

ESAP Chapter 4 Boxes, Figures and Tables

Table 4-1. Approaches for scenario development and impact assessment

Scenario	Focus	Time-line	Approach
IPCC SRES 2000	Climate Change	2100	Designed four different plausible world-A1: rapid economic growth; A2: fragmented world; B1: convergence with global environmental emphasis; and B2: local sustainability. The scenarios consistently describe the relationship between emission driving forces and their evolution over different time-line.
MA 2005	Ecosystem	2050	Developed four plausible scenarios by combining qualitative storyline development and quantitative modeling of driving forces. The four scenarios are: <i>Adapting Mosaic</i> -recognizes extensive value of ecosystem services for human well-being; <i>Techno-garden</i> -proactive policies towards economic value of ecosystem services; <i>Global Orchestration</i> -technology development to fix damaged ecosystem; <i>Order from strength</i> -security and protection within national boundary and ecosystems are less important.
GEO (2002)	Environment	2032	Developed four scenarios through consultation and experience of other scenarios groups. <i>The Markets First</i> : market driven development; <i>The Policy First</i> : strong actions at national level for specific social and environmental goals; <i>The Security First</i> : high inequality and conflict caused by socio-economic and environmental stresses; and <i>The Sustainability First</i> : A world with the emergence of new development paradigm in responses to the challenges of sustainability.
FAO (Bruinsma, 2003)	Agriculture	2030/2050	Looked at different driving forces that lead the growth of global agriculture and food consumption. Discussed future prospects for food, nutrition, agriculture and major commodity group in the future.
IFPRI (2002)	Agriculture	2020	Examined alternative regional and global scenarios (optimistic and pessimistic) based on a number of driving variables. These variables are also affected by policy decisions on investment in agricultural research, irrigation, clean water, and health, population programs and economic policies.

Table 4-2. Sources of productivity (Source: Roland-Holst et al., 2005).

		2005 – 2010	2010 – 2015	2015 – 2020	2020 –20 25
East Asia excluding Japan					
GDP		6.7	6.0	5.5	5.3
Contribution of:	Labor	0.4	0.3	-0.1	-0.1
	Capital	3.4	3.6	3.6	3.5
	TFP	2.8	2.2	2.1	2.0
Southeast Asia					
GDP		6.9	6.8	6.1	5.5
Contribution of:	Labor	1.0	0.8	0.6	0.4
	Capital	1.8	2.1	2.4	2.6
	TFP	4.4	4.2	3.4	3.0
South Asia					
GDP		7.0	6.1	5.7	5.3
Contribution of:	Labor	1.0	0.9	0.8	0.7
	Capital	2.2	2.2	2.2	2.2
	TFP	3.8	3.0	2.6	2.4
Developing Asia					
GDP		6.8	6.2	5.6	5.3
Contribution of:	Labor	0.6	0.5	0.2	0.1
	Capital	2.9	3.2	3.2	3.2
	TFP	3.2	2.7	2.4	2.2

Table 4-3. Projections of poverty by region (Source: World Bank, 2007).

Region	Population (%)					
	less than \$1 per day			less than \$2 per day		
	2003	2015	2030	2003	2015	2030
East Asia and Pacific	11.5	2.8	0.8	40.2	15.5	6.7
China	13.9	3.6	1.1	41.2	16.5	7.3
Rest of East Asia and Pacific	6	1.1	0.2	37.7	13.5	5.4
South Asia	33.2	16.2	8.1	79.5	60.2	46

Table 4-4. Changes in the commodity composition of food demand (expressed in kcal/person/day)

Source: FAO, 2006.

