

Sustainable Rural Development and Climate Change in the Asia-Pacific Region*

Introduction

Most countries in the Asia-Pacific region have a large rural sector characterised by low economic growth and high levels of poverty. Rural development is, therefore, critically important for the entire region.

Rural development is a comprehensive and multidimensional concept that encompasses the overall development of rural areas with a view to improving the quality of life of rural people. There is, however, no universally acceptable definition of rural development. It is a multi-level, multidisciplinary, and multidimensional concept that includes economic, social, and cultural development.

The livelihoods and wellbeing of the poor in rural Asia are already vulnerable to climate variability because of a high dependency on natural resources and high exposure to climate impacts and hazards such as floods, droughts, landslides, famines, and epidemics. In the absence of significant mitigation and adaptation measures, human-induced climate change is expected to multiply these risks and undermine development goals (World Bank 2010).

Against this backdrop, the objective of this paper is twofold: firstly, to examine the prospective changes in rural development in the context of global change, in general, and climate change, in particular, with a view to suggesting future directions for rural development strategies and policies, and, secondly, to look at the role of governments in facilitating rural development in the new context.

The paper is organised into five sections. The first section examines the changing perspective of rural development and analyses the changing framework conditions for it in the Asia-Pacific region; the second looks at the driving forces of change and the evolution of the values and behaviour of rural agents; the third deals with climate change issues and the implications of climate change for the lives and livelihoods of rural people; the fourth looks at the emerging role of governments in promoting sustainable rural development; and the last section offers some conclusions.

Changing framework conditions for sustainable development and changing paradigms

Structural change in the rural economy and environment

A major structural transformation has taken place in the rural sector in the Asia-Pacific region including changes to the demographic and economic structure, and to communications, mobility, and technology. To design a future strategy and policy for rural development, it is necessary to understand the changing context of rural development.

Demographic trends: Rapid growth of urban population

The Asia-Pacific region is demographically highly dynamic. The population growth is very high in both rural and urban areas. In the five decades from 1950 to 2000, the rural population of almost all of the countries in the region more than doubled (Table 1).

*This paper has been prepared as a conference contribution. Additional references will be added and outstanding permissions sought before publication.

Table 1: Demographic trends in selected Asia-Pacific countries

	% change in rural population 1950 to 2000	Rural population as a % of total population		
		1950	1975	2000
Afghanistan	221	94.2	86.7	78.1
Bangladesh	254	95.8	90.1	75.0
Bhutan		97.9	96.5	92.9
India	247	82.7	78.7	72.3
Indonesia	179	87.6	80.6	59.0
Lao PDR	263	92.8	88.9	80.7
Malaysia	192	79.6	62.3	42.6
Myanmar	232	83.8	76.1	72.3
Nepal	249	97.7	95.0	88.2
Pakistan	288	82.5	73.6	66.9
Philippines	214	72.9	64.4	41.4
Sri Lanka	228	85.6	78.0	77.2
Thailand	288	89.5	84.9	80.2
Vietnam	244	88.4	81.2	75.9

Source: calculated by the author based on Hugo (2003)

The growth in the rural population has been modest compared to that of the urban population (Table 1). While in the 1950s, 80 to 90 per cent of the population was in rural areas in most countries, in 2000, this figure had fallen to 70 to 80 per cent or less in most countries in the region. However, the trend of decline in rural populations is not uniform in all countries. In some, such as Indonesia the rural population dropped to 59 per cent and in Malaysia and the Philippines to around 40 per cent, in the larger countries, such as India, Pakistan, and Bangladesh around 70 per cent of the population still lives in rural areas, whereas in countries such as Nepal, Lao PDR, Bhutan, and Thailand more than 80 per cent of the population still live in rural areas. In almost all of the countries in the region, the trend towards urbanisation is very strong. Table 2 shows that in the 1950s only 5 to 10 per cent of the total population lived in urban areas in most of the countries, except the Philippines and Malaysia, where the urban population was already more than 20 per cent. In 2000, more than 25 per cent of the population lived in urban areas in most countries. However, there is a huge variation in urbanisation trends across the region. In 2000 around 60 per cent of the population lived in urban areas in countries like the Philippines and Malaysia, whereas in Bhutan, Nepal and Lao PDR it was less than 20 per cent. Projections indicate that by 2030 some 40 to 50 per cent of the population will live in urban areas (Table 2).

Table 2: Growth of urban population in selected Asia-Pacific countries

	Urban population (%)			Urban population (%) projected		
	1950	1975	2000	2010	2020	2030
Afghanistan	5.8	13.3	21.9	27	33.3	39.9
Bangladesh	4.2	9.9	25	31.1	37.7	44.3
Bhutan	2.1	3.5	7.1	9.9	13.5	17.9
India	17.3	21.3	27.7	30.3	34.7	40.9
Maldives	10.6	18.1	27.6	32.3	38.3	44.9
Indonesia	12.4	19.4	41.0	50.9	58.4	63.7
Lao PDR	7.2	11.1	19.3	24.2	30.2	36.8
Malaysia	20.4	37.7	57.4	63.8	68.6	72.7
Myanmar	16.2	23.9	27.7	33.4	40.0	46.6
Nepal	2.3	5.0	11.8	15.6	20.4	26.1
Pakistan	17.5	26.4	33.1	36.9	42.4	48.9
Philippines	27.1	35.6	58.6	66.1	71.4	75.1
Sri Lanka	14.4	22.0	22.8	26.8	33.2	39.8
Thailand	10.5	15.1	19.8	22.3	26.7	33.1
Vietnam	11.6	18.8	24.1	28.8	34.7	41.3

Source: Hugo (2003)

Structural shift in the economy: The growing non-farm sector in rural areas

Many countries in the Asia-Pacific region have achieved impressive economic growth over the past decades (Table 3). Between 1980 and 2008, while the global economy was growing at around three per cent, most of the countries of Asia-Pacific region registered growth of four to eight per cent, although there was a setback in the late 1990s in some Southeast Asian countries (i.e., Indonesia, Thailand, Malaysia, and the Philippines). These countries, however, recovered in the early 2000s. In the current decade (2000-2008) most of the countries in the region also achieved impressive economic growth, ranging from 3.5 per cent to 7.9 per cent. It is expected that this growth will continue in the coming years, although the global economic crisis has had some adverse impacts on economic growth in the region.

