6

Assessing Current and Changing Socio-Economic Conditions

ELIZABETH L. MALONE[1] AND EMILIO L. LA ROVERE[2]

Reviewers

Suruchi Bhawal[3], Henk Bosch[4], Hubert E. Meena[5], Moussa Cissé[6], Roger Jones[7], Ulka Kelkar[3], Khandaker Mainuddin[8], Mohan Munasinghe[9], Atiq Rahman[8], Samir Safi[10], Barry Smit[11], and Gina Ziervogel[12]

1 Pacific Northwest National Laboratory, Washington, DC, United States
2 Centre for Integrated Studies on Climate Change and the Environment, Rio de Janeiro, Brazil
3 The Energy and Resources Institute, New Delhi, India
4 Government Support Group for Energy and Environment, The Hague, The Netherlands
5 The Centre for Energy, Environment, Science & Technology, Dar Es Salaam, Tanzania
6 ENDA Tiers Monde, Dakar, Senegal
7 Commonwealth Scientific & Industrial Research Organisation, Atmospheric Research, Aspendale, Australia
8 Bangladesh Centre for Advanced Studies, Dhaka, Bangladesh
9 Munasinghe Institute for Development, Colombo, Sri Lanka
10 Lebanese University, Beirut, Lebanon
11 University of Guelph, Guelph, Canada
12 Stockholm Environment Institute Oxford Office, Oxford, United Kingdom

CONTENTS

6.1. Introduction

Understanding the socio-economic pattern(s) of any system(s) is essential for adapting to climate change. Vulnerability to climate change depends on the interactions between changing socio-economic conditions and climate hazards; the feasibility of its adaptation options requires socio-economic analyses of the underlying barriers and opportunities. Therefore, socio-economic conditions must be described in enough detail to evaluate the merits of policy options.

Earlier approaches for assessing vulnerability and adaptation made simplified assumptions, which limited the usefulness of the proposed adaptations. At worst, climate change impacts were projected on a static society, without accounting for changes in key socio-economic drivers of human development. In other assessments (Pepper et al., 1992; Nakicenovic et al., 2000), impact predictions were carried out with a very limited set of socio-economic indicators (such as population, GDP per capita, and land-use change and technological improvement) using computer-based models. For global models, this minimalist treatment is appropriate. But at smaller scales, where adaptation actually takes place, more detail is needed about the residents, and how they live and work in communities. Government policies – including taxes and regulations – encourage certain economic and social activities and discourage others. The culture of societies, their forms of social solidarity and organisation, are all important factors in shaping adaptation policy.

The challenge is to develop adaptation strategies appropriate to the societies of the future. To achieve this goal, first, the relationship between current and future climate and changing socio-economic conditions must be explicit. Second, projected socio-economic conditions and their implications for vulnerability of systems should be explored. Adopting this approach increases the realism of the analysis.

To support this type of analysis, this Technical Paper (TP) provides guidance in three areas:

- characterising socio-economic conditions and drivers with indicators;
- relating these indicators to vulnerability and climate analyses;
- integrating adaptation to climate change into sustainable development objectives.

This paper emphasises qualitative or mixed quantitative/qualitative approaches. Its application will produce either a qualitative or quantitative description of current and future socio-economic conditions for the priority system. Specific outputs may include (1) a general overview of historical socio-economic conditions, (2) detailed description of current conditions, (3) and a set of alternative "storylines" describing future socio-economic prospects in the context of potential climate change impacts.

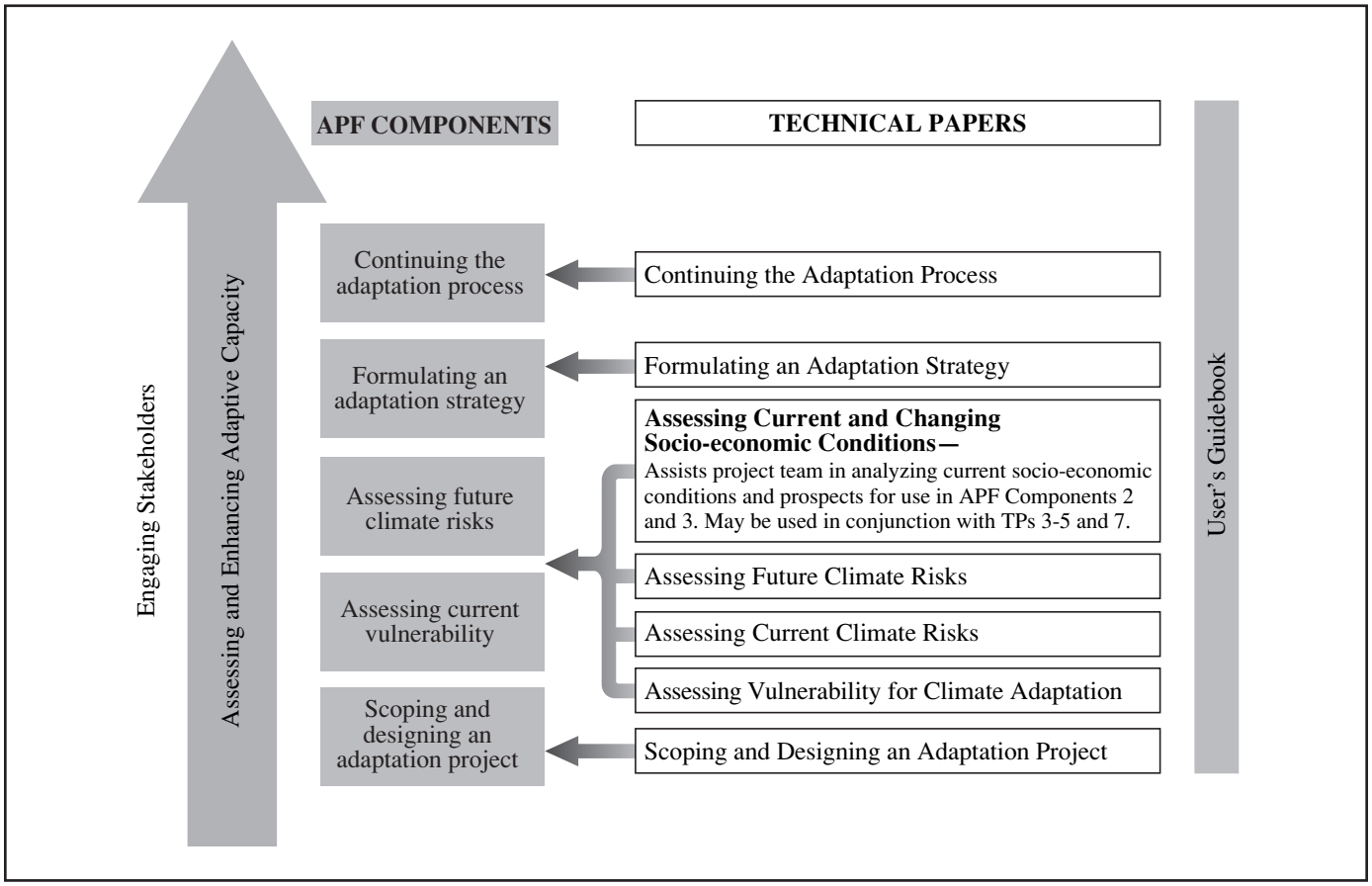

Figure 6-1: Technical Paper 6 supports Components 2 and 3 of the Adaptation Policy Framework

6.2. Relationship to the Adaptation Policy Framework as a whole

This paper relates to Components 2 and 3 of the Adaptation Policy Framework (APF) process (Figure 6-1). It assumes that the APF users have designed and scoped a project using Component 1. At this point, the team will use concepts from this paper to analyse current socio-economic conditions and prospects within the identified priority system(s). Components 2 and 3 of the APF provide the basis for developing and implementing coherent adaptation strategies, policies and measures (TPs 8 and 9).

Depending upon the methodological choices made under Component 1, this paper may be used in combination with TPs 3, 4, 5 and 7 to varying degrees. Essentially, the extent of the team's socio-economic analysis will be dictated by the degree to which they have incorporated other APF analyses, including those for vulnerability (TP3), climate risks (TPs 4 and 5), and adaptive capacity (TP7).