	1969/71	1999/01	2030	2050
	South Asia			
Cereals, food	150.4	157.1	167	169
Roots and tubers	16.9	23.5	31	36
Sugar (raw sugar eq.)	20.3	25.6	30	32
Pulses, dry	14.5	10.1	8	7
Vegetable oils, oilseeds and products (oil eq.)	4.6	9.7	15	18
Meat (carcass weight)	3.9	5.5	12	18
Milk and dairy, excl. butter (fresh milk eq.)	37.0	67.6	106	129
Other food (kcal/person/day)	84	141	180	200
Total food (kcal/person/day)	2066	2392	2790	2980
	East Asia			
Cereals, food	152.2	186.7	176	162
Roots and tubers	96.6	65.8	61	53
Sugar (raw sugar eq.)	5.7	11.6	17	20
Pulses, dry	4.8	2.0	2	2
Vegetable oils, oilseeds and products (oil eq.)	3.5	10.6	15	17
Meat (carcass weight)	9.2	39.8	62	73
Milk and dairy, excl. butter (fresh milk eq.)	3.7	11.3	21	24
Other food (kcal/person/day)	98	322	405	440
Total food (kcal/person/day)	2012	2872	3190	3230

Table 4-5. Climate change and adaptation measures in agriculture

Sectors	Adaptation Measures	AKST Challenges
Agriculture cropping	<p><i>Choice of crop and cultivar:</i> Use of more heat/drought tolerant crop varieties in areas under water stress Use of more disease and pest tolerant crop varieties Use of salt-tolerant crop varieties Introduce higher yielding, earlier maturing crop varieties in cold regions</p> <p><i>Farm management</i> Altered application of nutrients/fertilizer Altered application of insecticides/pesticides Change planting date to effectively use the prolonged growing season and irrigation Develop adaptive management strategy at farm level</p>	<ul style="list-style-type: none"> -identification of appropriate gene -lack of resources for the development of varieties -time-lag between development; field trial, acceptability of farmers and onset of climate change -onset of new pests and diseases -Needs extensive research on nutrients and fertilizer requirements of new crop varieties -Changing planting date could have effect on yield -resources and technology require at grass roots level
Livestock Production	<ul style="list-style-type: none"> Breeding livestock for greater tolerance and productivity Increase stocks of forages for unfavorable time periods Improve pasture and grazing management including improved grasslands and pastures Improve management of stocking rates and rotation of pastures Increase the quantity of forages used to graze animals Plant native grassland species Increase plant coverage per hectare Provide local specific support in supplementary feed and veterinary service 	<ul style="list-style-type: none"> -breeding less climate sensitive livestock will be a formidable challenge -less climate sensitive grass and pasture varieties need to be developed -many native grassland species are not nutritious for animals -need resources, advanced technology for feed and veterinary service
Fishery	<ul style="list-style-type: none"> Breeding fish tolerant to high water temperature Improved fisheries management capabilities to tackle climate change 	<ul style="list-style-type: none"> -cross breeding with fishes from arid region is a possibility but its effects on local varieties will be unknown for long period -Technology and resources will be major obstacle
Development of agricultural Bio-technologies	<ul style="list-style-type: none"> Development and distribution of more drought, disease, pest and salt-tolerant crop varieties Develop improved processing and conservation technologies in livestock production Improve crossbreeds of high productivity animals 	<ul style="list-style-type: none"> -will emerge as technological challenge for poor countries -faster technological transfer is required -a new nexus between technology owners may emerge to take advantage of climate change
Improvement of Agricultural Infrastructure	<ul style="list-style-type: none"> Improve pasture water supply Improve irrigation systems and their efficiency Improve use/store of rain and snow water Improve information exchange system on new technologies at national as well as regional and international level Improve sea defence and flood management Improve access of herders, fishers and farmers to timely weather forecasts 	<ul style="list-style-type: none"> -improved water store, supply and irrigation need new technologies and replacement of the old -dissemination of information on technology requires to build institutional capacity and educating farmers -improved sea defence and flood management have potentials but they have certain limits

Note: This table is modified from Chapter 10: Asia of the IPCC WGII, Fourth Assessment Report (AR4), 2007.

Table 4-6. Biofuel policy initiatives in ESAP (Source: Raju, 2006)

Country	Source of Biofuel	Suggested Blending (%)	Issue of National Biofuel Policy/Act
China	Ethanol	10	2005
India	Ethanol, Jatropha oil, Pongamia oil	5 (with up to 10 for public transit)	2003
Japan	Ethanol	3	2003
Malaysia	Palm oil	5	2005
Thailand	Tapioca, Ethanol	10	2005
The Philippines	Coconut oil	10	2005

Table 4-7. Major uncertainties and likely impacts in the ESAP region.