Table 3: Change in gross domestic product (GDP) of selected countries in the Asia-Pacific region (%)

Country	Average 1982-1991	1993	1995	1997	1999	Average annual % growth 2000-2008
Bangladesh	4.8	4.5	5.0	5.0	3.9	5.9
India	4.2	6.7	7.1	6.3	6.4	7.9
Nepal	4.1	8.2	5.3	3.0	6.0	3.5
Pakistan	7.3	3.9	4.9	2.6	5.1	5.8
Sri Lanka	4.3	5.6	3.8	4.7	6.0	5.5
Indonesia	7.2	7.5	8.0	-13.0	4.9	5.2
Lao PDR	7.0	8.1	6.9	5.0	5.7	6.9
Malaysia	8.9	9.2	10.0	-7.4	8.5	5.5
Philippines	0.3	4.4	5.8	-0.6	3.0	5.1
Thailand	8.1	9.0	5.9	-10.2	4.3	5.2
Vietnam	8.6	8.8	9.3	3.5	5.5	7.7

Source: data for 2000-2008, World Bank 2010; remaining data Paudyal 2007

The growth process over the years has changed economic structures in the region. In the 1950s, agriculture was a major contributor to GDP in most of the countries in the region; by 2008 its contribution had declined significantly whereas the contribution of the service and industry sectors had increased significantly (Table 4). There has been a significant structural shift in the economy

towards the urban sector, and within the urban sector, towards the manufacturing and service sectors, especially the informal sector.

In the rural sector, the shift has been towards non-farm activities. The connectivity of rural areas, except in hill and mountain areas, has improved significantly with more roads and infrastructure, including telecommunications. This has facilitated a change in agriculture and the rural economy.

There has been a significant change in agriculture; traditional subsistence farming is gradually being replaced by commercial agriculture. Many farms are now connected with national, regional, and global markets. Agricultural methods are also being modernised in terms of input use, methods of cultivation, harvesting, threshing, and processing. Agribusiness and contract farming has been emerging rapidly. A significant part of the rural economy is, in fact, being redeveloped in the form of non-farm activities in the service sector or small industries, or through non-crop agriculture. The traditional view of agriculture as a 'way of life' and a preferred occupation is no longer tenable.

Table 4 Contribution of different sectors to GDP of selected countries in the Asia-Pacific region

	Agriculture contribution to GDP			Industry contribution to GDP (%)			Service contribution to GDP (%)		
	1965*	1988*	2008**	1965*	1988*	2008**	1965*	1988*	2008**
Bangladesh	53	46	19	11	14	29	36	40	52
India	44	32	18	22	46	29	34	38	53
Nepal	65	56	34	11	16	17	23	27	50
Pakistan	40	26	20	20	24	27	40	49	53
Sri Lanka	28	26	13	21	27	29	51	47	57
Indonesia	56	24	14	...		48	31	40	37
Lao PDR	...	59	40			31		21	29
Malaysia	28	...	10	25		48	47		42
Philippines	26	23	15	28	34	32	46	44	53
Thailand	32	17	12	23	35	46	45	48	43
Vietnam			20			42			38

Source: * World Development Report (1990); ** World Development Report (2010)

A wide range of such activities is appearing in rural areas, which is redefining the structure of the rural economy and its links with the urban sector. This structural shift in the rural economy has big implications for rural development.

Changing priorities and the rural sector

There has been a significant change in the priorities of international development agencies and national governments in the allocation of resources. While there is an increasing trend of allocation of resources towards the social sector, including social safety nets, there is a declining trend of development assistance to the agricultural sector. The real volume of development assistance to agriculture has decreased by nearly two-thirds from US\$ 6.2 billion in 1980 to US\$ 2.3 billion in

2002 (Figure 1 shows the trends in development assistance in different sectors. It is clear that the share of total development assistance for agriculture has been declining over the years. Similar trends can be observed in government expenditure on agriculture. Although recent data are not readily available, the data from 1972 to 1990 show that the percentage of government expenditure on agriculture has been declining in almost all countries in the Asia-Pacific region (Table 5).

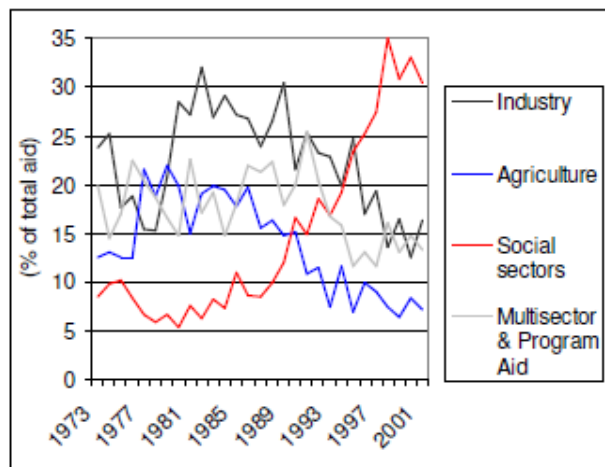


Figure 1 Trends in development aid to different sectors (Source: Bezemer and Headey, 2007)

A parallel, although not uniform, trend can be observed in national resource allocation. Investment in agriculture and rural development decreased up to the end of the century and changed only slightly in the second half of the first decade under the pressure of soaring food prices and high energy costs.

Table 5 Government expenditure on agriculture in selected countries of Asia-Pacific

Country	Percentage of total government expenditure on agriculture				
	1972	1975	1980	1985	1990
Bangladesh	23.2	11.0	12.3	15.7	5.4
China	8.5	12.1	12.4	8.3	8.9
India	22.1	9.7	14.6	12.6	11.5
Indonesia	7.6	9.8	9.6	6.8	7.6
Malaysia	4.0	4.2	7.2	7.9	5.7
Myanmar	12.5	13.3	23.6	24.5	9.3
Nepal	13.7	15.5	16.4	22.0	8.5
Pakistan	5.7	6.7	5.4	2.9	2.6
Philippines	4.5	9.0	5.3	5.7	6.0
Sri Lanka	12.3	9.0	5.7	20.0	5.8
Thailand	7.8	5.9	8.1	11.7	10.4
Total	15.4	10.5	12.4	10.9	9.6

Source: Hazell 2009

Demographic changes, rapid urban population growth, a structural shift in the rural economy, and rural-urban migration have all changed the overall framework conditions of rural development. This means that rural development strategies can no longer be perceived in the same economic context as visualised in the 1960s and 1970s. Therefore, the nature, scope, and focus of rural development has to move away from traditional agrarian development to broad-based development of the rural economy, environment and ecosystem protection, human resource

development, infrastructure development, market development, and technology and knowledge development.