In other words, an analysis of socio-economic conditions and prospects can be conducted as a stand-alone exercise – this would constitute the policy-based approach – or as part of a vulnerability assessment (TP3). As a stand-alone exercise, the project would use the guidance outlined here to assess the potential efficacy of an existing or proposed policy (or strategy or measure) in a scenario of future climate change. Depending on the project requirements, it is possible to develop an adaptation strategy, using this policy-based approach and this TP as a resource. Used as part of a vulnerability assessment, the analysis of socio-economic conditions outlined here would provide indicators for this larger assessment. This analysis can, in turn, be integrated with the results from the climate risk analysis (TPs 4 and 5) for APF Components 2 and 3. (The information on current socio-economic conditions is similar to that required for United Nations Framework Convention on Climate Change (UNFCCC) National Communications.)

6.3. Key concepts

The concepts presented below are central for characterising socio-economic conditions. These concepts are also outlined in the APF User's Guidebook.

Indicators – Since socio-economic conditions and prospects are intangible and cannot be measured directly, analysts use indicators, i.e., parameters that characterise these abstract concepts. For example, although social welfare is important, it cannot be measured directly; often, GDP per capita is used as an indicator. GDP per capita is a flawed indicator for either welfare or growth, since it neglects a range of important values, from the ability of a household to meet basic needs to the use/depletion of natural resources.[1] As a measure of economic productivity, however, GDP can be observed, measured, and compared across areas. When using indicators, project teams should ensure that informal activities are taken into account. Such activities are not captured in official statistical data, yet are so important to livelihoods in developing countries.

Qualitative and quantitative analysis – Qualitative and quantitative approaches are mutually dependent. Quantitative analysis rests on judgmental, qualitative assumptions about how the world works, what are suitable categories for data, what constitute good data, and the validity of scientific procedures. For future projections, the role of qualitative assumptions is even more marked. Qualitative research, on the other hand, if it is to make sense of the world at all, must weigh and measure, and judge what is important, and what are critical variables in human development. Whether or not numbers are used, these are essentially quantitative tasks.

The question is not "Shall we use a qualitative or quantitative approach?" but "How can we use both to answer the question usefully?" This approach means including policy-makers and other stakeholders in the process, debating the starting assumptions, and being willing to re-examine categories, assumptions, and data as the analysis proceeds.

Scenarios – A scenario represents a plausible and simplified description of how the future may develop, based on a coherent and internally consistent set of assumptions about driving forces and key relationships. Scenarios may be derived from projections, but are often based on additional information from other sources, sometimes combined with a narrative storyline.

Storylines – Storylines are qualitative, holistic pictures of the general structures and values of society. Storylines can be developed at any scale – from the global, to the regional, national, or local levels. They describe conditions that might be produced by human choices about economic and social policy, reproduction, occupations, and energy/technology use. Storylines are useful tools for policy makers to "vision" alternative future worlds.

6.4. Guidance on characterising current and changing socio-economic conditions

In this chapter, users will find guidance for characterising current socio-economic conditions (i.e., developing an adaptation baseline), and projected conditions (scenarios or prospects) in their priority system, with three variants: no policies regarding adaptation; and two alternatives for adaptation policy.

This effort can range from a qualitative description to a full-

[1] GDP per capita neglects the value of unpaid work, people's satisfaction with their occupations, and many other aspects of welfare. As it does not represent income or real wages, the measure of GDP per capita does not capture a household's ability to meet its needs. The additions provided in various versions of "green" GDP compensate for some of the shortcomings.

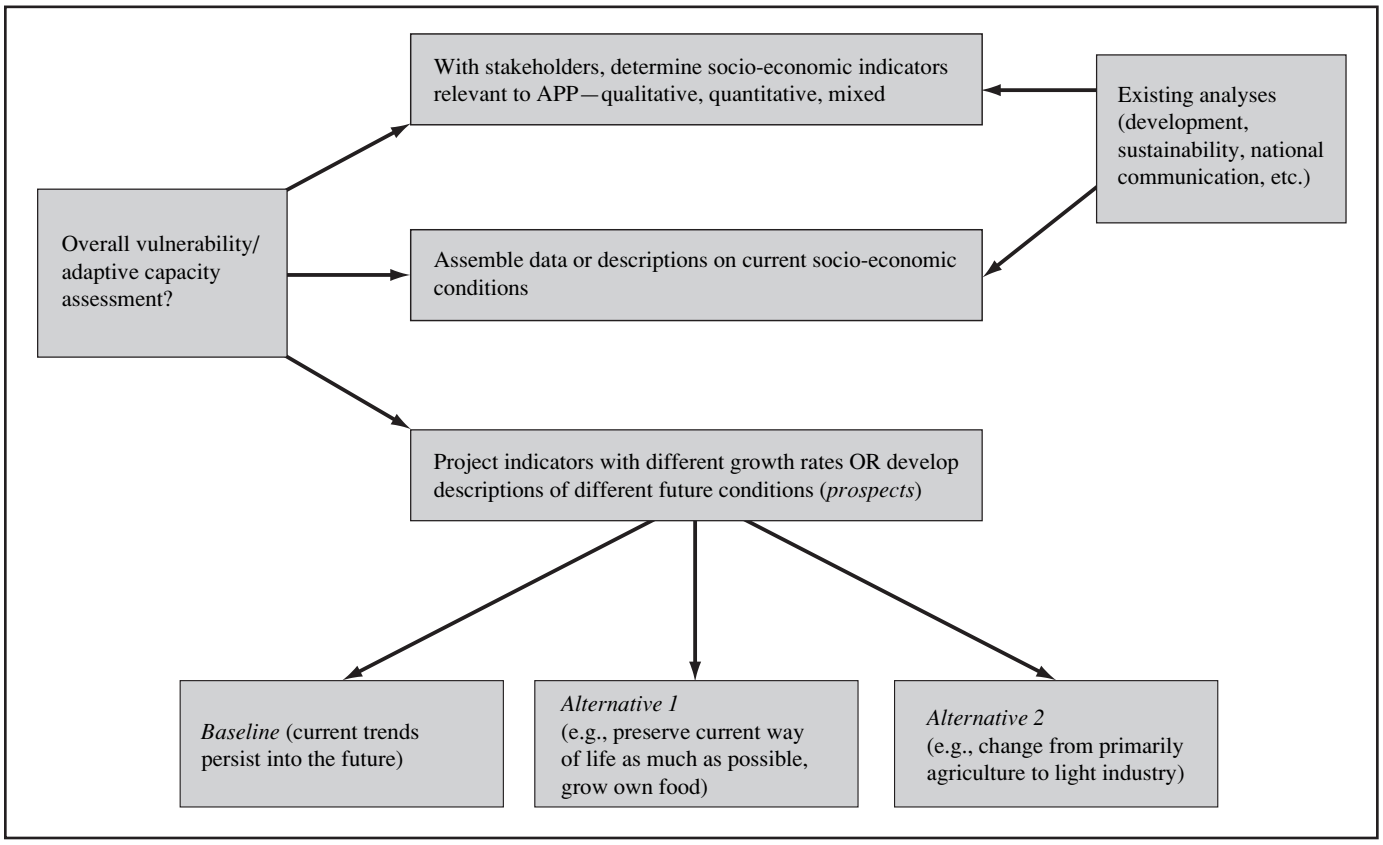

Figure 6-2: Overview of developing socio-economic conditions and prospects

blown assessment, based on resource-intensive, model-based processes. The output may be summarised as a brief (five to eight page) section of the full adaptation report, or as an extensive report that includes model results. The "example" boxes in the text show how this information may be summarised.

The description should accomplish the following (Figure 6-2):

- Analyse current socio-economic conditions, including current natural resource management practices, describing changes in the last 10 to 20 years (50 years, if possible) due to climate change, including variability. This analysis constitutes the adaptation baseline.
- Develop qualitative storylines, and quantitative or qualitative future scenarios: construct a reference scenario without adaptation, scenarios with past and current adaptation measures, and scenarios with additional adaptation policies and measures.
- Ensure consistency among global, regional, national, sub-national and local scenarios.
- Analyse socio-economic prospects, taking into account the lower and upper parts of the economic cycle.
- Analyse vulnerability to climate change (TP3), considering the cyclical, sometimes random fluctuations found in different sectors and regions.

6.4.1. Setting up study boundaries

In keeping with the APF process, this guidance assumes that a socio-economic analysis will be focused on a priority system (TP1). Setting system boundaries is important for adaptation issues. However, it is unlikely that a system will be self-contained; most likely, the priority area will be "key" for many reasons.[2] This priority system may be connected to the national or international economy, many people may be affected by it, and it may contain an important natural or cultural resource. Thus, the system must account for links among the elements, both inside and outside the locale or sector. Such elements include trade, kinship, migration, culture, transportation, communication, etc.