Key Uncertainties	Drivers of change directly affected	Implications for agriculture, food systems, products and services	Implications for development and sustainability goals in the ESAP region
1. Climate change ¹ Rise in - sea level - temperature - precipitation (2015-2075)	Demographic changes Economic growth Agricultural growth Trade Investment	-Resurgence of tropical diseases - High morbidity rates -Reduced labor availability -Unpredictable employment opportunities -Factor productivity declines -Food prices increase -Unstable markets -Declining crop productivity -Cost of production increase -Animal & crop diseases increase -Preservation +storage crucial -Deciduous forests incapable of regeneration -Desertification increases -Unpredictable production estimates, quality standards, etc. -Futures markets collapse -Higher market regulation with increasing loopholes -Capital diverted to survival (food, health,) -Returns to investment decline	-Increase in poverty, hunger and malnutrition -Inequality, civil strife increase -Economic growth unsustainable - Natural resource degradation -S&T becomes emergency driven and legitimacy falls -Governance and decision-making become more centralized -End of capitalism ²
2. Regional conflicts (water/energy) (2015- 2030)	Water	- Irrigation water pricing -Production costs increase -Urbanization slows - Off-shore fishing	- Water conflicts – worsening law and order -Hunger and food crisis severe – global aid resolves some of it -Limited employment

¹ IPCC (2007)² Industrial capitalism “will walk out of the economy silently, on its toes” after it has wreaked havoc on humanity and the ecosystem (Beck, 1992).

	<p>Energy –</p> <p>Trade</p> <p>Economic growth</p>	<p>collapses</p> <ul style="list-style-type: none"> - Migration increases -China + India – efforts to contain domestic inequities -India –global collaboration for basic needs -Nuclear energy increases - Hydel power collapse -Non-conventional energy increases - Gains in off shore oil gas -Energy prices soar -Trade declines – tariffs increase - Regional cooperation collapses -GDP and agricultural growth declines -Public investment in maintenance/ compensation -Private capital shifts to EU/LAC/ Africa 	<ul style="list-style-type: none"> -Gender relationships, female labor options worsen -Economic development grinds to a halt -Investments in water/energy saving, construction, agricultural and industrial production -South Asian trade blocks collapse – China or China + Australia dominate East Asian trade -China regional leader -Civil liberties curtailed
<p>3. Global conflicts (2020-2030)</p>	<p>-Fiscal / Political stability</p> <p>- Globalization</p>	<ul style="list-style-type: none"> -China withdraws investments in the USA -USA³ attempts to contain Chinese growth -ESAP divided –Chinese vs. US allies -Collapse of WTO -EU vs. USA – sub-regional trade blocks -Labour/capital mobility constrained -Global trade declines -Markets/ investments shift to ESAP and LAC -Regional and sub-regional instability -Regulations increase 	<ul style="list-style-type: none"> -USA and EU unemployment increase -Worst global economic depression -Economic growth limited to some pockets -China dominates ESAP -Intra-regional alliances increases -Global defense expenses escalate
<p>4. Confederation of Asia-Pacific States (2020-2050)</p>	<p>-Political stability</p> <p>-Civic space</p>	<ul style="list-style-type: none"> -Increasing domestic strife -Lack of faith in the UN to resolve local conflicts, detract authoritarian nation states in Asia -Transnational constitutionalism -Civil society + private sector led negotiations -Pan-Asian identity -Political maturity –South Asian Parliament and Boao Forum ideas⁴ 	<ul style="list-style-type: none"> -Asia-Pacific Union/Parliament emerges - Yeng\$ (China-Japan-Australia-Singapore-Brunei lead Asia-Pacific currency) , Asian Monetary Fund -Unrestricted labor and capital mobility -Trans-Asian transport improved -Trans-national integration and governance given prime importance. -Human rights and ecological values politically accepted.