Shifting paradigms in rural development

The concept of rural development has evolved over the years along with changes in perspectives on economic development and tied-up with the evolution of economic growth theories. In the 1950s, the focus of economic development was to increase gross national product (GNP). The first paradigm shift in rural development occurred in the early to mid-1960s when agriculture was seen as an engine of growth for developing countries that could increase food production and provide employment for the growing rural labour force. The focus, therefore, was on agricultural intensification through higher inputs including high-yielding seed varieties, irrigation, fertilisers, and pesticides.

Although increasing GNP and the modernisation of agriculture contributed to economic growth and increased agricultural production, the benefits did not trickle down to the poor as expected. Poverty, malnourishment, and economic and social deprivation have become widespread resulting in increased inequality. The lesson learned was that the top-down sectoral approach to development cannot address inequality.

The second paradigm shift in rural development took place in the 1970s with emphasis on the redistribution of income to ensure fulfilment of basic needs (food, health, shelter, clothing, education, safe drinking water, sanitation, and so on) of all, particularly the poor. Employment generation was considered a vehicle for the distribution of income in achieving the social goal of providing basic services to the poor. The delivery of basic services to the poor was considered a national responsibility making governments critical in ensuring these services and integrated rural development (IRD) became the main thrust of rural development in the Asia-Pacific region.

IRD became an umbrella term and was used by different countries in the region under different names, and with different focuses and implementation mechanisms. For example, in Bangladesh, India, Nepal, Pakistan, and Vietnam it was called IRD; in Malaysia it became the Integrated Agriculture Development Programme (IADP); and in the Philippines and Thailand it was called integrated area development (IAD) (Paudyal 2007).

The IRD approach, however, did not achieve the expected results. The combination of persistent rural poverty, poor coordination, and weak delivery of services, raised the issue of 'government failure'. Increasing external debt and the new neoliberal approach of structural adjustment, slim government, and sectoral focus led to the marginalisation of rural development

The development paradigm of the 1990s focused on private sector-led growth with a reduced role of government in business and development. In turn, government was seen as having an increased role in creating an enabling environment for the smooth functioning of the market and private sector through appropriate regulations and good governance. Likewise, the role of non-government organisations (NGOs) and civil society was emphasised in poverty alleviation and rural development.

Another paradigm shift in rural development took place recently with a focus on ecologically sound development and mainstreaming rural development in poverty reduction strategy papers (PRSPs). The concept of ecologically sound development emphasises the protection of ecosystems, conservation of resources, minimisation of waste, and maximisation of the use of renewable resources, as well as respect for local social and cultural values, aspirations, and needs.

Table 6 presents a summary of the trends in major development paradigms and poverty reduction-strategies since the 1950s.

Table 6: Paradigm shift in thinking on economic growth and rural development

	1950s	1960s	1970s	1980s	1990s	2000s
Dominant paradigms	Increase GNP	Agricultural intensification, Green Revolution,	Basic needs, redistribution with growth	Development of local organisations	Sustainable development	Ecologically sound development
Approaches	Growth through industrialisation, agriculture seen backward	Sectoral	Integrated rural development	Decentralisation, participation	Market liberalisation, partnership between public and private sector	Climate responsive development
Strategies	Transfer resource modernisation	Transfer technology Green Revolution	Develop appropriate technology	Structural adjustment private sector-led development	Structural adjustment free market, get the price right,	Sustainable livelihoods, poverty reduction (PRSP) adaptation and mitigation, good governance
Local cultural values	Ignore as unimportant	Neutralise local factors	Accept and learn work with them	Encourage as a key source of social energy provide information generate support	Capacity building	Respect local social and cultural values community-based adaptation

Source: [developed](#) by ICIMOD

Understanding rural development today

Drivers of Change

Although drivers of change may be context specific and vary from one country to another, some common drivers can be observed in the Asia-Pacific region. The most important of these are globalisation, liberalisation, agricultural development, agricultural mechanisation, population growth, urbanisation, connectivity, mobility, rural-urban linkages, migration, and the growth of the rural economy. These drivers, together with trends in communication technologies, transportation, and education have induced a structural change in rural areas.

Globalisation and liberalisation of international trade and investment, combined with reduced tariff and non-tariff barriers and improved communication facilities, have facilitated the increased movement of goods and services, as well as labour, worldwide. This process has facilitated new market access including remittances and a greater diversity of livelihood options, and integrated many isolated local economies into national, regional, and global markets and economies.

Social and cultural changes have also taken place due to exposure to new media and labour migration. Popular soft drinks and packaged foods from multi-national companies have reached the remotest areas and replaced traditional food and drink available in local areas. Mobile phones have reached remote villages and mobile phone networks have allowed for the greater coordination of business activities and marketing in rural areas.

In general, the growth of the industrial and service sectors was made possible by the increase in agricultural productivity based on the Green Revolution and technological development and cheap energy prices. In certain countries, social reform (land reform or the eviction of small farmers) were important factors in this structural change.

Rural areas are becoming more urban

Today the dichotomy of rural versus urban has lost its weight. The rapid increase in the level of urbanisation has accelerated rates of rural-urban migration. This rapid urbanisation process

has also resulted in a new, distinctive landscape called the 'desakota region' (see Figure 2). First coined by McGee (1989) and later elaborated by Ginsburg (1990), the term is a combination of two Indonesian words: 'desa' for village and 'kota' for town. Desakota regions are characterised by an intense mix of agricultural and non-agricultural activities that often stretch along corridors between large city cores (Suia & Zeng 2001).