As a starting point, the team should review existing documents and modify them as needed. Examples include development plans, poverty reduction strategies, and sustainability assessments. In developing countries, most of these plans exist.

6.4.2. Using indicators

Desirable indicators fulfil three criteria: (1) summarise, quantify and simplify relevant information; (2) capture phenomena

[2] The terms "priority area" and "priority system" are used interchangeably here to refer to the area of focus of the adaptation project. (See TP1 for guidance on identifying a priority system.)

of interest; and (3) communicate relevant information. They may be qualitative, quantitative, or both. If quantitative scenarios of the future relevant to climate change vulnerability and adaptive capacity are desired, the process involves choosing relevant indicators, collecting appropriate data, and estimating future values for those proxies (Malone et. al., 2002).

6.4.3. Characterising socio-economic conditions today

Together, the adaptation project team and stakeholders select the indicators and/or descriptions that are most relevant to the area, sector, and people that are being analysed. The suggestions below are not prescriptive; characterising the socio-economic conditions could use any combination or none of the indicators discussed. For example, one indicator may stand for several others in a specific place. Also, stakeholder knowledge may be more important than any quantitative data.

In developing an adaptation baseline, the starting point is an overview of the socio-economic elements that make the selected priority area important. These elements are likely to include the significance of the area for: supporting its population; producing food and other goods for consumption; natural resources such as forests, fisheries, and tourism; and facilitating (or inhibiting) trade and markets. Box 6-1 provides an overview of such information for a coastal region in China. In any adaptation process, the overview should be tailored to suit the priority system or area. This example relies on quantitative data (statistics), although qualitative data may be as good as or better.

It is likely that this priority system was chosen because its important assets and economic activities have been systematically impacted by climate hazards, and that this maladaptive trend has increased its vulnerability. Its socio-economic elements should be described (e.g., people and infrastructure at-risk from floods; or hunger, disease and internal migration consequences of drought). Recent experience, both events and responses, should be summarised, e.g., several good harvests may have encouraged more extensive (i.e., expansion of) agriculture. The overall assessment may include biophysical information as well as socio-economic information.

6.4.4. Exploring specific characteristics

This phase of the analysis focuses on socio-economic elements most relevant to current conditions. (This analysis corresponds to the assessment of adaptive capacity discussed in TP7.) For convenience, the elements – or indicators – are divided into five categories: demographic analysis, economic analysis, natural resource use, governance and development policies, and culture. For all categories, the description should be more detailed than simply trends in population growth and GDP per capita over the past two to five decades. If the information is available, a set of appropriate indicators could be established for each category. Whenever possible, both quantitative and qualitative approaches should be used.

The availability of data and data quality, the level of detail, and the selection of specific indicators are matters for the individual teams and their stakeholder groups to consider and decide. Data at specific time and spatial scales may not be available. However, many countries carry out periodic population and agricultural censuses and household income and expenditure surveys for development planning. If the quality of these data are adequate, they may be used for the APF process. Even in developed countries the data set will never be perfect.

Table 6-1 shows an example of an indicator set for water resources. These indicators represent just a small sampling of the many possibilities. Although these indicators have been divided into categories, there are significant linkages between them.

6.4.4.1. Demographic analysis

Demographic characteristics are essential for an analysis of socio-economic conditions. Since gathering every available statistic would be impractical, key demographic indicators should be selected. The objective is to assess the socio-economic vulnerability of people in the priority system.

The number of people living in the priority system is a starting point, but the population's well-being also depends on how they are distributed in the area (in terms of urbanisation, for instance, or the number of hectares per farm household), the

Box 6-1: Example of brief overview of current socio-economic conditions using geopolitical, demographic, and economic data

The coastal region (1.27 million km^2) of the People's Republic of China (hereafter referred to as China) includes Tianjin and Shanghai D.C.; Liaoning, Hebei, Shandong, Jiangsu, Zhejian, Fujian, Taiwan, Guangdong, Hainan provinces; and Guangxi Zhuangzu Zizhiqu. This region accounts for 12.24% of the total land area of the country, yet it supports 40.2% of China's population and contributes 55% of the country's gross agricultural and industrial output. The narrow 40- to 50-km-wide portion of this region along the coastline includes 44 coastal cities with prefecture status, 35 coastal cities with county status, and 111 coastal counties or districts from two D.C. and nine provinces. Although this coastal zone makes up 2.9% of the area of the country, its population constitutes 13.43% of the total, which makes the population density 4.7 times the average for all of China. The region's total social output value is 28.8% of the total, and the output value per unit is 9.9 times the average for the country (adapted from Yang, 1996, pp 265-266).

Table 6-1: *Example set of indicators for water resources*

Demographic indicators	• Access to clean water and sanitation • Withdrawals as a % of available water • % shares of total use (household, industry, agriculture) and rate of increase in uses
Economic indicators	• Presence or absence of water markets • Contribution of water to products (e.g., irrigation to agricultural products) • Amount/kinds of water infrastructure (reservoirs, dams, etc.)
Governance and policy indicators	• Treaties or agreements regarding available water resources • % of water resources not under regional control • Development plans for area (e.g., population growth, agricultural development and water-use implications)
Cultural indicators	• Cultural meaning and recreational uses of rivers/lakes (sacred or forbidden uses) • % unpolluted stream and beach kilometres (and nature of protection)

Partial Source: Moldan and Billharz, 1997

land tenure regime, the rate of population growth (e.g., fertility trends and death rates), the age distribution (e.g., "How many working-aged people?" "What is the dependency ratio?"), the workforce versus unemployment levels, health characteristics, and male/female education levels. Such demographic characteristics are key to the priority area's vulnerability and adaptive capacity. For example, the presence of young children raises unique education and health issues.

The next step is to relate the demographics of the priority area to national-level information. "What are the differences between the priority area or sector and the country?" Relevant socio-economic changes include rural-to-urban migration, epidemic disease, and fluctuating educational levels. The differences between, first, *levels of change*, and, second, *rates of change*, in the priority area, and the country as a whole, will yield insights about vulnerabilities at both scales.

The example of analyses in Box 6-2 is incomplete, but it is intended to suggest elements of focus and indicators for use in an economic analysis.

Examples of **potential indicators for use in demographic analysis** include the following: population size, age structure, population density, location/urbanisation, migration, education (e.g., literacy rate), fuel used by households (e.g., firewood), housing with electricity, rate of poverty and extreme poverty, health characteristics (e.g., infant mortality), food security (e.g., dietary needs, composition and costs, local basic diet, food sources, availability and accessibility).

6.4.4.2. Economic analysis

An economic profile of the people who live in the area – their types of employment activity – is an important element of current socio-economic conditions. "What are the principal ways people make their livings, and what is the share of each activity in the priority area or sector's overall economy?" "Are shifts being seen, e.g., in the types of crops planted or livestock raised?" "Is off-farm employment an increasing trend?" "What is the unemployment rate?" Such questions can inform the eco-

Box 6-2: Example of demographic analysis: Urbanisation, education and health

Within the Sudano-Sahel region, urbanisation is increasing rapidly and is expected to continue in the near future. These migration trends impose a burden on the existing education and health systems in the region, and increase people's vulnerability. To this extent, progress already made in the region on education is being seriously threatened by the deteriorating economic trends, which are caused to a large extent by droughts, heavy external debt and political instability. The priority area is already affected by these factors, and access to health services has not kept up with population increases (adapted from Wang'ati, 1996, pp 76-77).

To describe changes in education and health, the following indicators may be used: income per capita and its distribution, the number of school-age children enrolled in schools, access to food and health care, and the average life expectancy at birth. However, accurate censuses are rare in the region and this type of data is often limited.

nomic analysis. For these surveys, the household may be a more appropriate unit than the individual.

The principal economic activities of the priority system can be captured by the following development patterns, policies, and associated indicators.

Monetary policies

- *Market participation:* Adaptation choices are profoundly affected by national policies, free trade agreements, and the extent of participation in domestic and international markets. For example, the well-being of subsistence farmers is directly dependent upon weather, while the well-being of farmers growing cash crops is highly dependent upon market prices. The impacts of privatisation policies should be identified (here and/or in the governance category) as they significantly affect the economic vulnerability of rural farmers.

- *Public and private investment:* The level of investment in economic activity, such as manufacturing and other business enterprises, can provide powerful indicators of economic conditions. Investments provide employment and marketable products.

