

Invited Lecture

Climate Change and Economic Development: A Pragmatic Approach

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Two major problems promise to dominate economic and social policy during the twenty-first century. These are global climate change and the growing gap between the rich and the poor. Economists are facing these issues at a time when many of the standard tools of economic analysis—for example, competitive general equilibrium and the theoretical system that supports it—have fallen into disfavour in analysing global issues involving uncertainty and irreversibility. This is both a challenge and an opportunity for development economics. This paper first examines economic models of human development and climate change, drawing, where possible, on the situation in Pakistan. We then outline an approach to coping with climate change based on new perspectives in behavioural and development economics, and on the likely consequences of global warming for Pakistan. We focus on adaptation to climate change rather than on mitigation strategies.

INTRODUCTION

Two of the most pressing issues of our time are global climate change and the increasing income gap between the rich and the poor. Both of these issues are particularly acute in Pakistan with its unique and fragile environment and its rich and varied cultural and economic traditions. Dealing with these problems will require innovative approaches based on sound economic analysis and detailed knowledge of the specific environmental and social conditions at work. One advantage in Pakistan's favour is the country's many economists who have worked for decades to develop realistic, on-the-ground approaches to economic development. The value of these approaches has been confirmed by the current revolution in economic theory and policy.

During the last quarter of the twentieth century, economic theory and policy came to be, for the most part, based on the "microfoundations" principle.¹ That is, the proper way to examine macroeconomic problems is to use the assumptions and concepts

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¹By "microfoundations" we mean macroeconomic models based on Walrasian assumptions of rational economic man and perfect competition. The new microfoundations project also begins with individual behaviour, but this behaviour is based on realistic assumptions about decision-making by consumers and firms [see Akerlof (2007); van den Bergh and Gowdy (2003)].

developed to study the behaviour of individuals and firms. According to many observers, the microfoundations approach to economic theory has been in a state of crisis for some time now due to theoretical intractabilities within the Walrasian framework and empirical falsification of some of its basic assumptions regarding consumer and firm behaviour [for surveys see Bowles and Gintis (2000); Gowdy and Mayumi (2001); Gowdy (2004); O'Hara and Stiglitz (2002)]. The importance of the debate within economics was highlighted in the Presidential Address to the 2007 American Economic Association in Chicago given by Nobel Laureate George Akerlof (2007) who lamented the lack of correspondence between predictions made by macroeconomic models based on the "rational actor" model and actual human behaviour: "If there is a difference between real behaviour and behaviour derived from abstract preferences, New Classical economics has no way to pick up those preferences." He called for a redirection of economics based on norms of observed human behaviour and the detailed workings of actual markets. Akerlof's advice is relevant to the quest to achieve a workable economic programme to deal with economic development in the face of global climate change. Related development issues are gender inequality and the growing gap between the rich and the poor.

NEW DIRECTIONS IN DEVELOPMENT ECONOMICS

By the late 1990s, economists were calling for approaches to development that went beyond increasing per capita income alone. Sen (1999) suggested an approach to development emphasising the ability to live an informed and full life rather than concentrating solely on increasing per capita income. Nussbaum (2000) called for a focus on "distributive justice", that is, creating the conditions for the realisation of a set of central human capabilities. Such policies promise to be more effective than simply relying on aggregate income growth alone to improve the lives of the world's poorest. They also offer more flexibility in adapting to environmental changes and widely differing cultural worldviews. With a focus on well-being, individual happiness and self-actualisation, the developing world may improve its human welfare position without emulating the environmentally destructive consumption patterns that drove past economic growth in the developed economies.

According to Haq, *et al.* (1995) the Bretton Woods institutions moved away from their original purpose and they need to be restructured around their original mandates. Haq (1997) is particularly critical of the increased financial burden placed on South Asian nations through debt restructuring packages and structural adjustment programmes. Siddiqui and Malik (2001) found that debt accumulation was a major factor in the decline of Pakistan's relative economic position in the 1990s. They support increased investment in social capital, education, and health care as a way to promote well-being and as a means of increasing the labour productivity, and thus the wages, of low skilled workers. Haq's work on the human development reports for South Asia emphasises that, while economic growth is necessary for poor countries, it does not automatically lead to human development. Haq, *et al.* (1995) call for a pro-active role for the state to invest in human development to ensure that the benefits from economic growth are distributed evenly. For example, a lack of labour rights for wage workers has given large landholders the benefits of agricultural development, while peasant farmers and workers have not seen

significant wage increases. In terms of governance: “every governing institution, every policy action should be judged by one critical test: how does it meet the genuine aspirations of people” [Haq, *et al.* (1995)].