Migration as a livelihood strategy

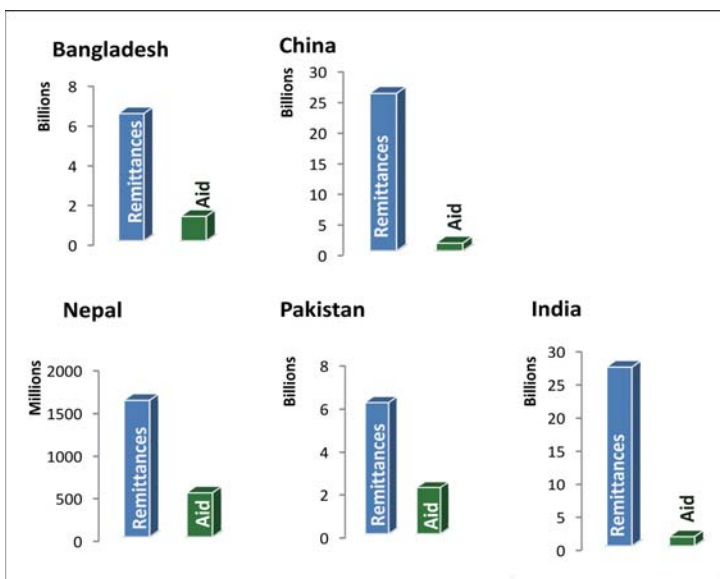
Migration – seasonal, temporal, or permanent – has become a strong pattern and a strategy for livelihood development in the Asia-Pacific region. Remittances are growing and are becoming an important part of GNP. In Nepal, the share of remittances of GNP according to the latest figures is more than 21 per cent. In Bangladesh, remittances register an annual increase of more than 22 per cent, a rate that continued to grow in 2009 despite the global economic crisis. Annual per capita remittances range from US\$ 26 in Thailand to US\$ 185 in the Philippines. In South Asia, the highest per capita remittance is US\$ 131 in Sri Lanka, followed by Nepal at US\$ 61 (Table 7).

Table 7 Relative size of remittance inflows in selected Asia-Pacific countries

Country	Remittance inflow (million US\$)	Relative size of remittance inflow			
		Per capita (US\$)	As % of net OD receipts	As % of GDP	Ratio of of remittances to FDI
Bangladesh	6,562	41	436.9	9.5	10.1
India	35,262	30	2,716.2	3.1	1.5
Nepal	1,734	61	289.8	15.5	302.1
Pakistan	5,998	37	271.1	4.2	1.1
Sri Lanka	2,527	131	429.1	8.1	4.2
Indonesia	6,174	27	776.1	1.5	0.9
Lao PDR	1	0	0.3	0	0
Malaysia	1,700	64	851.4	1.0	0.2
Philippines	16,291	185	2,567.7	11.6	5.6
Thailand	1,635	26	-	0.7	0.2
Vietnam	5,500	63	220.3	7.9	0.8

Note: ODA = official development assistance; GDP = gross domestic product; FDI = foreign direct investment

Source: UNDP (2009)



Most of the countries in the region do not have a coherent strategy to plough remittances back into rural areas – from where these services have been generated. However, remittances grossly exceed foreign aid. Results from macro-economic studies suggest that, on average, a 10 per cent increase in per capita official international remittances leads to a 3.5 per cent decline in the proportion of people living in poverty (Adams and Page 2005).

Figure 3: Contribution of remittances to the national economy

Source: Hoermann and Kollmair 2009

For many rural people in the Asia-Pacific region remittances from migration have become a livelihood strategy. Migration generates financial and human capital as well as contributing to poverty reduction. In Nepal, remittances are responsible for almost 20 per cent of the poverty decrease since 1995, despite the armed insurgency and global economic downturn (Lokshin et al. 2007). According to ICIMOD studies, households in mountain areas use migration and remittances as an adaptation strategy to diversify sources of household income. In the Hindu Kush-Himalayan region, households in Pakistan (Chitral district), Nepal (Far West and Mid-Western Development regions and Koshi river basin), India (Uttarakhand, Koshi and Brahmaputra river basins), and China (Yunnan Province) have been reported to use migration, particularly seasonal migration, as a strategy to improve lives and reduce vulnerability to climate change induced water stress and hazards.

Migration also presents potential opportunities to learn new skills (service oriented, urban linked, trade skills) and for adaptation to climate change.

I went to India to work on an apple farm. I learned how to manage the trees and once back home I bought land with the money I saved to plant trees. I now have a nursery with 28,000 plants and make a good profit. I'm glad I went to India, earned money, and learnt the skills. But, there are plenty of opportunities here as well. (Mr Rawal, Jumla, Nepal)

In Nepal, almost half of all hill households receive remittances that represent close to 35 per cent of their income (Hoermann and Kollmair 2009). Afghans in Iran send 67 per cent of their monthly wage back home, and, as many are the head of their household and the sole breadwinner for their family, this money often represents the sole source of income for their families (UNAMA 2008).

A case study in Pakistan's North-West Frontier Province and the Jammu and Kashmir highlands, two highly food insecure districts, showed that up to 60 per cent of surveyed households rely on remittances to support their livelihoods. Almost 96 per cent of them depend on these inflows as their primary source of income, and, for half, it is their only source of income (Steinmann 2005).

Changing values and behavioural patterns

The development of transport, communication, trade, and information technology has brought about a change that cannot be quantified. Education and professional training of the young generation is largely urban-centred. The younger generation barely identifies with traditional rural values. They are using modern communication tools and enjoy the amenities of modern rural life. They will never again become traditional rural inhabitants. The challenge is to harness the curiosity, interest, and dynamism of the next generation for rural development and upliftment.

Migration is increasingly influencing rural societies' exogenous values. While shuttling and seasonal migration has created a growing rural-urban continuum, the expansion of international labour migration has created new standards. Migrant workers not only adapt to new urban values, depending on the social background of the migrants and their occupation in the host country, they can be strongly influenced by the prevailing cultural values of their host countries. Equally rural areas are not only importing urban culture into rural areas, but sometimes even more conservative cultures. The Middle East, comprising countries with predominantly conservative values, has become a centre of migration for people from rural areas all over Asia. The Muslim population and youth are presented with a cultural model that does not consist of modern western urban values and these migrants are more influenced by the conservative values of their host country, which tallies with their rural roots. These values are not just religious or cultural: they reshape values and attitudes helping migrants and youth to adapt to a rapidly changing world.

