

Executive Summary and Action Plan for the Commonwealth

1. The world is worried about the weather. That worry has increased in recent years, partly because of extreme events which have affected many countries, including a number of members of the Commonwealth. There was flooding in Bangladesh in 1987 and again, on a massive scale, in 1988 when cyclones and tidal waves brought additional death and destruction. The Maldives Islands were inundated in 1987. Hurricane Gilbert devastated Jamaica in the following year. Many African countries have experienced severe drought. India has been assailed by both drought and monsoon flooding. Mid-western Canada had a serious drought in 1988. A severe cyclone hit New Zealand. Severe flash flooding caused damage in northern Australia. Britain was damaged by the worst gales since 1703. These events illustrate vividly how the climate profoundly affects our lives and economic activities.

2. Such disasters are disturbing enough in their own right, but political and public concern has been intensified by the increasing belief among scientists that the underlying pattern of global climate is being altered by humanity to humanity's detriment. Five of the warmest years on record have occurred in the decade of the 1980s. Global mean temperatures are increasing, and many people believe that there is a link between these changes and the extreme events that have affected so many countries. Human activities are undoubtedly altering the chemical composition of the atmosphere, and there is a widely held view among scientists, elaborated later in this report, that this is likely to be a cause of the temperature increases we have experienced.

3. Moreover, there are good reasons for regarding these changes in climate as just one consequence of human pressures on the global environment. The analysis in *Our Common Future*, the report of the World Commission on Environment and Development, leads to the conclusion that the present patterns of human activity which we call 'development'—the transformation of the earth to serve perceived

human needs—are not sustainable and threaten a breakdown in the environmental systems essential for the support of human and other life. This unsustainable environmental pressure is in turn linked to the incessant expansion of humanity's consumption of natural resources, and the rapid growth of human population. Climate change, caused by 'greenhouse gas pollution' is bound to make sustainable development more difficult, exacerbate problems of poverty and increase pressure on water, soil, and food production systems.

4. The implications for Commonwealth countries are perhaps more profound than for many other nations. Since the Commonwealth includes a disproportionate number of small, low-income states, any change which increases their vulnerability and aggravates problems of poverty is to be regarded with the greatest concern. Recognition of the potential seriousness of the problem spurred Heads of Government in Vancouver to propose the establishment of our Expert Group.

5. Since then, concern over climate change and sea level rise has absorbed a growing amount of international attention at the highest level and there has been increasing popular anxiety. The work of the Intergovernmental Panel on Climate Change (IPCC), established in November 1988 by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP), and discussions in other fora, will help to clarify both the scientific facts and the policy implications in the next few years. However, the scale of public concern is such that evaluation of the policy options needs to start now. The Expert Group seeks to contribute to that evaluation by providing a balanced summary of the scientific evidence, of the possible socio-economic impacts, and of the policy implications of climate change and sea level rise, in the particular context of the Commonwealth with its varied membership including countries from virtually every major climatic region in the world.

6. The scientific study of global warming and climate change has progressed in recent years from tentative hypothesis and speculation to somewhat firmer consensus. It is now accepted, from extensive observation, that the world's mean surface temperature has risen over the past century by around 0.5°C, and the sea level has risen by around 10-15 cm. While it cannot be proved that the observed global warming has been caused by the build up of greenhouse gases—predominantly carbon dioxide originating from the burning of fossil fuel—the observed temperature rise is consistent with this belief. Measurements show that greenhouse gas emissions and concentrations in the atmosphere have increased considerably in recent decades, in parallel with the rapid expansion of the world economy. These emissions are bound to continue to rise for many years, and, at some date between 2015 and

2050, their effect on global radiation balance is likely to be equivalent to that expected from a doubling of pre-industrial concentrations of carbon dioxide. The lags in the system (especially due to heat storage in the ocean) mean that, even when concentrations stabilise, the earth will continue to warm and the seas to rise, for some decades.