- *Income:* If the economy is largely monetised, some measure of income or wages, along with income inequality, may capture important information. If there is a large informal or subsistence economy, better ways to characterise well-being include wealth, assets, or consumption. One of the accepted measures of the poverty rate may also be used (e.g.,, $1 or $2 per day, or a nationally-defined poverty level).

- *Savings:* Similarly, national savings and borrowing can be used to finance reconstruction following a climate disaster. However, the creation of national debt could reduce economic growth, and further exacerbate poverty and vulnerability to future climatic disasters.

Industrial and infrastructure policies

- *Industrialisation:* The extent of industrialisation and diffusion of associated technologies are related to market activity. One facet of industrialisation is the presence (or absence) of modern farming methods and cultivars.

- *Infrastructure:* The extent of infrastructure, such as roads, rail and air transport, electricity generation, communications, irrigation districts, dams, and buildings, are important for economic development. One indicator might be the portion of the public budget that is dedicated to social infrastructure, such as schools and hospitals.

Labour policy

- *Labour:* In many countries, the secondary and tertiary economic sectors are the most important in terms of the labour market. Moreover, in many developing countries, a large informal economy generates most of the labour demand.

- *Migration:* In developing countries, members of the rural household units often migrate abroad and provide additional incomes to their families (e.g., Sri Lanka, Kerala). In some countries, these sources of income represent an important percentage of the national budget. Domestic migration – seasonal, for example – may be a current strategy to cope with climate variability.

Agricultural policy

- *Food security:* In countries where food security is a major issue, it is critical to evaluate the implications of a changing climate on agricultural production. "What are the dietary needs and how are they met by domestic production and/or imports?" (See also the food security example in TP3.)

- *Land tenure:* The land tenure regime and the extension of household plots are especially useful in characterising rural economic conditions.

Environmental policy

- *Environmental impacts:* The environmental sustainability of economic activities should be identified. This assessment will reveal the extent to which current development processes (e.g., industrialisation, international free-trade agreements, privatisation) are facilitating adaptation or promoting maladaptation.

The examples in Boxes 6-3 and 6-4 are incomplete, but are intended to suggest areas of focus and indicators that could be

Box 6-3: Example of general economic analysis for an urban area

Mexico City is divided into two broad industrial sectors: the means of production and consumer goods. In 1970, the first sector represented 27.4% of all industry, including machinery, tools, and raw materials for other industries. Consumer goods comprised 73% of all industry, including immediate and durable goods. Also, the city holds an enormous share of Mexico's major financial exchanges, private businesses, and central offices. In 1980, 4.9% of the active population was employed in the primary sector, 41.4% in industrial activities, and 53.7% in services (adapted from Guillermo Aguilar, et al., 1995).

Box 6-4: Example of household analysis for an agricultural area

In 1979 the average area of land cultivated by households studied in the Kosi Hills of Nepal was about one hectare. The 43% of households with access to less than a half-hectare of cultivable land were only able to produce about one-half of their own food-grain requirements and were short of food for a few months each year. Household members thus depend on off-farm seasonal employment opportunities and the health of employable household members. In practice, these households are likely to be in debt, causing them to adopt strategies that provide quick returns without necessarily giving them the best possible yield from their endeavours. For example, they may accept local, low-wage, casual work rather than travel for several days to find buyers for their hand-made crafts (adapted from Nabarro et al., 1990, pp 68-69).

used in an economic analysis. In these examples, the APF users will need to ask, "What are the implications for climate change adaptation?"

6.4.4.3. Natural resource use

The priority system most likely has natural resources that are used by the population in various cultural and economic activities. An assessment of these resources and their uses can reveal a lot about a population's vulnerability to climate change. If the area is largely dependent upon agriculture for food security and/or income, the quality and amount of land available for crops and/or livestock is critically important to understanding the climate risks that people face. Similarly, water quality and availability – the amount and timing of precipitation, surface water, and groundwater – are important and potentially limiting factors for a population's agriculture, industry, sanitation, and consumption, and can thus be central to vulnerability.

Other natural resources may also be important. Resources such as minerals; forest products; abundant sun, wind, or water; scenery; and biodiversity can reduce a population's dependence on agriculture or its exposure to agricultural risks and, in this way, reduce its vulnerability to climate risks. However, the exploitation or use of natural resources may also damage other natural resource systems. A natural resources assessment should consider current and potential uses, along with current and potential negative consequences.

Examples of **potential indicators for use in natural resource analysis** include the extent of natural resources, current uses and state of health/degradation (e.g., water quality and quantity, forest cover, deforestation rates, expansion/abandonment of agricultural lands, soil degradation or desertification), and the potential for further and different uses (considering sustainability).

The examples in Boxes 6-5 and 6-6 are incomplete but are intended to suggest areas of focus and indicators that could be used in a natural resources analysis.

6.4.4.4. Analysis of governance and policy

Economic development and environmental policies provide both constraints and opportunities for adaptation, as noted above. This analysis consists of three major steps: (1) evaluating existing policies and programmes; (2) detailing the planning and policy-making processes for the priority system; and (3) assessing adaptive capacity to implement policies and programmes.

First, specific policies and programmes should be evaluated for their potential to advance sustainable development and adaptation to climate change. The anticipated environmental consequences should also be specified. State reforms, such as privatisation and liberalisation of trade, are especially important.

Additional relevant policies include:

- The government makes policy choices about economic development—whether or not to encourage domestic markets and international trade, to develop supporting institutions such as banks and intellectual property protections, or to focus on increasing GDP. Domestic economic policies are used to reduce the negative effects of transitions to privatisation and liberalised trade through emergency relief programmes, job training, insurance, the establishment of reserves, etc.

Box 6-5: Example of innovative resource development

In Port Antonio, a town in Jamaica, wild fish stocks have been depleted and the beach has been treated as a dump. However, oyster farming is addressing both of these issues. Oyster production includes both collecting spat-on pieces of old tires strung on fishing line in government nurseries on the southern coast, and cultivation on the north coast which has no natural stock but ideal growing conditions. Pressure on wild fish stocks is being reduced and impetus is being provided for protecting coastal marine habitat – not only for oysters, but also for thousands of other marine species (adapted from Bourke, 1995).

Box 6-6: Example of oil extraction impacts on ecosystems

With rich biodiversity and immense oil reserves, the Niger Delta is an important source of biological and economic wealth. Since the 1950s, Nigeria has exported large quantities of oil from the southern region of the Delta known as the "oil belt". However, the extraction and production of oil has caused environmental damage in this extremely sensitive ecosystem. Oil spills have destroyed freshwater ecosystems, fouled farmland, killed wildlife and endangered human life. In addition, canals built to support oil pipelines have impacted the hydrology of the Niger Delta, creating a scarcity of water, and channelling pollutants back into the ecosystem (adapted from *PECS News*, Spring 2000).

- Economic development and internal welfare policies, such as these are most relevant to adaptation. They may, however, be considered low priority when compared with other policies, e.g., trade agreements, border or internal security proposals, or existing government support legislation. Policies such as land set-asides and tenure reforms are critical for natural resource management.

- Policy choices also greatly affect the internal well-being of a country's citizens; a government may choose to emphasise poverty reduction, preservation of traditional cultures, development of endogenous technologies, provision of funding for research programmes, and extension of education and health services.

Second, once the most relevant policies for the priority system have been identified, the project team should outline the planning and policy-making process. The policy analysis (laws, standards, regulations, etc.) will be relevant to selecting pathways for implementing alternative adaptation. Ultimately, the adaptation choice may be determined by the path of least resistance.

Finally, the capacity of government institutions to carry out current policies and development programmes should be assessed (TP7). The team should identify the relevant agencies and actors, and their roles and effectiveness. "What agencies and other actors are involved?" "Is it a participatory or top-down approach?" "Who makes the decisions?" "Are there ways to alert the policy makers who implement policy changes?"

Examples of potential indicators for use in governance and policy analysis include environmental trends and policies, the extent of integration of economic and environmental policies, and the planned state reforms (e.g., privatisation, current and planned free-trade agreements).

In an urban area, relevant policies might include those to improve slums (e.g., sanitation, housing, electricity supply, local security); capacity development may include training people to enter the workforce; investing in public schools, hospitals, roads or clinics; and combating air pollution and the urban heat island.

In an agricultural area, policies could include research into drought-resistant cultivars and other technological options (e.g., irrigation, dams); capacity development may involve implementing land reform and environmental policies (e.g., regulations, laws, standards, incentives), and providing off-farm employment.