Today we can no longer clearly differentiate between urban and rural. Modern development means that values and behaviours influenced by the urban experience are strongly affecting life and livelihoods in rural areas. Rural livelihoods are becoming less dependent on rural factors. They are influenced by global trends, macro-economics, and the strong dynamics of urban centres. Rural development, therefore, cannot be the exclusive responsibility of a technical ministry. It calls for a comprehensive government policy.

Climate change: An emerging issue in rural development

Climate change is a long-term global phenomenon having long-term societal implications. Immediately, climate change creates new vulnerabilities and risks. In the long-term, it poses a serious threat to livelihoods and food security. Particularly mountains and coastal areas will be highly affected. This will have serious implications, not only for the people living in the mountains, but also for those downstream. In coastal areas, the expected rise of the sea level will lead to a loss of living space and subsistence for millions. Climate change, therefore, has become a central concern, and one that will strongly influence the future course of rural development.

The physical changes: Rising temperature; melting glaciers

One of the generally observed and accepted facts is that the global annual average temperature has been increasing steadily for more than a hundred years primarily due to human activities.

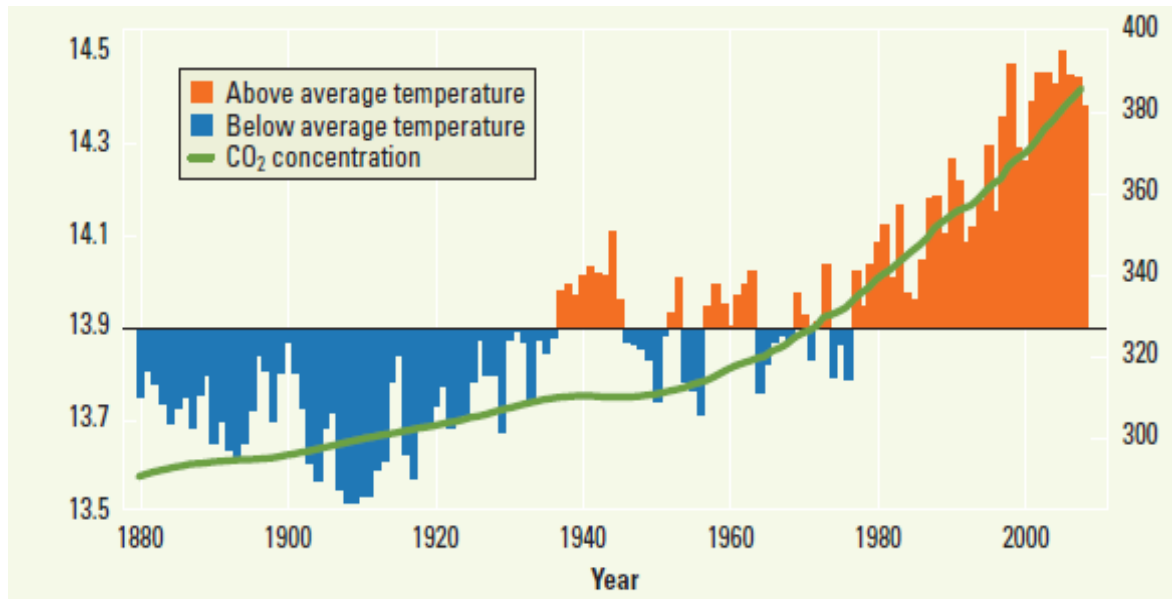


Figure 4 Global temperature change from 1880 to 2007

(Source: World Bank 2010)

The temperature rise has also been observed to be higher at higher elevations. The Hindu Kush-Himalayan region, including the Tibetan Plateau, has also experienced inconsistent trends in overall warming during the past hundred years. For example, the last 30 years witnessed an average temperature increase of 0.6°C per decade in the Nepal Himalayas, while in the Tibetan Plateau the average temperature increased by 0.3°C per decade (Liu and Rasul, 2007). The rise in temperature in the Hindu Kush-Himalayas has accelerated the melting of ice and snow and areas covered by permafrost and glaciers are decreasing in many parts of the region. Growing evidence shows that the glaciers of the Himalayas are receding faster than in other parts of the world. For example, the rate of retreat of the Gangotri glacier over the last three decades has been more than three times the rates of retreat during the preceding 200 years.

A growing number of studies suggest that the Hindu Kush-Himalayan glaciers are retreating substantially, especially in China, India, and Nepal. The glaciers in the Karakorum Range are also in a general state of retreat, although some of these glaciers may be advancing. On the Tibetan Plateau, the glacial area has decreased by 4.5 per cent over the past 20 years and by 7 per cent over the past 40 years (CNCCC 2007). Twenty-seven per cent of the glacier area, equivalent to an ice volume of 16,184 km³, is expected to disappear by 2050, as will 10 to 15 per cent of the frozen soil area (Qin et al. 2002, cited in Liu and Rasul 2007).

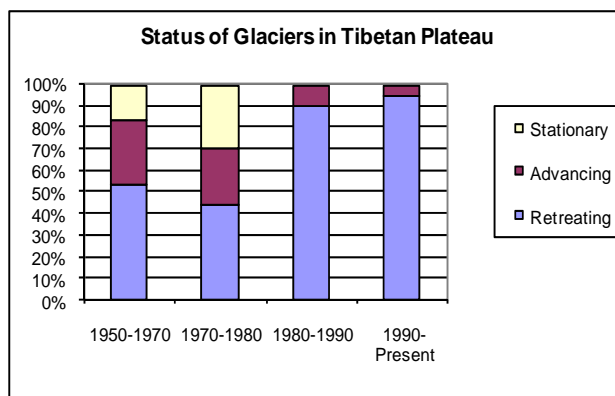


Figure 5 Status of glaciers on Tibetan Plateau

Source: Tandong et al. 2004

Rising sea levels

Rising sea levels may submerge much of the Maldives and inundate 18 per cent of Bangladesh's land. This is also of dire concern in many other countries of the region. Millions of people in coastal areas may lose their homes due to sea level rise. It is estimated that over the next several decades 200 million people may become permanently displaced due to rising sea levels, heavier floods, and more intense droughts (Stern 2007).