Khan (1999) argues that, in many cases, the positive effects of structural adjustment programmes imposed on developing nations have been exaggerated. Like Haq, he argues that the state must play a strong role in the development process. He argues that, in many cases, development would have progressed faster if multilateral organisations had not been involved [Khan (2002)]. According to him the blueprint for poverty reduction in Pakistan has been accompanied by conditions imposed by lending institutions that have often exacerbated the country’s economic and social problems. Furthermore, the imposed policies have frequently failed to meet the lending institutions’ own targets. As a result, unemployment within sectors employing less advantaged workers has risen relative to those sectors employing better off workers [Khan (1999)]. Khan is of the opinion that governments in Pakistan have used the conditions imposed by the IMF and World Bank to avoid tough decisions on land reform, agricultural taxes, and making tax administration more effective [Khan and Naqvi (2002)]. He argues that regional governments are best equipped to avoid the mistakes of the past and implementing effective human development policies. A regional approach is also supported by Kardar (2002) who feels that this is the best way to increase public sector effectiveness and real human development.

Banuri, Najam, and Odeh (2002) make a case for service provision under the leadership of NGOs, either through stand-alone service delivery or through a partnership with the public sector. There is evidence that at the grassroots level, “civic entrepreneurship” is capable of empowering local communities and contributing human development efforts. Evidence from health care service delivery [Chowdhury and Bhuiya (2004)] and from partnerships between the public sector and NGOs [Mondal (2001)] suggests that growth strategies at the community level can enhance service delivery to the disenfranchised. Based on the economic development experience of the past, a regional approach to development, tailored to the specific social and economic characteristics of a particular area seems most appropriate, even though challenges exist for service coordination [Brinkerhoff (2003)].

It has also become apparent that improving the status of women, particularly in rural areas is of critical importance in development [Brody, Demetriades, and Esplen (2008)]. Numerous studies have shown that educating and empowering women is the most effective way to achieve development goals such as increasing income, lowering fertility rates, and improving health indicators. In many countries modernisation has adversely affected the roles of women in traditional societies. In Nigeria, for example, modernisation of agriculture has meant that traditionally female owned and managed crops like cassava are now grown on large farms resulting in a loss of income and status for women [Gowdy, Iorgulescu, and Onyeiwu (2003)]. In South Asia women’s livelihoods have been adversely affected by encroachments on traditional lands by mining, logging, and commercial farming [Shiva (1989)].

Women play a pivotal role in all areas of economic life in Pakistan. Because of their knowledge of local ecosystems, they take care of farmyard manure collection and its application, which has important consequences for soil fertility management. Women

possess knowledge of herbs for medicine for both general and reproductive health, food and fodder. They also know the location of pastures and water sources, etc. [Pakistan (1995)]. Many environmental initiatives have given women a prominent role in order to facilitate resource conservation efforts. But across a wide range of initiatives (forestry, soil conservation, water, rangeland management, and integrated pest management), outcomes have often been disappointing and sometimes even damaging to women.

The relationship between development and the environment is critical. In Pakistan, as in many other parts of the world, the state of the environment is deteriorating. Land, forests and pastures are degraded by prolonged misuse. The rich soils of the Indus basin are experiencing water logging and salinity. Wind and water erosion is accelerating and desertification is rapidly spreading. Forests are disappearing rapidly and rangelands are being denuded. Such ecological resource depletion has had a profound impact on women's basic roles of obtaining fuel, fodder and water. Shrinking mangrove stands caused by a scarcity of fresh water after the barrages were built, has made coastal women walk longer for the collection of fuelwood for the household and fodder for livestock [Pakistan (1995)]. Moreover, as soils degrade due to deforestation, salinity or waterlogging, and food and incomes decline, women are increasingly marginalised. They are left with the responsibility of taking care of degraded landholdings when men migrate from the villages. Women cotton pickers in Pakistan suffer from health effects caused by chemicals sprayed on crops [Siegmann (2006)].