The examples in Boxes 6-7 and 6-8 are incomplete but are intended to suggest areas of focus and indicators that could be used in an analysis of governance and policy.

6.4.4.5. Cultural analysis

Culture can be expressed as "the way we do things here". Cultural values include the way families are defined, and their obligations toward one another, their relationship with nature (e.g., the maize culture in Meso America), the role and forms of governance, and technology diffusion. To a large extent, culture dictates social behaviour. It is a powerful force that can enable certain activities, and constrain others.

Cultural values have significant bearing on climate change adaptation. For example, where a strong culture of mutual self-

Box 6-7: Example of production-focused policies

The focus of production programmes in Nepal's mountain areas is primarily on resource-use intensification and extraction. These considerations also guide public interventions related to infrastructure, development and investment. The focus is on mountain niches such as irrigation and hydropower, mining, tourism, and horticultural production. These are largely guided by external demand and the revenue needs of the state. They result in a high rate of resource extraction, reduced diversification of resource-centred activities, and negative side-effects on fragile mountain resources. Moreover, the negative effects of intensification and over-extraction are accentuated by the absence of any measures to control or regulate the demand on mountain resources (adapted from Jodha, 1995, pp 167-170).

Box 6-8: Example of general development policies

Recent Brazilian development efforts, following an industrialisation and urbanisation model, have favoured certain areas of Brazil and imposed conditions on the northeast and the Amazon. Such economic development has not addressed the agrarian problem, nor has it encouraged a search for new organisations of the agricultural economy—concentration of agrarian landholdings, the exploitation of rural labour, and the appropriation by large landowners or other elites of the economic surplus generated by farmers or the landless. Sustainable development in this context has been difficult to achieve (adapted from Bitoun et al., 1996, p 145).

Examples of potential indicators for use in cultural analysis include cultural values and traditions relevant for adaptation especially education, knowledge development, technical assistance, endogenous technological development, local research, communication and public awareness.

help and co-operation exists, adaptation strategies may benefit from tapping into and building upon this social capital. As reflected by changing lifestyles, culture is greatly influenced by globalisation.

The example in Box 6-9 is an incomplete analysis but is intended to suggest areas of focus and indicators that could be used in a cultural analysis.

6.4.5. Characterising current adaptations

Current adaptations for coping with today's climate constitute the *adaptation baseline*. This baseline is a comprehensive description of adaptations that are in place to cope with current climate. The baseline may be both qualitative and quantitative, but should be operationally defined with a limited set of parameters (indicators). It also represents the analytical starting point for an adaptation project that uses the policy-based approach (both the User's Guidebook and TP1 explain the four major project approaches; Section 6.1 also briefly discusses the policy-based approach).

As economic and social conditions change, an area's climate can take on different meanings. For example, when traditional inter-cropping is practiced, the timing of rainfall is not as significant as when certain crops are grown exclusively. When rivers are the major form of transport, keeping the flow at a certain level is essential. But, if other means of transportation replace the rivers, water can become available for other uses, and the timing of precipitation becomes less significant. Current adaptations also represent an opportunity to address maladaptation to current climate.

Ideally, socio-economic conditions should describe historical changes over the past 10-20 years. However, depending on the recent political or socio-economic history of each country, timeframes could be 50 or even more years in the past.

The analysis is not intended to be comprehensive; in most cases, a narrative description will suffice, augmented by quantitative data if available. The examples in Boxes 6-10 and 6-11 suggest two types of recent adaptations to climate.

6.4.6. Characterising changing socio-economic conditions

At this point, project teams will have gathered enough information about the present and past to assess future socio-economic conditions. There are two remaining tasks. The first is to develop alternative "storylines" of the future for an appropriate time period (probably between 20 and 50 years into the future – see User's Guidebook and TP5 Section 5.4.4, *Selection Planning and policy horizons* for assistance in determining an appropriate time period). The second task is to make projections about how socio-economic conditions – indicators, if this approach has been taken – will change in the future under the alternative storylines. If the indicators chosen are qualitative, the description of socio-economic prospects will also be qualitative.

Box 6-9: Example of cultural analysis

Fonogram, a West Bengal village, has a strong tradition of mutual support among the poorest in the village, based on the informal system of loans and an often strongly-voiced animosity toward the rich. Villagers go from house to house asking for *khud* and *bhater fan,* as well as for building materials. The main kind of loan made between the poorest households is in the form of small amounts of money or foodstuffs. Other forms of mutual support include looking after children or livestock. But an important distinction is made between a "loan" between poor people that is seen as an expression of support, friendship and solidarity, and a loan begged from either another poor person or someone better off, which involves a subordinate relationship (adapted from Beck, 1990, pp 28-29).

Box 6-10: Example of recent adaptation

In the 1930s, there was doubt that Kenya's Machakos district could feed itself. However, the district has not only produced enough food under current climatic conditions, but has evolved a complex farming system that appears sustainable. Abolition of the colonial economy, which restricted some cash crops to the coloniser, has led to widespread growth of such crops. Also, there has been significant, ongoing intensification of food crops for both subsistence and the national market. The increase in production has been accomplished under a complex land-use system, in which management of vegetation is practiced systematically for both production and conservation purposes. Machakos farmers have organised extensive co-operatives (adapted from Wang'ati, 1996). A farming system that is well-adapted to current climate will probably be resilient to mean changes in future climate.

6.4.6.1. Developing storylines

In order to examine future adaptation to climate change, analysts construct accounts of what the future may be like. For this purpose, the Special Report on Emissions Scenarios (SRES) (Nakicenovic et al., 2000) developed "storylines"—i.e., coherent pictures of the future within which certain trends make sense. These narrative descriptions provide very general accounts based on two dimensions: the extent of sustainable development and economic development at local or global levels. These storylines allow for integrated analysis and for identification of key systems.

This guideline uses multiple storylines to characterise three alternative futures for the priority system (population). This approach accounts for a wide variety of possible futures and the large uncertainties involved in such projections (TP5 provides a discussion of quantitative and qualitative approaches to uncertainty in developing scenarios).

(1) The first storyline is a *reference scenario*, which does not consider climate change. The "current socio-economic conditions" (already discussed) are projected into the future. For example, if deforestation is currently taking place, the reference scenario prospects are for continued deforestation.

(2) and (3) are two significantly different projections in which development will proceed, taking climate change into account through adaptation policies. One set of policies may attempt to preserve current economic activities and socio-economic conditions using technologies (regulations for buildings to resist damage from storms or sea level rise, for instance); another set of policies alternatively could emphasise different crops or a reduction of agricultural activity. These policies should be described in the storylines. Figure 6-3 illustrates this approach.

Given the wide spectrum of possible development paths open to countries, the choice and assumptions of the reference scenario is thus crucial. Further, it may be useful to repeat the comparison of reference scenarios with two storylines to test the sensitivity of adaptive policies to different reference scenarios, and provide a range for their possible outcomes. Several strategies can be used, with increasing levels of complexity, from extrapolation (1) to the desirable integrated analysis (4).

(1) Extrapolation

An approach to define a reference scenario is the extrapolation of historical trends. Quantitative scenarios can be calculated through the adjustment of linear, exponential or logarithmic curves to time series, describing the behaviour of a given variable in the past and its projection into the future. A qualitative analysis of the priority area will describe how "more of the same" will play out in the future.

(2) Perpetuation of short-term trends

The current conditions and trends expected to prevail in the near future may be assumed to continue in the medium and long term. The implementation of current government policies can be assumed to continue in the same direction, for example. The external constraints coming from regional or global economic conditions and agreements should be taken into consideration; in many cases, they are strong drivers for national policies. This approach can be helpful to assess the outcomes of a given course of action evolving over time.

Box 6-11: Example of greater use of climate-sensitive agricultural resources

In the last 20 years, the Egyptian government has promoted agricultural expansion into the New Lands (located in desert regions) and reclamation of the New-Old Lands (long-used areas now salinised or waterlogged). Crops have been selected according to soil and water limitations in each region to produce the best yields and qualities (adapted from El-Shaer et al., 1996). In this way, agricultural policy has maximised agricultural production by selecting crops that are well adapted to current climatic conditions.