³ Tammen (2006); Christensen (2006)

⁴ Muni (2004)

	<ul style="list-style-type: none"> - Energy/Climate change -Economic growth 	<ul style="list-style-type: none"> -Federalism and democratic governance -Fungible borders, shared problems and solutions -Regional protocols, policies and S&T for systems understanding + solutions -Intra-regional co-operation and trade increase 	
--	---	---	--

Figure 4-1. Asian population trends (Source: DESA, 2006)

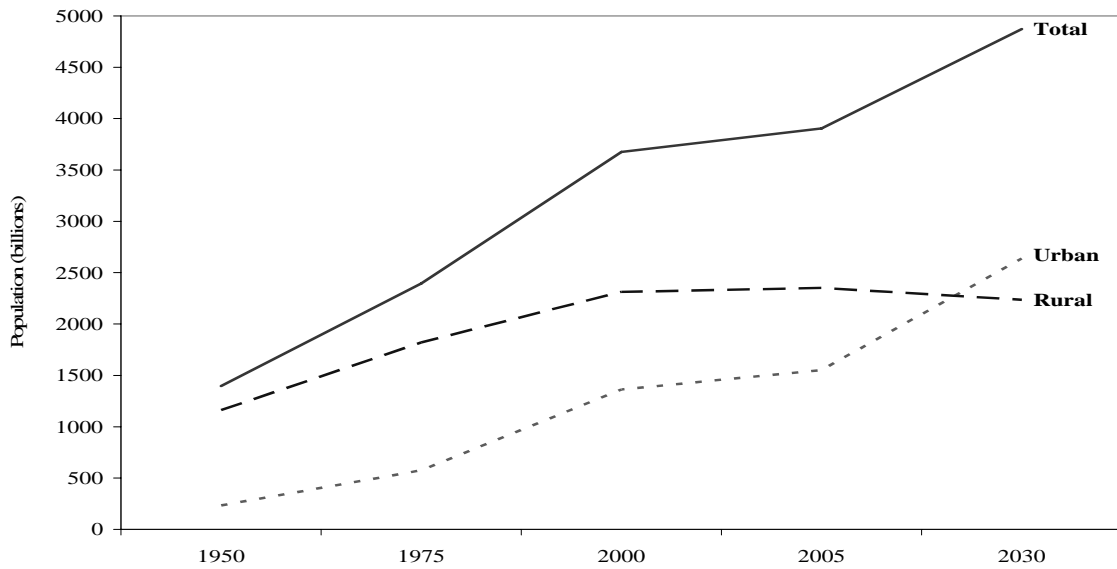


Figure 4-2. Status and future projection on percentage of women age 15-49 in some Asian countries and regions (Source: UN, 2001).