In addition to the changing realities of economic development, the issue of global climate change has also forced economists to re-think basic assumptions embedded in the traditional economic framework. For example, Dasgupta (2007) writes: "Climate change and biodiversity losses are two phenomena that are probably not amenable to formal, quantitative economic analysis. We economists should not have pressed for what I believe is misplaced concreteness." Likewise, Weitzman (2007) in a commentary on the *Stern Review* writes: "But in lumping together objective and subjective uncertainties and thereby obscuring their distinction...I think that contemporary macroeconomics goes too far and leads to a mindset that too easily identifies probability (and "economic science") with exercise in calibration to sample frequencies from past data." Although he does not use the term, Weitzman calls for applying the "precautionary principle" to avoid the potentially catastrophic effects of global climate change. This change of attitude among economists who have written extensively about climate has important policy implications. And, although directed towards climate change models, the remarks of Dasgupta and Weitzman could easily be applied to many formal models of economic development.

THE THREAT OF CLIMATE CHANGE

A consensus has emerged among scientists and policy-makers that global warming represents a major threat to the environment and to the well-being of humankind and the biosphere [Stern (2007); IPCC (2007)]. During the past century the average global temperature has risen by about 1C with much of that increase due to fossil fuel burning and deforestation. The rate of increase has accelerated during the past 20 years or so as the human impact has begun to dominate natural processes. Global temperatures are projected to increase further by between 1.4C and 5.8C by 2100 and to continue to rise long after that. Scenarios of the likely consequences of such an increase differ

substantially among regions, but include sea level rise, shortages of fresh water, increased droughts and floods, more frequent and intense forest fires, more intense storms, more extreme heat episodes, agricultural disruption, the spread of infectious diseases, and biodiversity loss. Less certain is the possibility of runaway positive feedback effects from, for example, the release of massive amounts of methane from permafrost and marine clathrates buried under the ocean floor [Flannery (2005)]. A cause for alarm is the increasing evidence of disruption to the earth's ecosystems from the relatively small increase in temperature experienced so far. These effects include massive changes in arctic ecosystems to the detriment of keystone species such as polar bears, massive damage to the earth's coral reefs due to ocean warming, acidification, and sea level rise, disruption of migration patterns of birds and megafauna (for example the wildebeest migration in the Serengeti), and disruptive changes to South American rainforests. If such profound changes can result from a 1C average warming one can only imagine the effects of the projected increase of up to 6C over the next 100 years or so.

The climate challenge to Pakistan is adaptation, not mitigation. South Asia, in spite of its large population, produces only a fraction of the world's annual CO₂ emissions. Significant steps toward CO₂ mitigation will be impossible unless the world's largest emitters, the United States and China, take the lead. The United States in particular, as the world's largest and wealthiest economy, has a moral responsibility not only to curb its own emissions but to provide technical assistance to help the developing world move to a carbon neutral path. Even if CO₂ emissions were immediately halted, the Earth would warm by 2-3C solely because of past emissions and the inertia of the climate system. Even if we take extreme mitigation steps soon, the Earth's climate is most likely in for a rough ride in the coming decades.

South Asia is particularly vulnerable to the effects of climate change. A substantial portion of the world's population lives in the four countries of Pakistan, Nepal, India and Bangladesh, and much of the population of three of these countries will eventually be displaced by rising sea levels. Furthermore, the drinking water for much of India and Pakistan comes from the Himalayan, Karakoram, and HinduKush glaciers that are already beginning to melt from warmer temperatures [Jianchu, *et al.* (2007)]. South Asian economies are heavily dependent on agriculture, the economic sector most vulnerable to climate change. Crop yields are already declining in the region, probably due to climate change. According to Rajendra Pachuri, Chairman of the IPCC: "Wheat production in India is already in decline, for no other reason than climate change. Everyone thought we did not have to worry about Indian agriculture for several decades. Now we know it's being affected now" [quoted in Worstall (2007)]. In Pakistan, agricultural yields are also declining and climate change is the likely culprit.² Changes in the timing of monsoons are already having an adverse effect on Pakistan and India. In recent months tens of thousands of families in India have been displaced by severe flooding. Dasgupta (2007) asks: "If a developing country is so vulnerable even to normal seasonal variations, how will it cope with the impacts of climate change—floods and droughts, sea level rise, changes in rainfall patterns, cyclones or typhoons?" It is the very poor in low income countries that are the most susceptible to the effects of climate change.

²Crop yields are adversely affected by higher night-time temperatures because of increased metabolic activity, which draws down energy built up during sunlight hours.

