solutions to key challenges in SIDS.

From these inputs, the expert group developed an ensemble of elements for the SIDS Outlook - the blue-green economy; technological leapfrogging; priority to island community and culture; and reconnecting with nature - and a set of enabling actions. Finally, they proposed a SIDS sustainability policy framework to help SIDS to navigate the challenging waters ahead and implement pathways to achieve sustainable development and poverty eradication.

Acknowledgements

Group of experts

Sabah Al-Jenaid, Arabian Gulf University
Anthony Chiu, De La Salle University
Arthur Dahl, International Environment Forum
Karl Fleischmann, University of Seychelles
Keisha Garcia, The University of the West Indies
Mark Graham, Secretariat of the Pacific Regional Environment Programme
Peter King, Institute for Global Environmental Strategies
Ida Kubiszewski, The Australian National University
John McManus, University of Miami
Sachooda Ragoonaden, Association pour le Développement Durable, Mauritius
Beate Ratter, Institute of Coastal Research, Helmholtz-Zentrum Geesthacht
Asha Singh, Organization of Eastern Caribbean States
Richard Suckoo, Coastal Zone Management Unit, Barbados
Philip Weech, The Bahamas Environment, Science & Technology Commission

UNEP expresses gratitude towards Hon. Mr. James Fletcher, Minister for Public Service, Sustainable Development, Energy, Science and Technology of Saint Lucia, for his written contribution on renewable energy

Contributors in the GEO SIDS Community of Practice http://uneplive.unep.org/community/

Asma Abahussain, Arabian Gulf University
Paul Anderson, SPREP
Bruce Potter, Island Resources Foundation
Asha Singh, Organisation of Eastern Caribbean States
Hanneke Van Lavieren, United Nations University
Poh Poh Wong, University of Adelaide, Singapore

Reviewers

Scientific and expert reviewers:

Joe Appiott, Convention on Biological Diversity
Oliver Hillel, Convention on Biological Diversity
Robin Mahon, University of the West Indies
Liana Talaue McManus, University of Miami
John Laing Roberts, Indian Ocean Commission
Randolph Thaman, University of the South Pacific

UNEP reviewers and contributors

Mahenau Agha
Jacqueline Alder
Munyaradzi Chenje
Christopher Corbin
Charles Davies
Ananda Dias
Artie Dubrie
Emily Franc
Jonathan Gilman
Mark Griffith
Sol Jimenez
Edwin Laurent
Mushtaq Memon
Joachim Monkelbaan
Mara Murillo
Asad Naqvi
Samuel Orecho
Ainhoa Carpintero Rogero
Andrea Salinas
Subrata Singha

Han Xu
Kaveh Zahedi
Chen Zhang
Jinhua Zhang
Zinta Zommers

UNEP Coordination and Production Team

Misha Alberizzi
Josephine Bauer
Matthew Billot
Ludgarde Coppens
Tessa Goverse
Hartwig Kremer
Monika MacDevette
Jacqueline McGlade
Janak Pathak
Audrey Ringler
Pinya Sarasas
Asha Sitati
Anna Stabrawa
Ron Witt

UNEP Live and Data Support

Johannes Akiwumi
Chris Ambala
Bruno Chatenoux (GRID-Geneva)
Erick Litswa
Esther Maina
Josephine Mule
Elijah Munyao
Jane Muriithi
Simon Obiero
Neeyati Patel
Pascal Peduzzi (GRID-Geneva)
Stefan Schwarzer (GRID-Geneva)

UNEP Secretariat Support

Harsha Dave
Linda Duquesnoy
Winnie Gaitho
Nyokabi Mwangi

Graphics, Design and Layout

Pouran Ghaffarpour
Josephat Kariuki
Catherine Kimeu
David Koch
Martin Michuki
Chris Mungai
Audrey Ringler
Jinita Shah

Copy Editor

Deborah Kirby

www.unep.org

United Nations Environment Programme
P.O. Box 30552 - 00100 Nairobi, Kenya
Tel.: +254 20 762 1234
Fax: +254 20 762 3927
e-mail: uneppub@unep.org
www.unep.org

UNEP

GEO SIDS Outlook is a contribution to the 2014 Third International UN Conference on Small Island Developing States, which has an overarching theme of the *sustainable development of Small Island Developing States through genuine and durable partnerships*. It is also an important and new contribution to UNEP's Global Environment Outlook that looks at the drivers for change and highlights opportunities and challenges for SIDS in a rapidly changing world.

ISBN: 978-92-807-3405-8
Job Number: DEW/1828/NA