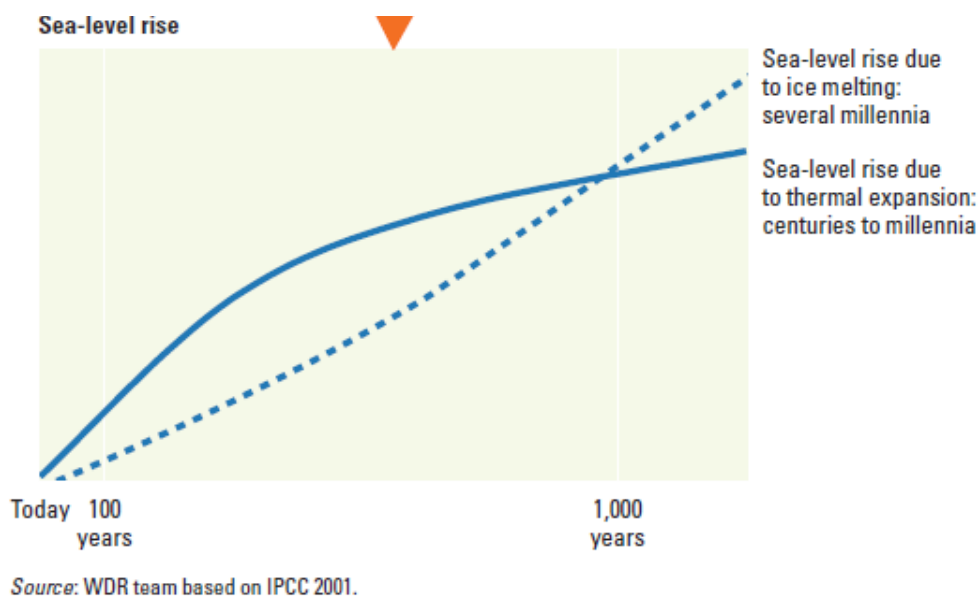


Figure 6 Sea level rise (Source: World Bank 2010)

Besides melting Himalayan glaciers, water resources are likely to be affected by climate change through its effect on the Indian monsoon, which provides 70 per cent of annual precipitation over a four-month period (World Bank 2010).

Extreme events and natural disasters

Global warming may cause increased weather variability, more frequent and intense extreme events such as droughts, floods, and forest fires, and greater exposure to coastal storm surges. Asia-Pacific countries are more exposed and less resilient to climate hazards.

Developing countries are particularly reliant on ecosystem services and natural capital for production in climate-sensitive sectors. Much of their population lives in physically exposed locations and economically precarious conditions. In addition, their financial and institutional capacity to adapt is limited.

Many of the Asia-Pacific countries are vulnerable to natural hazards including floods, droughts, glacial lake outburst floods, landslides, and tsunamis. Floods are a recurring phenomenon in Bangladesh, India, and Nepal and in some other Asia-Pacific countries. The frequency of high intensity floods and other natural disasters is increasing. Asia-Pacific countries have to incur huge economic and social costs as well as loss of human life due to natural disasters (Table 8). Frequent natural disasters have put enormous constraints on the development potential of these countries and have become a serious concern for rural development.

Table 8 Economic and social costs of natural disasters in the Asia-Pacific region

	Mortality 1971-2008	People affected per annum on average			Economic loss			Population and area in coastal zones	
	No. of people dying annually	Drought (in thousands)	Floods storm (in thousands)	Share of population (%)	Droughts (in million US\$)	Floods and storm (million US\$)	Largest per loss (%GDP)	Population in low elevated coastal zones (%)	Area in low elevation coastal zones (%)
Bangladesh	5, 673	658	8, 751	9.1	0	445. 6	9.8	45.6	40.0
India	2, 497	25, 294	22,314	7.2	61. 6	1, 055.4	2.5	6.3	2.5
Indonesia	217	121	206	0.3	4. 2	62. 6	9.3	19.6	9.3
Lao PDR	5	112	123	6.3	.03	8. 7	22.8	0	0
Malaysia	12	0	15	0.1	0	28. 0	0.9	23.5	6.2
Nepal	137	121	87	2.0	.3	25. 8	24.6	0	0
Pakistan	277	58	1,163	1.3	6.5	120. 9	10.5	2.9	2.8
Philippines	743	172	2,743	4.5	1. 7	164. 4	11.0	17.7	7.7
Sri Lanka	45	165	282	3.1	0	12. 0	3.7	11.8	8.3
Thailand	95	618	929	2.2	11. 1	132.7	...	26.3	6.9
Vietnam	393	161	1,749	3.0	17.0	157.6	...	55.1	20.0

Source: World Bank 2010

Implications of climate change for rural livelihoods

Climate change is likely to have a negative impact on rural livelihoods and agriculture in different ways. Rural people are highly dependent on natural resources and ecosystem services and highly vulnerable to climate change including its affects on water availability, rainfall, the hydrological regime, natural disasters, and extreme weather events.

The Himalayan mountains play a significant role in agriculture and food security in South Asia through water supply, climate and wind regulation, groundwater recharge, and in sustaining wetland ecosystems. The Himalayan glaciers are the headwaters of ten major rivers in Asia (Figure 7). The glaciers store the water from precipitation in the form of ice and release it slowly over time. Glacier contribution to river flow is most important in the dry season when there is no rainfall and in areas of generally low precipitation. The amount of melt water depends on the mass of ice available for melting. This melt water is the major source of dry season water for several large river systems, including the Indus, the Ganges, and the Brahmaputra, which provide the main basis for surface and ground water irrigation. These three rivers form the largest river basins (Indo-Ganga-Brahmaputra), which are the major source of rice and wheat in South Asia. Besides surface water, the contribution of mountain discharge to groundwater is also significant, which makes it an important resource for agriculture and food security in South Asia. In addition to providing surface and groundwater, the Himalayan mountain system provides huge inputs to agriculture by regulating micro-climates, as well as wind and monsoon circulation, and by supporting river and wetland ecosystems in South Asia (Eriksson et al. 2009).