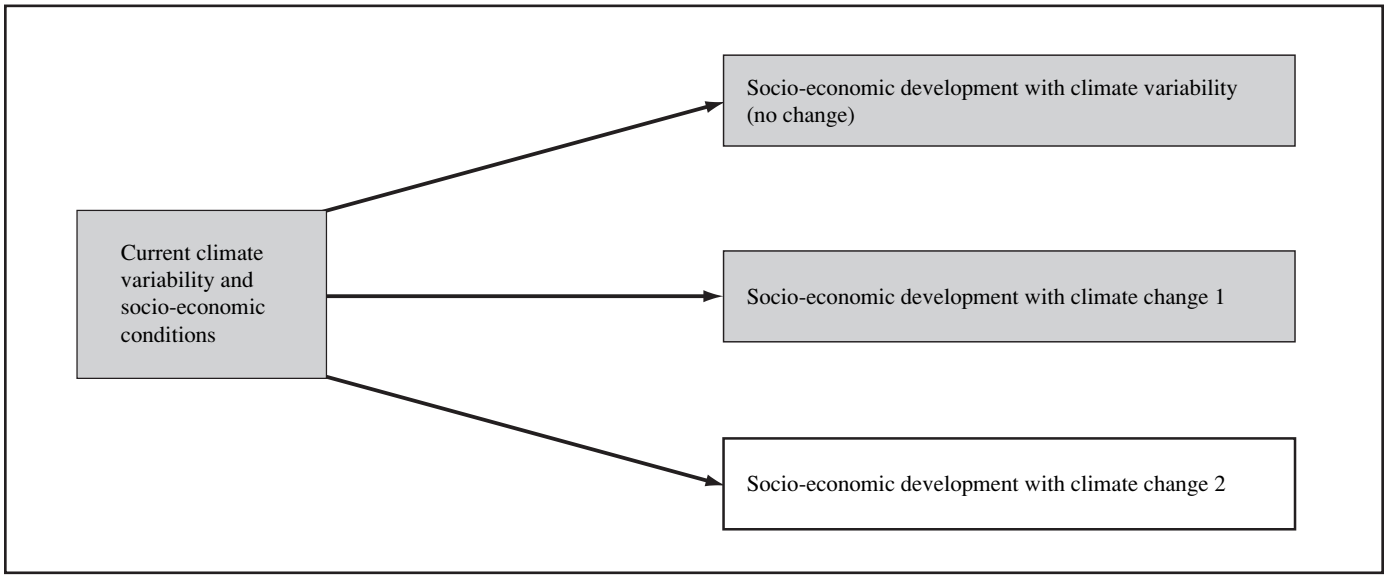

Figure 6-3: Schematic view of the multiple storylines approach

(3) Analogues using key indicators or other countries as prospective futures[3]

This approach requires an in-depth qualitative analysis in order to fully consider the national circumstances and drivers, including the social organisation and the nature of the development process. One or several analogue areas may be identified that are similar to the priority area in terms of natural resources, economic activities, history, culture, and governance but that have successfully addressed some of the issues currently facing the priority area. (Note: Similarities in demographic and economic characteristics will probably not be sufficient for a good analogue.) For example, an area that has made a successful transition from subsistence agriculture to high-yielding crops for markets may provide a "with adaptation policy" analogue that suggests, e.g., protection of smallholders, local technical support, and institutional mechanisms of cooperation as important dimensions of the transition. The use of analogues implies a rather normative approach to the design of storylines; i.e.,, the analogue is treated as a "norm" against which the priority area is compared.

(4) Integrated analysis

Recognising that accuracy is not possible when projecting the future, this approach aims for ownership and believability of the storyline built. A flexible design accounts for the interplay of trends, trade-offs among policy mixes, making use of subjective judgments to depict a feasible unfolding of the future. Here the approach is to ensure the pertinence of the storyline, through the involvement of key stakeholders in its design.

Within any given storyline, it is important to emphasise the transition pathway to the future as much as the final outcome at the end of the time horizon. This is particularly true for vulnerability and adaptation. The effects of extreme events, both in the ecological and socio-economic dimensions, are usually more relevant than the average conditions. It is unusual to observe continuously smooth growth or decline in socio-economic variables, particularly in the developing world. Up-and-down, stop-and-go patterns are found in many sectors and regions. Vulnerability and adaptation analyses can draw useful lessons from risk analysis and the design of contingency plans. For example, coping with floods or droughts tends to be far more painful in recession times than during high economic growth periods.

It is very useful to conduct the analysis of adaptive capacity separately, in the lower and upper parts of the cycles, corresponding to the behaviour of socio-economic variables in each storyline. The ups and downs of economic conditions should be accounted for as well. Some sectors or geographic regions could experience recession or even sustained decline. Even if the national economy enjoys economic growth, many groups may be marginalised and may receive no benefit from this growth. Therefore, resources for adaptation to climate impacts would not necessarily be available.

6.4.6.2. Projections of socio-economic changes

For any of the storylines, the projection of the socio-economic context is of utmost importance to the climatic vulnerability of the priority area. The impacts of climate change will depend, not only on the magnitude of the change, but also on the adaptive capacity of the ecosystems, including the local social structures and organisation.

The same five categories described in the overview of the socio-economic conditions today (i.e., demographic, economic, natur-

[3] UNFCCC Secretariat (2004) *Compendium on methods and tools to evaluate impacts of, vulnerability and adaptation to climate change,* for additional information on the use of analogues.

Box 6-12: Example of three scenarios (no climate change)

Korzeniewicz and Smith (1999) discuss three qualitative scenarios for Latin American countries that they term the "low-road," "middle-road," and "high-road" scenarios. In the low-road scenario, power remains concentrated in the state and high-status groups, high levels of inequality persist, and poverty is likely to rise. This scenario is "often accompanied by a lack of transparency, a deterioration of accountability, and widespread corruption among office-holders (features that become major obstacles to sustained economic growth)" (Korzeniewicz and Smith, p 21). The middle-road scenario is characterised by market reforms and sustained economic growth in a stable democratic regime. Although significant power remains with currently dominant groups, there are also consistent decreases in unemployment and poverty, increases in transparency and accountability, and efforts to combat corruption and clientelism. In the high-road scenario, a country exhibits strong economic growth, movement toward equality in income and wealth, and advances toward democracy and accountability.

al resource, government/policy, and cultural analysis) could be used to develop projections of socio-economic conditions. As illustrated in the previous section, the relationships among these different categories can be explored to evaluate overall progress towards sustainable development for the priority area.

The examples in Boxes 6-12 to 6-14 are provided to illustrate possible approaches to the projection of socio-economic changes in vulnerability and adaptation analyses.

Box 6-13: Example of four scenarios for East Anglia consistent with SRES Scenarios

World markets (A1)

Responsibility for action at enterprise level under market forces. Fast growing sectors: health care, leisure, financial. Declining sectors: manufacturing, agriculture. Annual country GDP growth: high (% see region; modify for country or location). Global carbon emissions: medium increase (cf. 1990 levels).
Weak international climate regime. Voluntary reduction of emissions. Emissions trading through markets

Provincial enterprise (A2)

Responsibility for action at individual level. Fast growing sectors: private health care, defence, maintenance services. Declining sectors: high-tech specialised services, finance. Annual GDP increases moderate. Global carbon emissions: high increase (cf. 1990 levels).
Very weak climate regime. Increased emissions. No controls. Voluntary action.

Global sustainability (B1)

Responsibility for action at state level, dictated by international government. Fast growing sectors: renewable energy, business services, clean technology. Declining sectors: fossil-fuel based and resource-intensive systems. High GDP growth. Global carbon emissions: low increase (cf. 1990 levels).
Strong international climate regime. Stringent reduction of emissions. Regulatory approach.

Local stewardship (B2)

Responsibility for action at collective level, supportive governmental framework. Fast growing sectors: small-scale manufacture and agriculture, local enterprises. Declining sectors: retailing, leisure and tourism. Low annual GDP increases.
Global carbon emissions: medium low increase (cf. 1990 levels)
Strong/weak climate regime. Uneven emission controls. Fragmented regulatory approach.

Note: Annex A.6.1 has a summary description of SRES scenarios A1, A2, B1 and B2
Source: Lorenzoni et al., 2000

Box 6-14: Example of socio-economic scenarios of the future for Egypt

Strzepek et al. (2001) developed model-based socio-economic scenarios of the future. They then integrated the scenarios with climate scenarios and developed alternative futures with different adaptation strategies. The details of the representative socio-economic scenarios are given below.