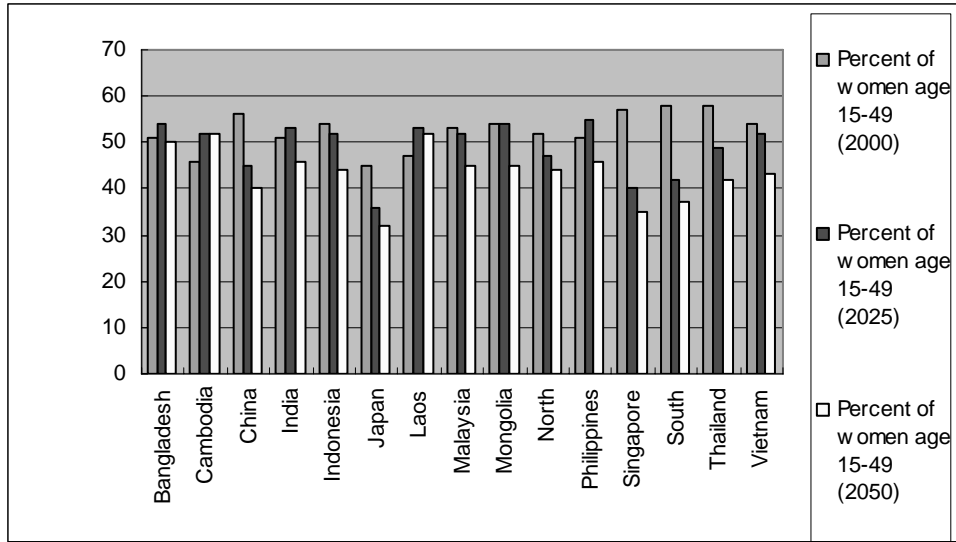


Figure 4-3. Baseline growth projections by ADB (Source: Roland-Holst et al., 2005).

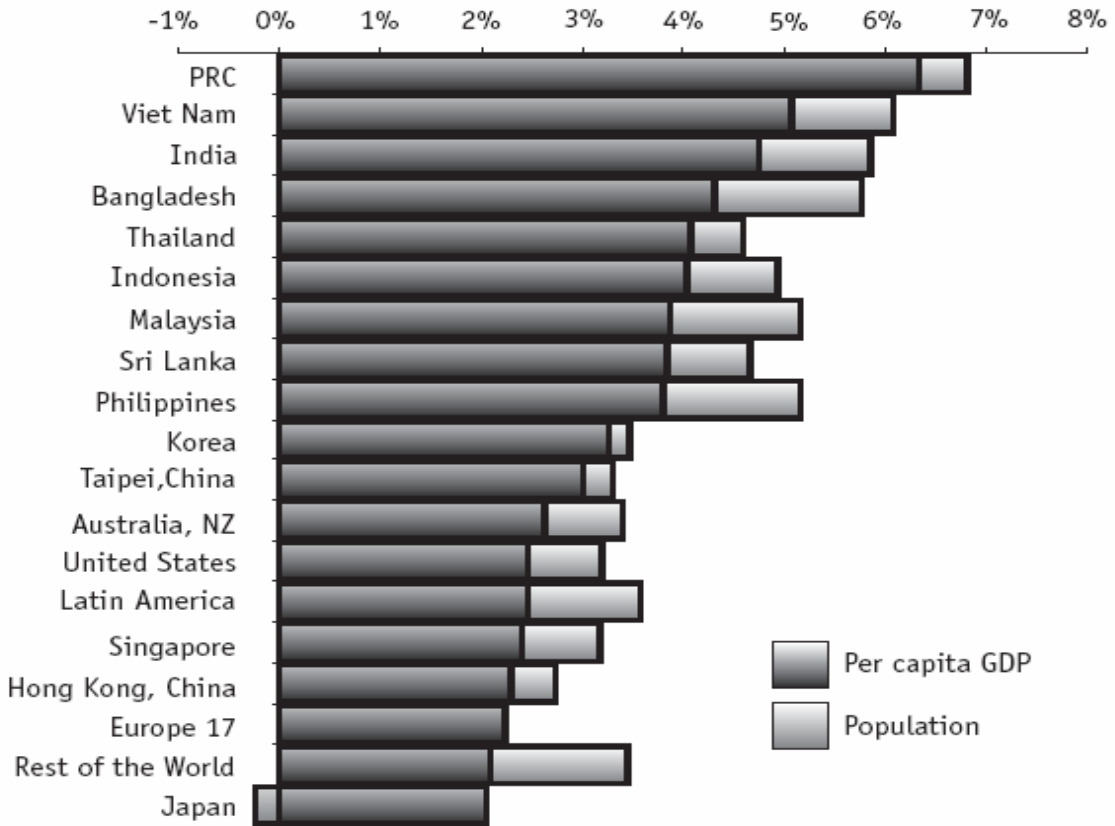


Figure 4-4. Yield growth rates by region, all cereals (Source: Rosegrant et al., 2001).