Figure 7 River basins downstream of the Hindu Kush-Himalayas

Based on a simulation study on the impacts of climate change on global cereal production (von Braun 2007), the International Food Policy Research Institute concluded that the negative impact of climate change on world cereal production may vary from 0.6 per cent to 0.9 per cent, but that in South Asia the impact could be as high as 18.2 per cent to 22.1 per cent (Table 9). Similarly, UNDP (2006) warns that increased temperatures and water stress may lead to a 30 per cent decrease in crop yields in South Asia by the mid-21st Century. Although increased temperatures may offer the opportunity to grow cereal crops at certain altitudes in the Himalayas, the environmental costs of this could be very high due to accelerated soil erosion.

Table 9 Expected impacts of climate change on global cereal production

	1990-2080 (% change)
World	0.6 to -0.9
Developed countries	2.7 to 9.0
Developing countries	-3.3 to -7.2
Southeast Asia	-2.5 to -7.8
South Asia	-18.2 to -22.1
Sub-Saharan Africa	-3.9 to -7.5
Latin America	5.2 to 12.5

Source: von Braun (2007, p. 4)

Climate change may further reinforce the pressure on available resources and ecosystem services and trigger a vicious circle of poverty, resource degradation, environmental deterioration, and social unrest.

The new role of government

Climate change, water stress, food crises, energy crises, and economic crises have posed new challenges and opportunities and raised a question about the validity of the prevailing neoliberal approach to poverty reduction and sustainable rural development. It is now clear that market alone cannot solve all the problems, particularly addressing the issues of poverty, environmental conservation, climate protection, market failure, institutional development, and good governance. Government has to play a special role in the future in promoting rural development. The following section briefly outlines the prospective role of the government in promoting sustainable rural development.

Food security a strategic requirement for adaptation to climate change

Climate change will alter the timing, availability, quantity, and quality of water resources. To feed the burgeoning population, agricultural productivity has to be increased significantly. As discussed earlier, the major challenge faced by the governments of Asia-Pacific countries in development of the rural sector, particularly agriculture, is the growing water stress and increased weather variability. This will require concerted efforts to identify or develop crop varieties able to withstand droughts and climate shocks as well as better management of water and land resources.

- Increasing agricultural productivity by developing water resources:** Given the increasing water stress, the future growth of agriculture and food production will depend on the management of water and land resources. This issue can be addressed through better management of water resources including storing monsoon rainwater in lakes and reservoirs, and through multipurpose river development. Besides water storage, there is an underestimated scope for enhancing efficiency in irrigation and water resource management, which is very low in South Asia. In India, for example, water use efficiency compared to China varies from 41 to 64 per cent (Table 10). Scholars (e.g., Saleth 1996) suggest that 10 per cent improvement in the efficiency of water use could allow another 14 million hectares of land to be brought under irrigation. Efforts should be made to increase water use efficiency as well as better management of transboundary water resources to improve agriculture productivity, and reduce risks and vulnerabilities of flood, droughts and other natural hazards.

Table 10: Water use efficiency

Crops and products	Average amount of water (in cubic metres per ton)			India's water efficiency compared to China (%)
	India	China	US	
Rice	4,113	1,906	1,840	46
Wheat	1,654	690	849	42
Maize	1,937	801	489	41
Soya beans	4,124	2,617	1869	64

Source: Adapted from Kapur et al. 2009 (p. 41)

- **Increasing the productivity of hill, mountain, and other rain-fed areas:** Diversification of agriculture in favour of high-value products such as fruits, vegetables, dairy products, poultry, fish, and so on is necessary to augment the income of farmers in hills, mountains, and other rain-fed areas. For example, Himachal Pradesh in India and North West Frontier Province (NWFP) in Pakistan have witnessed an upsurge in production in fruit and vegetables in the last two decades. Similarly, in Bhutan, the area under apple production increased by more than 30 per cent between 1986 and 1995. Considerable expansion of horticultural crops, particularly apples and citrus, also took place in Nepal during the same period. The potential of rural areas can be further developed by improving post-harvest management and agro-processing, and through the value-addition of mountain products and reducing post-harvest losses through proper storage, packaging, handling, and transportation.
- **Increasing agricultural productivity by removing supply constraints:** The removal of supply constraints on things such as agricultural inputs, power, irrigation, fertilisers, and infrastructure facilities can increase agricultural productivity. South Asian countries do not produce enough electricity to sustain agriculture productivity. In India, Pakistan, and Bangladesh, farmers suffer heavily from shortages of power supply for irrigation. For example, farmers in Madhya Pradesh, India have electricity for irrigation for only 2 to 4 hours per day and in Rajasthan for 6 to 8 hours (TERI 2009). Agricultural productivity could be improved considerably by improving the supply of inputs and infrastructure facilities.
- **Climate change and water stress lead to a review of the role of governments in research:** These factors along with the energy and food crisis call for new priorities and investments in agricultural research. There will be an increase in attention to weather forecasting, particularly in monsoon areas. It is, therefore, important to increase the level of public investment in agricultural research, technology, and rural infrastructure.
- **Developing of non-farm sectors:** Options for food security should not be confined to the agricultural sector. As nearly 70 per cent of the rural population depend on agriculture as a primary or secondary source of livelihood, there is a need to generate rural jobs in non-farm sectors so that their dependence on agriculture as a main source of income and livelihood is reduced.

New opportunities

- **Migration and remittances:** The relevance of remittances has been explained above. From the point of view of rural development, it will be essential for governments to promote policies favouring the investment of remittances in rural areas. Such policies include the promotion of saving and credit schemes, the creation of incentives for investment in rural areas through matching funds, the prioritisation of services and strategic infrastructure, and the promotion of capacity development schemes. Such policies are a prerequisite for the promotion of return migration.
- **Managing rural ecosystems and their services for rural poor:** Managing ecosystems and their services will be more important in poverty alleviation and rural development in the future. Well managed ecosystems and landscapes can modulate natural disasters and provide additional income to rural farmers. Reducing emissions from deforestation and forest degradation (REDD) and REDD(+) would be one of the of the quickest instruments, expected to be operational soon, and would be an important source of income for rural communities if appropriate policy, institutional, and legal support is provided by the government. Here it is important that rural development ministries support internal mechanisms to allow community forestry groups and rural communities to benefit from these instruments. This requires additional research and above all the creation of transparent and democratic governance mechanisms. Government, therefore, should develop appropriate policy and institutional

framework for taking opportunities of carbon markets and other adaptation and mitigation funds.