	Population	Non-agricultural productivity	Agricultural productivity	Investment efficiency	Terms of trade
Scenario A	Low	High	Low	High	High
Scenario B	Low	High	Low	Low	Low
Scenario C	Higher	High	High	High	High
Scenario D	Higher	High	Low	High	High
Scenario E	Higher	High	Low	Low	Low
Scenario F	Higher	Low	High	Low	Low

6.5. Conclusions

This paper has provided guidance on how to analyse current and prospective socio-economic conditions in the context of the APF. In designing adaptation strategies, stakeholders will guide integrated quantitative and qualitative approaches to achieve:

- Coherent descriptions of the socio-economic conditions relevant to current adaptation and adaptive capacity to climate change
- Development of two or more storylines that provide the outlines of socio-economic prospects in the context of future climate change impacts
- Stakeholder participation in both defining current socio-economic conditions and prospects.

Project teams could use the following example outline as a checklist:

1. General overview of recent historical socio-economic conditions
2. Stakeholder input and selection of indicators for analysis
3. Current conditions (adaptation baseline)
    a. Demographic analysis
    b. Economic analysis
    c. Natural resource assessment
    d. Governance/policy-based analysis
    e. Cultural analysis
4. Prospects
    a. Three storylines (constructing a reference scenario with adaptation to current climate, two significantly different alternatives)
    b. Demographic prospects
    c. Economic prospects
    d. Prospects for natural resource use
    e. Governance/policy prospects
    f. Cultural prospects

References

Beck, Tony. (1990). *Survival strategies and power amongst the poorest in a West Bengal village*. *IDS Bulletin* 20, 23-32.

Bitoun, Jan, Leonardo Guimarães Neto and Tania Bacelar de Araújo. (1996). Amazonia and the Northeast: the Brazilian tropics and sustainable development. in *Climate Variability, Climate Change and Social Vulnerability in the Semi-arid Tropics*, Jesse C. Ribot, Antonio Rocha Magalhães and Stahis S. Panagides (eds). Cambridge: Cambridge University Press, pp. 129-146.

Douglas, Mary, Des Gasper, Steven Ney and Michael Thompson. (1998). Human needs and wants. In *Human Choice and Climate Change, Volume 1: The Societal Framework*, Steve Rayner and Elizabeth L. Malone, eds. Columbus, OH: Battelle Press, pp.195-263.

Fourke, Sean. (1995). Fishing for a Better Tomorrow. *Nature Conservancy* January-February, 18-19.

El-Shaer, M.H., H.M. Eid, C. Rosenzweig, A. Iglesias and D. Hillel. (1996). Agricultural adaptation to climate change in Egypt. in: *Adapting to Climate Change: Assessments and Issues*, Joel B. Smith, Neeloo Bhatti, Gennady Menzhulin, Ron Benioff, Mikhail I. Budyko, Max Campos, Bubu Jallow and Frank Rijsberman eds., New York: Springer-Verlag, pp. 109-127.

Guillermo Aguilar, Adriár, Exequiel Ezcurra, Teresa García, Marsa Mazri Hiriart and Irene Pisanty (1995). The basin of Mexico. in *Regions at Risk: Comparisons of Threatened Environments*, Jeanne X. Kasperson, Roger E. Kasperson and B.L. Turner II. Tokyo: United Nations University Press, pp. 304-366.

Hulme, M., T. Jiang and T. Wigley. (1995). SCENGEN: A Climate Change SCENario GENerator. Software User Manual, Version 1.0. Climatic Research Unit, University of East Anglia, Norwich, United Kingdom, and WWF International, Gland, Switzerland.

Jodha, N.S. (1995). The Nepal middle mountains. in *Regions at Risk: Comparisons of Threatened Environments*, Jeanne X. Kasperson, Roger E. Kasperson and B.L. Turner II. Tokyo: United Nations University Press, pp.140-185.

Korzeniewicz, Roberto Patricio and William C. Smith. (1999). *Growth, Poverty and Inequality in Latin America: Searching for the High Road*. Rights vs. Efficiency Paper #7, Institute for Latin American and Iberian Studies at Columbia University. http://www.ciaonet.org/wps/smw01/

Lorenzoni, I., A. Jordan, M. Hulme, R.K. Turner, and T. O'Riordan. (2000). A co-evolutionary approach to climate change impact assessment: Part I, Integrating socio-economic and climate change scenarios. *Global Environmental Change* **10**, 57-68.

Malone, Elizabeth L., Joel B. Smith, Antoinette L. Brenkert, Brian Hurd, Richard H. Moss, and Daniel Bouille (2002). *Developing Socioeconomic Scenarios for Use in Vulnerability and Adaptation Assessments*. UNDP-NCSP, New York.

Moldan, Bedrich and Suzanne Billharz. (1997). *Sustainability Indicators: A Report on the Project on Indicators of Sustainable Development*. Eds., Chichester: John Wiley & Sons.

Moss, R.H., Brenkert, A. and E.L. Malone. (2001). *Vulnerability Indicators*. Washington, DC: Pacific Northwest National Laboratory,

Nabarro, David, Claudia Cassels and Mahesh Pant (1990). *Coping Strategies of Households in the Hills of Nepal: Can Development Initiatives Help? IDS Bulletin* 20(2), 68-74.

Nakicenovic et al. (2000). *Special Report on Emissions Scenarios*. Cambridge: Cambridge University Press.

PECS News [Population, Environmental Change, and Security Newsletter] (Spring 2000). Washington, DC: Woodrow Wilson Center

Pepper, W.J., J. Leggett, R. Swart, J. Wasson, J. Edmonds and I. Mintzer (1992). *Emissions Scenarios for the IPCC: An Update—Assumptions, Methodology, and Results*. Intergovernmental Panel on Climate Change, Geneva.

Strzepek, K., David Yates, Gary Yohe, Richard Tol and Nicholas Mader. (2001). Constructing "not implausible" climate and economic scenarios for Egypt IN: *Integrated Assessment* 2 (3, 2001): 139-157

Tol, Richard S.J. (1998). Socio-economic scenarios. In *UNEP Handbook on Methods for Climate Change Impact Assessment and Adaptation Studies*, Jan F. Feenstra, Ian Burton, Joel B. Smith, and Richard S.J. Tol. eds. United Nations Environment Programme and Vrije Universiteit. http://www.vu.nl/english/o_o/instituten/IVM/research/climatechange/Handbook.htm

Wang'ati, Fredrick Joshua (1996). The impact of climate variation and sustainable development in the Sudano-Sahelian region. in *Climate Variability, Climate Change and Social Vulnerability in the Semi-arid Tropics*, Jesse C. Ribot, Antonio Rocha Magalhães and Stahis S. Panagides (eds). Cambridge: Cambridge University Press, pp.71-91.

World Bank (1998). World Development Indicators 1998 [CD-ROM]. International Bank for Reconstruction and Development/The World Bank, Washington, DC.

Yang, H. (1996) Potential effects of sea-level rise in the Pearl River Delta area: preliminary study results and a comprehensive adaptation strategy. in *Adapting to Climate Change: Assessments and Issues*, Joel B. Smith, Neeloo Bhatti, Gennady Menzhulin, Ron Benioff, Mikhail I. Budyko, Max Campos, Bubu Jallow and Frank Rijsberman eds. New York: Springer-Verlag, pp. 265-276.

ANNEXES

Annex A.6.1. Methodological guidance in using models to construct socio-economic scenarios

(Source: Extracted from Malone et al., 2002)

This guidance begins at the global-regional level to help the reader establish general directions for and limits to scenarios so they will (1) account for global factors that have been analysed and, in the case of the SRES scenarios (Nakicenovic et al., 2000), approved by the IPCC; and (2) be internally consistent as the scenarios "tier down" to national and sub-national levels.

A.6.1.1. Using existing scenarios

Socio-economic scenarios for use in climate change analyses exist at global and regional (multi-national) levels; these can be adapted for use in more localised vulnerability analyses. Tol et al. (1998) provide information and references for five socio-economic scenarios generated by the World Bank, IPCC, and integrated assessment modelling groups.

Many projections of climate change have made use of the IPCC's IS92 scenarios (Pepper et al., 1992). More recent work focuses on the new set of IPCC reference (no intervention through specific climate policies) SRES scenarios (Nakicenovic et al., 2000). The authors of the SRES report define and elaborate the socio-economic scenarios now used by the IPCC to project various emissions pathways. An argument for using the SRES scenarios is that their outputs will be used as inputs into global climate models that will create estimates of change in global climate to be used in impacts assessment (Hulme et al., 1995). By reflecting the SRES scenarios, the socio-economic scenarios will be consistent with the climate change scenarios.