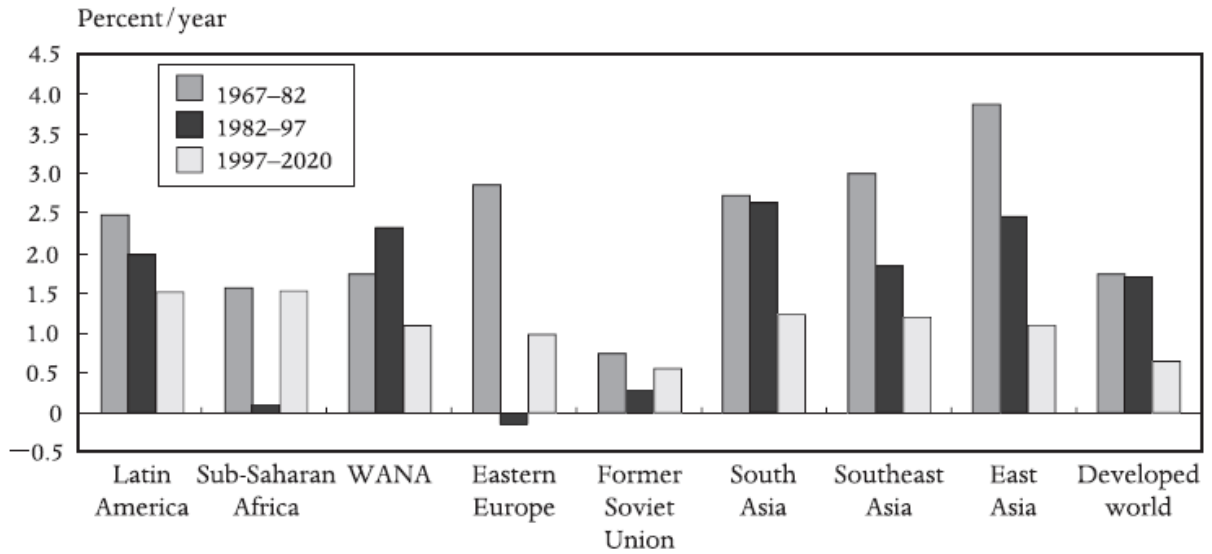
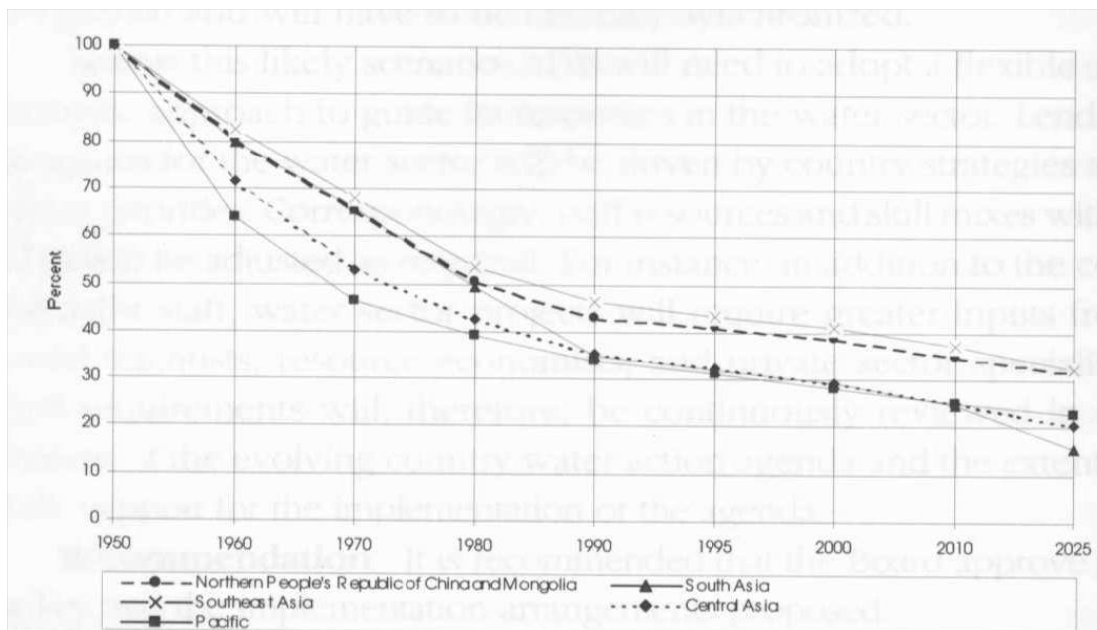


Figure 4-5. Decline in water resource per capita (1950-2025) (Source: ADB, 2001c).