ECONOMIC MODELS OF CLIMATE CHANGE

The most widely used economic models of climate change are integrated assessment models linking climate and economic simulations [Nordhaus and Yang (1996); Stern (2007)]. These models start with the standard economic assumptions of rational actors, perfect competition, and optimising behaviour. We do not intend to go into a detailed critique of these optimising-based climate change models [for this see Laitner, DeCanio, and Peters (2001); Spash (2002); van den Bergh (2004)]. The debate concerning the *Stern Review* has uncovered the fact that the differences among the major climate change models are driven almost solely by assumptions about the rate of discounting the benefits of climate change mitigation (avoiding the costs of future climate damage to economic activity) and costs of mitigation efforts.³ The standard formula used in these models is based on the work of Ramsey (1928), Arrow (1966) and Fellner (1967), among others:

$$r = \Delta + \eta * g \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

Where r is the discount rate, Δ is the rate of pure time preference, η is the elasticity of substitution for consumption, and g is the growth rate of per capita consumption. The “inherent discount rate” Δ is the part of the discount rate arising solely from myopia or impatience [Spash (2007)]. η reflects the extent to which marginal utility changes as income changes in the future. As the many critics of the Stern report have pointed out, the results of the report’s modeling exercises are driven by (ultimately) arbitrary assumptions about the components of the discounting Equation (1)—the rate of time preference, the marginal elasticity of consumption, and estimates of future consumption growth rates. There is no consensus on how to assign values to any of these numbers. In the case of climate change, we are dealing with pure uncertainty in terms of the potential risks, the prospects for future economic growth, and the “proper” social discount rate [Weitzman (2007)]. As a result of the debate about the economic modelling in the Stern report there is a growing consensus among economists that the standard economic model is of limited use in dealing with either mitigation or adaptation policy responses to climate change. But the good news is that the door is open for a realistic approach to deal with climate change that combines sound science and contemporary approaches to economic theory and policy. A positive outcome of the *Stern Review* debate is that it forced economists to recognise the ethical content of seemingly “positive” economic analysis. Another positive outcome of the climate change debate is the realisation that the policy recommendations of climate change specialists echo the recommendations of development economists [Kramer (2007)]. In terms of social risk management, climate change adaptation policies represent “no regret” policies in the sense that that are desirable with or without climate change [Heltberg, *et al.* (2008)].

INNOVATIVE APPROACHES TO CLIMATE CHANGE AND DEVELOPMENT POLICIES

The effects of climate change will be felt first and foremost at the household level. In Pakistan, meeting this challenge will require a variety of policy approaches including

³The *Stern Review* used a standard model (PAGE 2002) to forecast the economic costs and benefits of climate change. But the report also argued forcefully for considering the importance of ethics, and the responsibility to future generations and the rest of the earth’s biosphere, in the climate change debate.

technological innovations, empowering local communities with the tools and information they need to adapt, and setting up mechanisms to provide relief from the effects of climate change. Adapting to climate change is increasingly challenging and will become more and more difficult as global temperatures rise. The task will be made easier because of new directions in economic theory and policy recommendations recognising the heterogeneity of regional economies and of human communities. Two new directions in economics are relevant to this task.

The Economics of Well-Being—Standard models of climate change and economic development have been criticised for an over-reliance on general equilibrium theory. Dasgupta (2007) has called this a case of “misplaced concreteness.” One example is the use of per capita GDP in these models as an indicator of social welfare. Frey and Stutzer (2002) point out that economic texts do not even discuss the meaning of utility but merely assume that utility is equivalent to income and that more income makes a person happier. Typical is a survey article on welfare measurement in the *Journal of Economic Literature* [Slesnick (1998)] which uses the terms “welfare”, “well-being of individuals”, and “household utility” interchangeably. But as Sen and Haq recognised long ago, the well-being of households is too rich and complex to be reduced to income measures alone.

In contrast to the orthodox view, a growing body of economic research uses subjective well-being measures. These measures show that the relationship between per capita income growth and well-being is not generally positive in real-world contexts, at least above some minimal income level [Frey and Stutzer (2002)]. Ng (2001) has shown that economic growth may reduce welfare even within a standard optimisation model.