The SRES features alternative "storylines" about the future. The storylines are qualitative, holistic pictures of the general structures and values of global society. They describe conditions that might be produced by human choices about economic and social policy, reproduction, occupations, and energy/technology use. The paces of population growth and economic development are set within and partially explained by the alternative tendencies of policies to support forms of global governance or localised self-sufficiency. There are four storylines (Nakicenovic et al., 2000):

- The A1 storyline and scenario family describe a future world of very rapid economic growth, global population that peaks mid-century and declines thereafter, and rapid introduction of new and more efficient technologies. Major underlying themes are economic and cultural convergence and capacity building, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system: fossil intensive (A1F1), non-fossil energy sources (A1T), and a balance across all sources.

- The A2 storyline and scenario family describe a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented and slower than in other storylines.

- The B1 storyline and scenario family describe a convergent world with the same global population that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid changes in economic structures toward a service and information economy, with reductions in material intensity, and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improved equity, but without additional climate initiatives.

- The B2 storyline and scenario family describe a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population 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. While the scenario is also oriented toward environmental protection and social equity, it focuses on local and regional levels.

Note, however, that the SRES scenarios were developed for the specific purpose of projecting future emissions of greenhouse gases. This means that they are not ready-made answers to the problem of developing socio-economic scenarios for vulnerability and adaptation analyses. They are a good starting point for considering such important factors as population growth and composition, economic conditions, and technological change. They do not explicitly represent other social institutions, such as farming, labour organisations, or the ways in which a government provides for the welfare of its citizens.

A.6.1.2. Adapting storylines and projections from SRES scenarios

This section will help the user choose the appropriate storylines, data, and projections for their socio-economic scenarios. A country or a region such as an urban area or watershed exhibits its own variety of linked environmental-social conditions, providing the challenge of representing these in the context of a global socio-economic scenario. A region may have

fragile ecosystems; major pollution problems, particularly air and water; and growing population and economy. International differences may further complicate the situation. Future developments in society hinge on the types of choices that are made, so many paths to the future are possible.

In other words, a region has its own set of storylines, which can be derived from the SRES storylines and adapted to regional circumstances. A scenario developer should ask, "What does an A1 kind of world mean for this specific region, and how would the A1 characteristics be manifested here? "

Vulnerabilities will be very different if a country seeks rapid industrialisation, takes food imports for granted, seeks self-reliance in food production or chooses a path of agricultural export-led growth. Vulnerabilities will also be different if a country chooses to protect and support its farmers, or let them face the whims of the market and the weather on their own strength (Tol, 1998, pp 2-14).

A country's likely approach to these policy matters must be considered in developing a storyline that will determine many of the socio-economic characteristics. Then appropriate values for the SRES variables can be determined by proportional calculations, i.e., applying the SRES percentage increases in population and GDP from the appropriate scenarios to the existing data for the region under study.

Using the SRES data and projections, users can review data on population and GDP projections, at a minimum. (For further methodological guidance see Malone et al., 2002.)

A.6.1.3. Adding country-specific factors to the socio-economic scenario

This section discusses national-level factors and storylines that will delineate two or more directions for the future. The primary concern is to keep a country's future development choices consistent with potential global developments and the country's own current policy directions. Storylines of the future will help the user to decide the most influential elements of that future and to construct ways to represent—and, if possible to quantify—those elements.

Besides the variables adapted from SRES or other sources of socio-economic scenarios, additional data for scenarios to be used in vulnerability analyses should be gathered from the literature (studies done about the user's particular country) and relevant databases (e.g., World Bank, 1998) to describe the social, economic, and institutional context in which climate variability and change will take place in the user's country. The important factors for the country's social future must be represented in its socio-economic scenario.

These factors include national indicators of well-being. Users should add to population and GDP figures (for the present and projections into the future) elements that capture more dimensions of overall development and the variations as well as the averages. It is possible to develop a specific and highly detailed set of indicators of national well-being. (For example, Douglas et al., 1998 contains descriptions of human needs, particularly Box 3.1.) Or the user can use the UNDP's Human Development Index (HDI) (World Bank, 1998). The HDI uses three indicators:

- life expectancy at birth
- literacy rates
- purchasing-power-adjusted GDP per capita (in logarithmic form).

The first two indicators reflect the supporting infrastructure for an individual's life. Life expectancy is a good indicator of public health, resulting from clean water, sewerage, medical practice, and nutritional status. Literacy indicates the spread of education and access to information. The third indicator, purchasing power, is relevant to the individual's ability to acquire goods and services.

The HDI rankings are given to countries on the human deprivation continuum (0 to 1) for each indicator; the average of the three indicators, subtracted from 1, provides the overall HDI.

Table A-6-1 demonstrates an approach midway between an elaborate set of country-specific indicators, and the three that comprise the HDI. This approach is multidimensional, with indicators for economic capacity, human and civic resources, and environmental capacity. Within each category a selection of proxy variables has been made, the relationship between the proxy and the category has been specified, and the functional relationship has been defined.

The discussions above should give the user a picture of the methodology that they can adapt to develop projections, again using the storylines they have selected to provide a basis for the determination of rates of change. For example, access to health care may increase more under the global solutions scenario than under the self-reliant scenario, since presumably a country would be able to obtain medical services and products on the global market more easily than developing them in-country. Conversely, a self-reliant scenario would indicate that the user's country would have more development of national programmes to address climatic and other extreme events.

Each choice the user makes of projected values must have an underlying rationale. Users should remember that a straight-line extrapolation will rarely be defensible. For example, a literacy rate cannot improve indefinitely, and increasing calories over the amount to ensure adequate nutrition actually decreases well-being. Also remember that the projections must be realistic; projected reductions in income inequality must be based on the potential of the national society to achieve them, a difficult goal for any country to attain. Finally, many of the proxies that can be identified may reinforce one another; increased GDP may have implications for educational advancement and technological change – another reason to be very selective in choosing proxies to use.

Table A-6-1: *Country-level factors for use in socio-economic scenarios*

Category	Proxy variables	Proxy for:	Functional relationship
Economic capacity	GDP(market)/capita Gini index	Distribution of access to markets, technology, and other resources useful for adaptation	Adaptive capacity ↑ as GDP/cap ↑ at present Gini held constant
Human and civic resources	Dependency ratio Literacy	Social and economic resources available for adaptation after meeting other present needs Human capital and adaptability of labour force	Adaptive capacity ↓ as dependency ↑ Adaptive capacity ↑ as literacy ↑
Environmental capacity	Population density SO_2/area % land unmanaged	Population pressure and stresses on ecosystems Air quality and other stresses on ecosystems Landscape fragmentation and ease of ecosystem migration	Adaptive capacity ↓ as density ↑ Adaptive capacity ↓ as SO_2 ↑ Adaptive capacity [of the environment]↑ as % unmanaged land ↑

Source: Moss et al., 2001

These additional characteristics, along with the adapted SRES projections, will provide a more detailed picture of a country's socio-economic future. Within these constraints, the user can extend the analysis into important sectors in their country. (Malone et al., 2002 has additional methodological guidance.)

Annex A.6.2. An example of the use of socio-economic analysis within vulnerability assessment

This annex outlines an example of a vulnerability assessment that draws on socio-economic analysis. (TP3 contains additional information on vulnerability assessment.)

Income and employment

As a result of El Salvador's growing economy, per capita income in 1994 was US $1440, which places this Central American country in the middle-income group of all countries. Nevertheless, with reference to the reduction of extreme poverty and improving the quality of life for the population, especially in rural areas, there is an important gap between urban and rural per capita incomes.

Urban per capita income is approximately $2200 annually; however, the level of rural income is only $500. With this per capita income, the majority of the rural population cannot acquire a basket of basic nutritional goods for a family, the price of which was $1100 per year in rural areas. In urban areas this same basket of goods cost $1512; nevertheless, minimum urban salaries represent $1550, which indicates that the most urban income goes to the acquisition of food.

This situation demonstrates overall that the majority of the population, whether rural or urban, is at risk of food insecurity. It has been pointed out that the average income in the rural sector cannot catch up with or cover the food requirements; at the same time, the average urban income is destined to satisfy only 90% of food requirements. In this way, food insecurity takes on a chronic and structural character.

The indicators used in El Salvador's First National Communication on Climate Change (February 2000) were population; per capita income, disaggregated into rural and urban per capita incomes; food prices; real wages; nutritional requirements; production of basic grains; and a calculated nutritional gap and consequent import needs.

(Source: El Salvador First National Communications to the UNFCCC; http://unfccc.int/resource/docs/natc/elsnc1e.pdf)