7. There is a range of estimates of future warming—based on different modelling assumptions regarding the warming process and different projections of future emission levels. But there is a scientific consensus that global warming of the order of 1 to 2 °C will occur by 2030 and some estimates predict much bigger temperature increases. Moreover, the increase in global mean temperature to which the world would be committed if greenhouse gas concentration were stabilised at the equivalent of a doubling of pre-industrial CO₂ would be 1.5 to 4.5 °C. It should be stressed that these figures are somewhat conservative, and assume, *inter alia*, an effective control over emissions of other greenhouse gases such as chlorofluorocarbons, as is now provided for under the Montreal Protocol. Moreover, while a few °C may seem a small increase to the layman, a change of such magnitude over 50 years is in fact unprecedented in recorded human history. Since the coldest point of the last Ice Age, world mean temperature has only increased by some 4 to 5 °C. By 2030 the earth is likely to be warmer than at any time in the past 120,000 years.

8. While there is a reasonable agreement about global average increases, there is much less agreement about what these could mean for the climate of particular regions, let alone individual countries. The current state of science simply does not enable predictions of future temperature and precipitation to be made at that scale with any confidence. Some countries will, however, experience changes significantly greater than the global average. While it should be stressed that these are speculative suppositions, there are reasons for expecting greatest warming in winter in high latitudes (especially Canada, Scandinavia and the USSR); and some of the models suggest that, in general, wet areas could become wetter and dry areas drier. Extreme events could become more common. There seem good reasons for believing that tropical storms could increase in intensity.

9. One of the consequences of global warming would be the expansion of the oceans and some melting of icecaps and glaciers. Scientists have produced different estimates of how much sea level would rise, but a 'best guess' is in a range of 17 to 26 cms by 2030 followed—even if global warming were then to cease—by some continued increases thereafter. These changes would be superimposed on the global mean sea level rise of 10 to 15 cm that has occurred over the past century. The national consequences of such global rises will depend on the topog-

raphy of particular areas and the extent to which they are undergoing land subsidence or elevation; on human activities that affect the durability of natural or artificial defences; and on the variability of sea level round the mean—in tides, seasonal variations and exceptional storm surges due to tropical cyclones and other storms.

10. Predicting the social and economic impact of climate change and sea level rise involves imposing another set of imponderables on a picture already characterised by uncertainty, particularly as regards the effects of climatic change at the regional and country level. Nonetheless, at a joint UNEP/WMO/ICSU Conference held in Villach, Austria, October 1985, scientists from 29 industrialised and developing countries agreed that:

“Many important economic and social decisions are being made today on long-term projects . . . such as irrigation and hydro-power; drought relief; agricultural land use; structural designs and coastal engineering projects; and energy planning—all based on the assumption that past climatic data . . . are a reliable guide to the future. This is no longer a good assumption since the increasing greenhouse gases are expected to cause a significant warming of the global climate in the next century”.

11. There will be a need to adjust to climate change and sea level rise, and a rapid change will be more difficult to adapt to than a slow one. It is the fact that projected climate change is so rapid in historic terms that causes such concern and threatens a costly process of adjustment. Greater climate variability and more extreme events also have costs. Many future problems will arise because of the uneven distribution of these costs. In general, poor countries, and poorer groups within countries, have less capacity to adjust. Poor countries are also, in general, more vulnerable since their economies are more dependent on agriculture and natural resources. Thus the action required to correct underlying problems of poverty and achieve sustainable development would become even more difficult. Although some countries or districts might gain a more benign climate (for example because of warmer, wetter conditions in the northern higher latitudes) and have the resources to exploit the opportunities presented, we do not believe that such local benefits would come near to offsetting the losses of other regions. The overall impact of climate change is likely to be strongly negative because of the costs of adjustment to the unprecedentedly rapid warming likely to be experienced.

12. The story is complex at the level of sectors, as of countries. One major set of impacts is that on natural ecosystems: forests, wetlands, savannah and—in relation to sea level—mangroves and coral. A

particular concern about the rate of anticipated climate change is that it may well exceed the capacity of some natural ecosystems to adjust. Forest tree species, for example, can probably disperse at most by two kilometres a year which is less than the speed at which the natural frontiers of different forest types—temperate and boreal for example—would move with global warming. The ecological adjustments would therefore lag behind climate change. Because the species would move more slowly than the conditions favourable to them, extinctions would probably increase, compounding the present serious problem of loss of the world's biological diversity. The problem would be aggravated by the probability that the world's limited network of nature reserves and protected areas would no longer be in the right place to safeguard the ecosystems or species for which they were established.