Sen and Haq in (1990) developed a more complete measure of human well-being, now widely used, called the Human Development Index (HDI). The HDI measures three basic dimensions of human development, health, education, and income. The HDI spawned a number of related indices that go deeper in measuring the notion of “human capabilities”. The “capability poverty measure” (CPM) looks at three basic capabilities—nourishment and health, the capability of healthy reproduction, and female illiteracy. The CPM measure shows that while 21 percent of the population in developing countries is below the income poverty line, 37 percent are below the minimum standard in terms of capability [Womenaid International (2007)]. This measure shows clearly that economic growth by itself does not increase human development for the poor. The economy of Pakistan has been growing rapidly in recent years, yet its food poverty level (32 percent of the population) is worse than it was in 1988 (26 percent). Almost half of Pakistan’s population is below the poverty line on the human poverty index [IUCN Pakistan (2003)]. Clearly the emphasis by the World Bank and IMF on increasing per capita income has not achieved the desired results. The work of IUCN Pakistan has also demonstrated that environmental quality and increasing economic opportunities are complementary, not competing goals.

Behavioural Economics

Experimental results from behavioural economics, evolutionary game theory and neuroscience have firmly established that human choice is a social, not self-regarding, phenomenon. Two broad principles have emerge from the literature (1) human decision-

making cannot be accurately predicted without reference to social context, and (2) regular patterns of decision-making, including responses to rewards and punishments, can be identified both within particular cultures and across cultures. Regularities in human behaviour have important implications for development and climate policy [Gowdy (2005, 2008)]. Among the identified regularities in human behaviour and their policy implications are these:

1. Altruism, Cooperation, and Strong Reciprocity

Humans and closely related primates cooperate on a scale not present in any other mammalian species [Field (2001)]. Recent evidence indicates that this cooperation goes beyond traditional explanations based on kinship and tit-for-tat reciprocity [Fehr and Rockenbach (2004)]. For most of our existence as a species we lived in small groups in environments where cooperation was essential for survival. Groups of people that cooperated were able to out-compete those who did not [Sober and Wilson (1999)]. The existence of pure altruism is not recognised in the traditional economic framework and this omission may seriously affect policy recommendations. Altruism implies that a wider range of effective policies may be available to encourage cooperation and mutual aid for the common good.

2. Altruistic Punishment (Elimination of Free Riding, Promotion of Cooperation)

Altruistic punishment means punishing others who violate social norms even at cost to oneself. Henrich, *et al.* (2006) argues that cooperation and altruistic punishment go hand in hand. People are willing to make sacrifices for others when they are assured that others (free riders) can be punished if they take advantage of altruistic behaviour. Henrich, *et al.* (2006) present cross-cultural results from 15 diverse populations indicating (1) all populations showed a willingness to punish free riders, (2) the amount of punishment varied considerably across the groups studied, and (3) costly punishment was positively correlated with altruistic behaviour. These findings and other game theoretic experiments are valuable in informing climate change policy. The existence of punishing and sanctioning mechanisms can ameliorate two related problems in resource management, free-riding and the tragedy of the commons [Killingback, Bieri, and Flatt (2006)].

3. Fairness and Trust

Related to altruistic punishment is the widespread finding that in humans, as well as in other members of the animal kingdom, a sense of fairness is an important determinant of behaviour and decision making. This is one result of the Ultimatum Game experiment [Güth, Schmittberger, and Schwarz (1982)] which has now been played in dozens of societies around the world. Findings consistently show that offers considered to be unfair are rejected even when it means a considerable loss to the person rejecting the UG offer. The behavioural findings regarding trust and fairness have enormous consequences for climate and development policy. The policy debate surrounding both these issues has centred on fairness, both in terms of intergenerational and cross-cultural equity.

Fairness is a central issue in the climate change debate. Climate change and the environmental and social disruption almost certain to accompany it will very likely have a negative impact on the world's poorest. 65 percent of Pakistan's population, and two-

thirds of its poor, live in rural areas. These areas will be the ones most affected by climate change and they will also be the most difficult to assess, plan for, and administer. Agricultural employment and income will likely be disrupted. Those with inadequate incomes will be most vulnerable to sea level rise, water shortages, and the intensification of storms. In the decades to come much the coastal areas of Pakistan will be submerged, water shortages will result from disappearing glaciers, and agricultural production will almost certainly be disrupted. These changes will inevitably lead to political instability, security concerns, and conflicts with neighbouring countries. There is already a growing gap between rich and poor in Pakistan and climate change is likely to make this gap larger unless pre-emptive steps are taken.

