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have a disastrous effect on what is an already economically deficient continent, especially by affecting coastal areas which — as in the west and east of Africa — make a profound contribution to their countries' economies. However, Africa's greatest problem lies more in its weak capacity to respond adequately to climate variability and extremes than in responding to global warming per se. This is compounded by its equally weak response and poor resilience to other global shocks.

Africa is the most vulnerable continent to the problems caused by the build-up of greenhouse gases. But it has accounted for less than 3 per cent of it so far, and still contributes less than 4 per cent of the annual addition (3.6 per cent in 2002). Most countries — the Seychelles, South Africa and Libya are exceptions — contribute less than 0.5 tonnes per capita, as opposed to the EU's 12 tonnes and the USA's almost 20 tonnes. The continent has an enormous capacity to be a net carbon sink.

Economic gains

All countries need to take collective and individual action to tackle this problem, and Africa must contribute by reducing its greenhouse gas emissions per unit of economic output and developing to cope with the likely impacts. Unfortunately, most of Africa's vulnerability to climate change is due to its infrastructure deficiencies and high dependence on natural systems. This was clearly demonstrated, for example, in the 2000 Mozambique floods which affected 4.5 million people — causing 700 deaths and economic losses estimated at \$500 million and cutting the GDP growth rate from 10 per cent to 2 per cent — and in the repeated Ethiopian droughts of 1968, 1994 and 2005.

The continent's food production increased 2.8 fold ►

Protect and Grow

OGUNLADE DAVIDSON describes Africa's particular vulnerability to a crisis it has done little to create, and suggests how it can grow both in wealth and in resilience

The world's poorest people have benefited least from the economic activities which have caused greenhouse gases to build up in the atmosphere. Yet they will suffer the most from the consequences, due to their weak resilience to global shocks. Nowhere is this more true than in Africa.

Scientific records indicate that Africa is warming at a rate of 0.5 degrees Celsius a century, and there has been significant decline in precipitation, especially since the mid 1970s. Climate models show, furthermore, that the northern part of the continent may become 5°C (and southern areas 7°C) warmer by the middle of this century and beyond, while its eastern and western regions may

receive increased rainfall. More extreme and more intense droughts and floods are predicted to increase, along with a greater probability of persistent and intense El Niño — Southern Oscillation (ENSO) effects. The variable rainfall in the Sahel and the south of the continent will result in more persistent droughts than at present.

Global warming

Over 80 per cent of Africa's people now depend on agriculture for their livelihoods. But it is predicted that by the 2080s major losses in cereal production will affect over 40 per cent of its countries. There will also be a significant impact on livestock and marine resources, as their wellbeing is strongly linked to rainfall. Vector-borne diseases such as malaria and cholera, which are closely related to climatic changes, are forecast to worsen. Climate change can also

between 1961 and 2002, but with a minimal impact on hunger because population increased by similar amount. About 40 per cent of the harvest is lost either on and off the farm, and reducing this with known storage and delivery systems can lead to tremendous economic benefits and hunger reduction. Similarly improved water storage and delivery, with well-known technologies, can save up to 40 per cent of water resources: using saved water for irrigation and a more rational distribution system can lead to substantial economic gains and reduce vulnerability to climatic change. Improving public health systems — such as with more rationalized health delivery and distribution mechanisms — can similarly reduce vulnerability to vector-borne diseases. All this requires funds, and a greater role for governments in mapping future growth strategies. So a two-pronged approach is needed: intensifying the more common approaches towards climate change adaptation and mitigation while achieving an aggressive growth of wealth creating activities.

Regional effort

Existing activities to build up human and institutional capacities to tackle climate change constraints, though welcome, should be strengthened to maximize gains from such actions as national communication and training programmes. Countries and institutions should be encouraged to learn from each other, while instituting schemes to retain human resources. Climate change research and development continues, but mostly outside the continent: the relatively little in Africa is uncoordinated, reducing its impact. The international attention the Gleneagles agreement gave to this should be exploited, along with regional and national efforts in a co-ordinated framework. This could lead to

promising environmentally-sound and climate-friendly technologies being developed and implemented, producing major economic gains. Using suitable research and development to integrate traditional knowledge with modern systems will be valuable; agriculture provides a rich base for this.

Wealth creation

African countries must be involved in major wealth creating activities, while coping with the demands from climate change mitigation and adaptation: growing poverty remains the greatest obstacle to Africa's development. The UN Department of Economic and Social Affairs estimates that the number of people living on less than \$1 per day rose from 288 million in 1980 to 516 million in 2001. Some positive economic growth has been recorded since 2000, but it needs to be strengthened. An even greater problem is the rising inequalities (in income, human capabilities, access to infrastructure, and decision-making) in several countries, as these can lead to civil conflicts and strife. Sierra Leone provides an example: just before the 1989 war the richest 20 per cent of its people accounted for more than 63 per cent of all spending: the bottom 40 per cent for just 3.1 per cent. Poverty and inequality can only exacerbate stresses from climate anomalies as the continent's response will be severely weakened.

Developing energy, industrializing agriculture and mining sustainably are three promising areas for wealth creation. Africa will be unable to cope with climate mitigation and adaptation demands without substantially increasing its use of its indigenous modern energy resources. It is the smallest consumer of modern energy services, though the ratio of its production of all fossil fuels to its reserves is above the world's average, and it is richly endowed with renewable energy resources. Similarly its vulnerability to climate change will only worsen, unless there is a significant increase in the use of fertilisers, irrigation and agricultural mechanization. Africa contains over 40 per cent of the world's as yet unexploited mineral resources but, unfortunately, only first stage low-value mining activities are being carried

out: the high-value processing stages remain outside the continent. Using more sustainable mining methods is crucial if it is adequately to respond to such global shocks as climate instability.

Scientific uncertainties and economic risks can no longer be used to justify inaction in preventing further major man-made interference with the global climate system. Countries should fully exploit the current growing international attention to climate change and development in Africa — as in the Gleneagles agreement — despite declining aid to the continent. Africa's capacity adequately to respond to the challenges of climate instability will be expanded by improving overall resilience, integrating climate change goals into sustainable development strategies, increasing the use of modern energy systems with reduced carbon intensity, and strengthening international initiatives.

Developmental aspirations

There are obstacles, however. Only five of the 210 Clean Development Mechanism projects registered as of June, 2006, were in Africa: most were India, China and Brazil. Special considerations are needed for African countries plagued with infrastructural deficiencies. Governments need to take a greater role in addressing this: the private sector involvement advocated by donor and international agencies can assist but only in an adequately regulated and competitive environment.

Africa's challenge is to develop a framework and policies that ensure that resources are used efficiently and equitably, to maintain economic and developmental aspirations, and to protect the weak in responding to changes in the climate ■

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