13. Like ecosystems, agriculture is generally highly sensitive to climate and carbon dioxide concentrations in the atmosphere. Yields could be affected positively by increased concentrations of CO₂, but higher temperatures (and the inevitably associated higher evaporation), changed precipitation, extremes of temperature and rainfall and the impact of climate change on the growth of weeds and pests would all have a major influence, so that the overall pattern for a particular area is difficult to predict. The effects of climate change on production will depend on how farmers respond through changed farm management practices, as a result of changing relative prices, and according to the actions taken by governments. If the climate changes are progressive, and not marked by an increased frequency of extreme events, it should be possible for most farming systems to adapt because of the short cycle between crops. But there are long maturing tree crops and the lead time for developing new strains averages 10 to 15 years, so adjustment to climate change could be highly problematic in some instances. And marginal farming, where environmental stress is already severe, could have particular difficulty in coping with new demands. For these reasons it will be necessary to initiate long term research and planning to ensure that agriculture, particularly rain-fed farming in developing countries, is helped to adjust to climate change.

14. One particular set of impacts that could be of concern to policy makers is where climate change undermines the assumptions underlying long term infrastructure projects. One sector requiring particular attention is water supply, with particular implications for drinking water, irrigated agriculture and hydro-power generation. A warmer world will, in general, be a wetter world; but a warmer world will also experience greater evaporation of water from the soil, reservoirs and lakes, with effects on the availability of economically usable supplies. The water supply situation is already regarded as serious in many countries and the climatically induced change in water distribution and

availability in these countries could be critical. Pressure on ground water resources, which are already over-exploited in many countries, is likely to intensify. Energy is another sector where long term planning is required, particularly in respect of hydropower where climate change could affect both demand and—through changes in precipitation—supply. Construction standards generally will need in future to take account of climate change.

15. Most economic and social sectors would be affected directly or indirectly by climate change, but among those that are most climate sensitive and face the need for a long term perspective is tourism, on which a good many Commonwealth countries depend. The Maldives for example could face the loss of its international airport and severe pressure on water supplies, while Caribbean and Pacific islands face potentially increased storm hazards. Human health could be affected by even quite small changes in average mean temperature and there is the prospect of some major diseases flourishing in warmer conditions and of more resistant strains of infection emerging.

16. Case studies carried out for the Expert Group show how sea level rise could have far reaching social and economic effects on low lying coastal areas, as in Guyana, Bangladesh, the Maldives, Kiribati, Tuvalu and other Commonwealth countries. Rising sea level threatens fragile ecosystems—mangroves, coral reefs, marshes—that protect coastal areas at present. It could add another element of instability into the rapidly changing, and hazardous, environment of deltas like that of the Ganges in Bangladesh; they face the prospect not only of flooding from the sea and greater risk of storm surges but deeper flooding on inland flood-plains. A one metre sea level rise would flood 15 per cent of Bangladesh, directly affecting ten million people. The small island atolls rarely exceed 2 to 3 metres in height and face greater risk of inundation, erosion of barrier reefs and defences, and contraction of fresh water lenses. Low lying coastal areas such as that of Guyana—where 90 per cent of the population live—are already at or below mean sea level and could face both flooding and disruption of traditional drainage systems. There are potential implications in each of these low lying countries for agriculture; fresh water supply threatened by salination; the siting of towns, factories, power plants and airports; and hazardous waste disposal. Given the long term nature of many investment decisions, planning of coastal infrastructure has to begin to incorporate likely sea level rise.