Box 4-1. SRES storyline summaries

A1. The A1 storyline and scenario family describes a future world of very rapid economic growth, global population peaking mid-century and declining thereafter, and the rapid introduction of new and more efficient technologies. There is convergence in regional incomes, capacity building and increased cultural and social interactions. There are three groups within the A1 family that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by technological emphasis: fossil intensive (A1FI), non-fossil energy sources (A1T), and balanced across all sources (A1B) (i.e. not relying too heavily on any one particular energy source). The food system dynamics of this scenario family are characterized by rapid increases in the volume of trade in food and feed; fast increases in agricultural productivity and rapidly increasing per person consumption of livestock products in line with rising per person incomes.

A2. The A2 storyline and scenario family describes a much more heterogeneous world. Themes include preservation of regional cultural identities. Economic development is regionally oriented, trade barriers remain and per capita economic growth is slow. Fertility patterns across regions thus converge only slowly, such that global population increases substantially. Technological change is more fragmented with slower diffusion than in other storylines. Food system dynamics are characterized by only moderate increases in agricultural trade, slow improvements in crop and livestock productivity and slow increases in per person consumption of livestock products.

B1. The B1 scenario family is characterized by a globalizing, convergent world with the same population dynamics as A1, but with more rapid changes in economic structures toward a service and information based economy. There is a strong focus on energy efficiency due to high fossil fuel prices and rapid introduction of clean technologies. Agricultural trade volumes increase rapidly and productivity growth in the sector is high. However per person consumption of livestock products is lower than in A1.

B2. The B2 storyline describes a world with increasing global population, but at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. The scenario emphasizes local solutions to economic, social and environmental sustainability and a focus on non-material quality of life factors. The food system is characterized by moderate increases in agricultural trade volumes, productivity, and increases in per person consumption of livestock products.

Source: IPCC (2001)

Box 4-2. Points for future investment in human resources in Asia-Pacific region

The IFPRI vision 2020 highlights the need for investment in human resources in the Asia-Pacific region. Accordingly the countries will need to:

- Introduce new programs and strengthen existing ones to target the poor and disadvantaged at household and intrahousehold levels based on effective policy research.
- Emphasize maternal and child health and nutrition programs.
- Improve access to clean water and sanitation.
- Provide safety nets for the poor and landless rural households affected by the new economic policy reforms.
- Invest more in schooling, especially for girls (IFPRI, 1995).

Box 4.3. Chinese National Development Program Compendium of Science and Technology for Mid-long Term (2006-2020) (Source: People's Republic of China, 2007).

Chinese agriculture is facing increased pressure on natural resources such as land and water with the increasing population and rapid economic development. The key issues urgently to be resolved for a sustainable agriculture in the near future include the food security, eco-safety, increase of farmer's income and sustenance of science and technology due to decline of arable land, land degradation and desertification, water pollution and scarcity, use of agriculture technology. The Chinese government recognized a range of such resource management problems and constituted guidelines to facilitate the development of the agricultural science and technology.

The newly released "National Development Program Compendium of Science and Technology for Mid-long Term (2006-2020)" in February 2007 developed the strategies of sustainable agriculture for the next fifteen years through enhancing development of agricultural science and technology. The four strategies which will be implemented include:

- By developing water saving and improving land productivity to substitute the resource scarcity;
- By changing agricultural patterns in a sustainable manner to achieve a win-win both in improving ecosystem function and facilitating agricultural production;
- By extending agro-product processing chains, promoting industrialized agriculture and agribusiness to increase farmer's income and
- By using the innovation of biotechnology and information technology to promote the efficiency and upgrading of the traditional technology, enhance the technological transfer and research on basic science in order to improve the ability of the agricultural science.