- **Payment for environmental services (PES):** Climate change has created a new awareness about the importance of ecosystem services provided by rural areas and particularly mountains. A worldwide effort is underway to put a price tag on such services and to value these services. While some of these services are already well accepted by stakeholders (in relation to water management), others are not yet viable as they do not have a market. Here the public sector has to play an active role as these services are, for the time being, considered public goods without any market value. Additional awareness creation and more applied research is required.

Adaptation to change: Creating a framework for better adaptation

- **Local/community based adaptation:** Traditional coping and adaptive practices are the entry point at the community level. A better understanding of these practices is needed in order to plan interventions to enhance and adjust them to new climatic parameters or complement them with modern technologies where necessary. At the local level, the following community-based interventions are needed: (i) addressing underlying causes of vulnerability; (ii) reducing the risk of possible adverse impacts of climate change, and (iii) building upon the existing rich indigenous and traditional knowledge base with regard to adaptation to environmental change to contribute to building the resilience of mountain communities.

The role of government

- **Promotion of sustainable adaptive practices:** As water is one of the most constraining factors for rural, natural resource dependent communities, the development of water harvesting and storage systems, as well as increasing water use efficiency, are likely to figure as key activities. The promotion of land management techniques and crops which are adapted to new environmental parameters will be essential. In relation to biodiversity, adaptation related biodiversity resource management and utilisation will be another important activity. Women, who are considered as being among the most vulnerable to climate change, but are also among those with the greatest potential to bring about change, must be involved in these activities and a special emphasis should be placed on the implications that the identified mechanisms will have on women's workload and drudgery.
- **Disaster risk reduction:** Creating awareness among communities of potential risks and hazards is a key activity for reducing their vulnerability to climate change impacts. In this context, providing information will be crucial to enhance their capacity to adapt. It will also be important to motivate communities to make use of their rich traditional knowledge about disaster risk preparedness and prevention and to make implicit knowledge explicit. Linking traditional knowledge systems with technologies, including weather information systems that reach the village level, early warning systems, and the participatory development of risk and hazard maps will figure among the key activities to be promoted by governments to prepare communities for the adverse impacts of climate change.
- **Diversification of livelihood options to build resilience:** Livelihood diversification is one of the most important strategies to build communities' resilience. Identifying, piloting, and critically assessing innovative livelihood options will contribute to strengthen the adaptive capacity of mountain communities. These options include the development of community-based mountain tourism, identification of options for the effective use of remittances, development of payments for ecosystem services (PES) (e.g., through carbon funds, the conservation of biodiversity or watershed management), hydropower development, and linking people to markets through value chain development of mountain specific products, among others. The learning from successful pilot studies needs to be disseminated and options scaled up at the regional level.

- **Institutional strengthening and climate change mainstreaming:** Adaptation to climate change never occurs in an institutional vacuum. Organisations (traditional, civic, public, and private) play a vital role in climate change adaptation. They shape the impacts of climate hazards on the livelihoods of the communities. Efforts should be made to strengthen micro-meso and macro level institutions and mainstream adaptation to national planning, development and policy decisions.
- **Communication and awareness raising:** Support for participatory impact and vulnerability assessments will serve as a way of raising awareness within communities of the changes affecting their livelihoods, while at the same time contributing to highlighting their own capacities to adapt and the emerging opportunities related to climate change. Furthermore, the learning from these impact and vulnerability assessments, as well as from the pilot testing of adaptation strategies and innovative livelihood options, needs to be documented and disseminated across the region.

Conclusions

Rural development continues to be a very important priority for the entire Asia-Pacific region. Although urbanisation is increasing rapidly and the contribution of agriculture GDP has been declining over the years, rural areas will still remain the main sector supporting the majority of people in the region. However, rural development strategies can no longer be perceived in the same economic context as in the 1960s and 1970s. The rural development and livelihood strategies of the future have to be understood as a continuum of urbanised and globalised systems. Traditional behaviour and values will be mixed with completely new interpretations of the past.

Integration of rural economies in the national economy and globalisation are increasing the inter-penetration between rural and urban. This means that rural policies have to be justified not only by their impact in rural areas, but by their contribution to national wellbeing. Material aspects (food production in its widest sense), ecosystem services (water, biodiversity, clean air, recreational capacities), and the contribution of rural areas to the mitigation of climate change have to be validated in the national context.

Rural development is a complex process. It requires simultaneous action in various sectors: agriculture, non-agriculture, infrastructure, and technology, as well as human resource development. It also requires mitigation and adaptation to climate change, as well as the creation of a dynamic environment for transforming the rural economy. As a result, rural development must be properly integrated into the national economy. Ministries of rural development alone cannot promote sustainable rural development; a coordinated effort is required. Government and other stakeholders should be motivated to allocate more resources to rural areas.

Knowledge and information sharing, including early warning of natural disasters and climatic events, are essential to build the resilience of local livelihoods and communities to climate change.

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Climate change and adaptation need to be supported by initiatives that build on the multi-tiered evidence base of transboundary socioeconomic and environmental 'hotspots' and, hence, the case for collective action on adaptation. Adaptation requires long-term planning and decision making, considering a broad range of climate and socioeconomic scenarios. It requires new knowledge, technologies, and understanding. It is important that government create opportunities for adaptation to climate change through creating a policy framework, resource mobilisation, regulating the private sector and NGOs, and facilitating adaptation and mitigation measures for climate change and economic globalisation.

We hope it will be possible for ministries of rural development to extract a rationale from this paper that will enable them to influence finance ministers and cabinets of ministers to allocate increased

resources to research and investment in agriculture and other rural sectors including physical and social infrastructure development and to promote sustainable rural development. This will not only reduce poverty, and enhance the quality of life of rural communities but will also reduce pressure on urban facilities that are already vulnerable in many Asia-Pacific countries due to continuous influx of rural migration.

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