Climate change and health in Maldives: protecting our common future

The term "sustainable development" was first defined in 1987, in the seminal report, *Our common future*, subsequently more commonly known as *The Brundtland report*.[1] The report was the synthesis of 3 years' work by the World Commission on Environment and Development, chaired by Dr Gro Harlem Brundtland, who would go on to be Director-General of the World Health Organization (WHO) from 1998 to 2003.

The *Brundtland report* was pivotal in establishing that the environment cannot be considered in isolation from human activity, and that development is not simply a niche activity whereby richer nations support their poorer counterparts through "development assistance". As famously emphasized by Dr Brundtland, "… the 'environment' is where we all live; and 'development' is what we all do in attempting to improve our lot within that abode. The two are inseparable".

Three decades since *The Brundtland report* was published, we are now in the era of the Sustainable Development Goals (SDGs), which are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.[2] The SDGs provide clear guidelines and targets for all countries to adopt. Almost all the SDGs are directly related to health or contribute to health indirectly and, as highlighted in the articles of this issue of the *WHO South-East Asia Journal of Public Health*, a clear and present danger that imperils achievement of the SDGs is continuing climate change.

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> *Dr Gro Harlem Brundtland, 1987*[1]

The launch of *The Brundtland report* in 1987 came at a pivotal time for Maldives, an archipelago of about 1192 small, low-lying coral islands that are grouped into 26 natural atolls in the Indian Ocean. Three years previously, as the result of two decades of tireless work, the last indigenous case of malaria was recorded.[3] Maldives' elimination of malaria represented not only a triumph in public health but also the inextricable link between a country's malaria status and its potential for development; in the same time period, Maldives transitioned from a low-income to an upper-middle-income country.

Climate change now threatens these successes. Maldives remains free of malaria, and lymphatic filariasis was eliminated in 2016. However, other vector-borne diseases are re-emerging. Dengue became endemic in 2004 and data available indicate that the epidemic dynamics of dengue fever are influenced by climate variability.[4]

Maldives therefore can be seen as a case-study in how a changing climate not only threatens progress made to date in public health but also creates new challenges to sustainable development. Health threats include increases in heat-related illnesses, diarrhoeal diseases and respiratory illnesses. The infrastructures needed to deliver health services, such as electricity supply and water, sanitation and health-care facilities, are also vulnerable to climate change and extreme weather-related events. Indeed, as with other small island states, climate change endangers the very existence of Maldives into the next century and beyond. Being a low-lying island country, Maldives is highly vulnerable to hazards associated with a changing climate.[5]

Maldives has no rivers or streams, and only limited freshwater sources in the form of groundwater. In most of the islands, the freshwater lenses – where a thin layer of fresh water floats on top of dense salt water – are not potable, owing to intrusion from salt water and contamination by leachate from septic tanks. Despite these challenges, by 2015, the country had managed to provide improved drinking water to 99% of its population and improved sanitation to 98%.[6] Most of the urban areas are supplied with desalinated water, while rainwater is the main source of drinking water in rural areas.

Air pollution is an emerging and pressing risk faced by many developing countries. The situation in Maldives is better than most, as there are fewer sources of pollution, except for the capital, Male', where emissions are rising owing to the increasing number of vehicles being brought into the city. Since most of the population has access to electricity and liquefied petroleum gas for cooking, less than 5% of the population uses solid fuels for cooking.[7] The reported range of annual $PM_{2.5}$ (i.e. particulate matter with diameter $\leq$2.5 μm) in Male' city is 11 μg/m^3 and the modelled median $PM_{2.5}$ in both rural and urban areas is 16 μg/m^3, both of which are slightly above WHO guideline values for ambient air quality.[8]

An estimated 313 900 tonnes per year of solid waste are generated in Maldives, of which 21% is attributable to tourism.[9] In addition, about 510 tonnes of medical waste are generated per year. The country is therefore faced with significant challenges in sustainably managing these huge amounts of waste. The bulk of the waste generated in the Male' region is transported daily by boat to Thilafushi, an artificially built industrial island, and then burnt in an uncontrolled manner.

As with many countries in the WHO South-East Asia Region, the health trends in Maldives are shifting from communicable to noncommunicable diseases (NCDs). For Maldives, epidemiological transition has been swift – cardiovascular diseases moved from being the tenth-leading cause of death in 1990 to the leading cause in 2010, and NCDs were estimated to account for 81% of total deaths in 2012.[10] Accordingly, the *Multi-sectoral action plan for the prevention and control of*

noncommunicable diseases in Maldives (2016–2020) targets the four key modifiable risk factors of tobacco use, diet, physical inactivity and alcohol use, and has a specific focus on cardiovascular diseases, diabetes, chronic obstructive pulmonary diseases and cancer.[11] The action plan is supported by recognition from non-health government sectors that prevention and control of NCDs is a cross-sectoral issue.[11] Key aspects of NCD prevention, such as production of fresh vegetables at affordable prices and good urban planning, will be affected by a changing environment.

Although the prevalence of mental disorders in Maldives is still largely unknown, there is growing evidence that it is increasing. The national mental health policy and strategic plan for 2016–2021 aims to create robust governance to ensure integration of mental health services with the existing health-care system, and to establish multisectoral collaboration for promotion, prevention and management of these disorders.[12] Development of a resilient mental health system for Maldives is especially important, since appreciation of the mental health effects of climate change is growing, especially within communities that are vulnerable to extreme weather events.

For 2012, the overall proportion of deaths attributable to environmental factors in Maldives was estimated at about 13%.[13] The country has made impressive progress in addressing environmental health risks; however, much more needs to be done to ensure that water supplied to houses is safe to drink, and to ensure safe management of wastewater. To address environmental degradation and protect human health, a rigorous system for management of solid waste, based on the "3 Rs" principle of reduce, reuse and recycle, has been introduced. Enhanced efforts are needed to maintain air quality within WHO guideline values and to reduce emissions of greenhouse gases in line with the commitment submitted to the United Nations Framework Convention on Climate Change.[14] All of these actions require concerted efforts from different line ministries.

The Ministry of Health in Maldives has plans to strengthen the resilience of its health system to cope with and adapt to climate change. An assessment to check the feasibility of providing solar panels in health-care facilities has been conducted. A study of the quality of drinking water has also been carried out and guidelines developed for managing groundwater. A policy and strategy on managing health-care wastes has also been developed and will be implemented.

Vigilance needs to be maintained to sustain the elimination status of both malaria and lymphatic filariasis. This will be done by progressively reinforcing the six building blocks of health systems, namely governance, health workforce, health information system, health technologies, service delivery and health financing. An exemplary project, the Low Emission Climate Resilient Development (LECReD) programme, is being implemented in Laamu island, through partnership with various ministries, communities and United Nations agencies, and is contributing to health-system resilience. The programme mainstreams LECReD issues into local-level development planning and service delivery, with the aim of greater community-level ownership and sustainability of benefits. Through this project, surveillance and control of dengue has been initiated countrywide.

Maldives will continue to address climate change to ensure the well-being of the generations to come. But climate change does not respect borders and, as noted by Dr Brundtland three decades ago,[1] sustainable development requires cooperation and action by everyone worldwide, to ensure that our common future is protected.

HE Abdulla Nazim Ibrahim
Minister of Health
Government of the Republic of Maldives
Male', Maldives

Arvind Mathur
WHO Representative to Maldives
Office of the WHO Representative to the Republic of Maldives
Male', Maldives

Correspondence to: Dr Arvind Mathur (mathura@who.int)

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