17. Low lying countries face a series of options in adjusting to rising sea level and it is important that these options are carefully examined in the broader context of coastal zone management. Major sea defences are one option but these are likely to be very expensive and, in any

event, impractical on small coral islands and in shifting deltas. Case studies we have carried out suggest a variety of ways in which, through diversification of food supplies, improved water collection, re-design of dwellings, more careful husbanding of natural defences and effective disaster preparedness strategies, it would be possible for many inhabited low lying islands to adapt, albeit with external assistance. For vulnerable deltas, as in Bangladesh, controlled flooding to increase siltation is one possibility to be seriously considered.

18. We are in no doubt that climate change will have far reaching and substantial consequences. Broadly, three approaches to policy can be adopted. One is for governments to do nothing. While this is understandable given the uncertainty we believe this is the wrong approach and could prove the most costly in the long term. A second is to try to prevent global warming by controlling emissions. We have suggestions to make for strong policy action on a concerted basis in that area but would emphasise that it is already too late to prevent significant warming. A third is planned adaptation.

19. In Chapter 4 we set out the actions we believe that the Commonwealth should take in the light of this serious situation. Our recommendations are grouped within three broad themes. First, we are clear that action must be taken to reduce the burden of uncertainty which hampers the formulation of policy in many areas. This means an increasing investment in sound scientific studies of many kinds, in the development of more reliable climate models, and in the maintenance of monitoring so that these models have sound data upon which to work. It is also essential to inform the public of the conclusions of these studies and monitoring, so that they understand the argument for the changes in lifestyle and circumstances which they may be asked to accept. The second area of action is needed in the sphere of adaptation. Some of the worst consequences of climate change and sea level rise can be avoided by adjustment in patterns of development, in the location of particular agricultural, industrial and development activities, and in consumer preferences for particular types of products. There is a need for governments to evaluate how best to bring about such adaptation within their own national circumstances. The third area of action must be to reduce emissions of greenhouse gases and bring their atmospheric concentrations towards stability. This demands both the application of existing knowledge, for example in energy conservation and the elimination of greenhouse gases like chlorofluorocarbons, and the development of new technologies.

20. In framing our recommendations under these headings we have been conscious of two factors of fundamental importance. The first is that developing countries face particular problems in relation to

climate change. They have an immediate, and immense, task in reducing poverty which climate change could make more difficult. To realise this goal they will need to achieve rapid rates of growth—albeit in a sustainable manner. They cannot, in these circumstances, be expected to curb that growth in order to help alleviate a global problem which they have, in any event, done little to create. The burden of measures to reduce emissions will therefore fall overwhelmingly on the developed world. A second point is that climate change is only one of several major manifestations of environmental stress and cannot be tackled in isolation from others. Our recommendations lay particular emphasis on actions that are prudent in any event, whatever view is taken over the likelihood of impacts of climate change.

21. Our full recommendations appear at the end of Chapter 4. In the paragraphs now following we are grouping the most important of these in a Commonwealth Action Plan, which we commend to Heads of Government as an achievable formula for the near future.

ACTION PLAN FOR THE COMMONWEALTH

1. Co-operation in Research and Evaluation

It is essential to reduce the uncertainty about how particular Commonwealth countries, or groups of countries, will be affected by climate change and sea level rise. All members of the Commonwealth should exchange scientific knowledge, co-operate in research and evaluation—including evaluation of socio-economic aspects—and participate actively in the work of the Inter-Governmental Panel on Climate Change, the World Climate Programme, and other international initiatives that promise to enhance our knowledge of the world climate system, our ability to predict its behaviour and our capacity to determine appropriate responses.

2. Co-operation in Monitoring

It is important for all countries to understand their own climate and to be able to monitor it effectively. Such monitoring, leading to better data, will also contribute to a deeper understanding of the greenhouse effect. Models of the world climate depend on the quality and global extent of the data fed into them. The test of the validity of models lies in comparison between what they predict and what actually happens. For both, a series of routine measurements of the climate at a network of points over the earth's surface is essential. With this in view, governments should ensure that any historic archives of weather records they have are maintained, should continue measurements at locations where there is already a good series of data, and should support one

another in initiating new series where they will contribute most usefully to the wider global coverage of data. Many small countries in particular will need assistance to establish and operate the detailed programme of climate monitoring and climatic hazard warning that we have recommended.