4. Loss Aversion

The finding that people are loss-averse—people place a higher value on losing something they have than they do on gaining something they do not have—is well-established [Knetsch (2005)]. Loss aversion implies that if economic policies are to respect human preferences these policies should err on the side of caution. This is especially true when it comes to placing values on environmental features. Estimating the value of environmental quality to future generations almost always involves losses (loss of climate stability, non-renewable resources, clean air and water). The precautionary principle was originally based on considerations of uncertainty and irreversibility. It is also justified by evidence from experimental economics. Loss avoidance is particularly important in vulnerable communities where the consequences of loss may be very large.

These and other behavioural regularities should be considered carefully while developing climate change adaptation strategies. Behavioural economics is beginning to have a major impact on public policy. Practical examples of using behavioural understandings to inform policy include the design of savings plans [Bernartzi and Thaler (2004)] and encouraging fertiliser adoption in Kenya [Duffo, *et al.* (2005)].

PUTTING THEORY INTO PRACTICE: THE NEED FOR PRIMARY RESEARCH

Development and climate changes challenges are daunting, but the recommendations of the development economists discussed above at least give a sketch of the coming crises and what needs to be done by planning agencies. Problems will vary greatly by region and putting into place regional policies to deal directly with the effects of climate change is a vital first step.

Holdren (2008) in his 2007 presidential address to the AAAS outlined the three pillars of *sustainable well-being* (1) economic conditions and processes, (2) socio-political conditions and processes, and (3) environmental conditions and processes. Nowhere are these pillars more challenged, or more inter-related, than in South Asia. Sound suggestions as to how to go about implementing sustainable well-being have been advocated in various forms by several development specialists [Agrawal (2008); Carvajal (2007); Heltberg, *et al.* (2008)]. A strong consensus seems to have formed in the development community. What is needed now are more case studies in a variety of institutional and geophysical settings. At the village level such case studies might begin by answering these questions:

1. *What are the components of well-being in the village and what is needed to improve them?*

Some aspects of well-being are clear and universal. Every human needs clean water, food, and access to medical care. Other aspects will vary from culture to culture and are harder to define. The starting point to answer this question should be contemporary behavioural research about real human needs and real human behaviour. How have these components been affected by climate change and socio-economic forces in recent years? How have local people adapted to these changes? How successful have these adaptations been?

2. *What are the biophysical constraints and contributors to human development?*

How are climate change impacts on the physical environment likely to affect human development goals? For example, how much clean water is needed in the area and what are the requirements of providing it? How do the services of nature contribute to the sustainable well-being of villagers? What are the land use requirements for adequately protecting biodiversity (placing land off-limits to agriculture)? How have environmental changes affected day-to-day life in the village?

3. *How is climate change likely to affect biophysical features?*

Economists should work closely with natural scientists to understand climate change in general and how it affects specific areas. One thing we have learned is that climate impacts will vary greatly from region to region, sometimes having positive as well as negative effects. Understanding these to the best of our ability is essential in order to help households understand and cope with impending change.

4. *What are some realistic policy options to ease the negative effect of climate change?*

There is a glaring need for an examination of the positive role proactive government policies could play. We need to step away from the focus on market efficiency and rethink the role of the public sector in human society. Ethics, value judgments, and human needs should drive public policies and these should be explicitly included in policy scenarios. These scenarios should work from well-being back to economic and physical requirements. Such models can be used to estimate the physical input requirements for the different scenarios and their likely consequences on a variety of social indicators.

CONCLUSION

Even if strict mitigation initiatives are quickly put in place, the human species faces an unprecedented challenge in adapting to a new and unknown climate regime. But climate change policy can learn much from new initiatives in behavioural economics and new approaches to human development. Climate change adaptation will depend critically on cooperation among countries regions and individuals. Behavioural science has shown that competition and material accumulation are only one part of the richness of human behavioural patterns. Policies building on types of behaviour conducive to cooperation, placing less emphasis on material possessions, and recognising the necessity of shared sacrifice, are more likely to be successful in meeting the climate change challenge. It is

this evolutionary heritage that holds promise for more humane development policies and for meeting the unprecedented challenges humankind will face in the coming decades.

The effects of climate change will be felt first and foremost at the household level. In Pakistan meeting this challenge will require a variety of policy approaches including technological innovations, empowering local communities with the tools and information they need to adapt, and setting up mechanisms to provide relief from the effects of climate change. Adapting to climate change is increasingly challenging and will become more and more difficult as global temperatures rise. The task will be made easier because of new directions in economic theory and policy recommendations recognising the heterogeneity of regional economies and of human communities.

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