3. *Co-operation in Public Information and Awareness*

Public information, education and training are essential, to help people understand the need for adjustment to climate changes and to prepare for it. Co-operation between governments would facilitate the dissemination of balanced information. The new Commonwealth of Learning initiative could be a valuable means to this end.

4. *Assisting Adaptation*

Suffering, cost and hazard are likely to result from inability to adjust to climate change. These negative effects will be felt most acutely by the poorest countries which have limited capacity for adjustment and are most dependent on natural systems. All members of the Commonwealth should review the sensitivity of their national and local development policies to likely climate and sea level changes, and so avoid unwise public and private investment. Technical assistance should be available, where necessary, to facilitate these reviews. Commonwealth activity can especially be focused on:

- * assisting small island, and other low lying, states to prepare realistic strategies for coping with sea level rise and flooding, in the overall context of coastal zone management;
- * assisting countries to develop effective disaster preparedness, including early warning systems, especially as climate change could well increase the intensity of tropical storms;
- * studying the 'coping mechanisms' of marginal farmers in rainfed agricultural regions with a view to promoting relevant research and training.

5. *Co-operation in Reducing the Rate of Increase in Greenhouses Gases*

It is essential to slow down the increases in atmospheric concentrations of greenhouse gases and eventually to bring them to stability. This will demand national strategies, especially for:

- * energy efficiency and conservation (the most cost-effective and immediately achievable area of action);
- * greater use of, and research on, renewable energy sources, especially hydro-power, biomass, wind and solar power;
- * phasing out of chlorofluorocarbons;

- * sustainable use of forests, promotion of agroforestry and social forestry, and extensive afforestation;
- * promotion of fuel substitution towards low CO₂ emitting fuels, notably natural gas, where this is economically feasible.

All of these actions are desirable on broader grounds regardless of the view that is taken of the uncertainty governing climate change, and determined action could reduce CO₂ emissions from developed countries substantially (by at least 20 per cent by 2005 according to the 1988 Toronto Conference).

Commonwealth countries should help one another in this work through the exchange of national analyses and expertise, and with financial assistance to permit developing countries to curb the greenhouse effect without penalty to their growth and development.

6. *Co-operation in the Development of New Technology for Greenhouse Gas Control*

New technology is needed:

- * to manufacture and apply substitutes for chlorofluorocarbons that are neither strong greenhouse gases nor hazardous to the ozone layer;
- * to increase the range of cost-effective small-scale renewable energy systems suitable for use in village communities of the developing world;
- * to enhance energy efficiency in industry, power generation, homes and offices and transport.

The Commonwealth countries should assist in the transfer of such technology to the developing country members on a bilateral and multilateral basis.

7. *Co-operation in International Action*

The Commonwealth is the source of only a minor proportion of the global emission of greenhouse gases. To solve the problems now confronting the world community, action is therefore needed on a wider international scale. Some Commonwealth governments have already taken a leading role in strengthening international co-operation in this area. Commonwealth members should intensify their efforts and also work together to enhance the effectiveness of international agreements on the environment, especially the Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol, and to develop the proposed Framework Convention on Climate and its subsequent Protocols.

8. *Machinery for Co-operation and Assistance*

There are many ways in which this co-operation can be achieved. But two central components will be organisation and finance. We specifically suggest:

- * Environment Ministers of the Commonwealth should hold periodic consultations to exchange views and experiences;
- * delegations from Commonwealth countries to international meetings concerned with the impact of human activities on world climate and sea level should also endeavour to work in harmony;
- * a Standing Commonwealth Expert Group should be established to assist governments to evaluate developments in the whole area of climate change and sea level rise through periodic reports;
- * the Secretariat should be strengthened in this area to provide effective support to member governments on environmental issues in general as well as to liaise specifically with the Expert Group;
- * additional assistance to developing country members of the Commonwealth to carry out the action in the Expert Group Report and highlighted in the Plan, above, should be accepted as a priority within the technical assistance programmes of the Commonwealth.