Two examples of qualitative Scenarios

Scenarios are plausible and often simplified descriptions of how the future may develop, based on a coherent and internally consistent set of assumptions about key driving forces and relationships (MA, 2005). It is important to note that scenarios are not forecasts of future events, nor are they predictions of what might or will happen in the future. What follow are the storylines of two Scenario exercises: (i) the Millennium Ecosystem Assessment and (ii) the “Future Climate for Development”, developed by Forum for the Future in 2010.

(1) The Millennium Ecosystem Assessment (MA) is one of the most widely known of the recent global scenario processes. In the MA, a large number of experts from across the world developed four scenarios to describe the consequences of different development pathways for ecosystem services and human well-being (Millennium Ecosystem Assessment, 2006). The scenarios were designed to explore contrasting transitions of society, as well as contrasting approaches to policies for managing ecosystem services. The four global scenarios are labelled: Global Orchestration, Order from Strength, Techno Garden, and Adapting Mosaic. The logic differentiating these four scenarios can be described along two main axes, see Figure 1 (below). On the one hand, the scenarios differ with regard to whether socio-economic conditions are governed largely by globalisation (i.e. Global Orchestration, Techno Garden), or whether fragmentation and regional blocs dominate (i.e. Order from Strength, Adapting Mosaic). On the other hand, the general approaches of how to deal with current and future environmental challenges differ: In Global Orchestration and Order from Strength the general philosophy is a largely reactive one, whereas both Techno Garden and Adapting Mosaic are based on the assumption of more proactive approaches.

Figure 1: Scenario logic of the Millennium Ecosystem Assessment scenarios

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Global Scenario 1: Global Orchestration

The Global Orchestration scenario depicts a globally-connected society in which policy reforms that focus on global trade and economic liberalization are used to reshape economies and governance, emphasizing the creation of markets that allow equitable participation and provide equitable access to goods and services. These policies, in combination with large investments in global public health and the improvement of education worldwide, generally succeed in promoting economic expansion and lift many people out of poverty into an expanding global middle class. Supra-national institutions in this globalised scenario are well placed to deal with global environmental problems such as climate change and fisheries. However, the reactive approach to ecosystem management favoured in this scenario makes people vulnerable to surprises arising from delayed action. While the focus is on improving human well-being of all people, environmental problems that threaten human well-being are only considered after they become apparent.

Growing economies, expansion of education, and growth of the middle class leads to demand for cleaner cities, less pollution, and a more beautiful environment. Rising income levels bring about changes in global consumption patterns, boosting demand for ecosystem services, including agricultural products such as meat, fish, and vegetables. Growing demand for these services leads to declines in other services, as forests are converted into cropped area and pasture, and the services formerly provided by forests decline. The problems related to increasing food production, such as loss of wildlands, are remote to most people because they live in urban areas. These problems therefore receive only limited attention. Global economic expansion expropriates or degrades many of the ecosystem services poor people once depended upon for their survival. While economic growth more than compensates for these losses in some regions by increasing our ability to find substitutes for particular ecosystem services, in many other places, it does not. An increasing number of people are impacted by the loss of basic ecosystem services essential for human life. While risks seem manageable in some places, in other places there are sudden, unexpected losses as ecosystems cross thresholds and degrade irreversibly. Loss of potable water supplies, crop failures, floods, species invasions, and outbreaks of environmental pathogens increase in frequency. The expansion of abrupt, unpredictable changes in ecosystems, many with harmful effects on increasingly large numbers of people, is the key challenge facing managers of ecosystem services.

Global Scenario 2: Order from Strength

The Order from Strength scenario represents a regionalized and fragmented world, concerned with security and protection, emphasizing primarily regional markets, and paying little attention to common goods. Nations see looking after their own interests as the best defence against economic insecurity, and the movement of goods, people, and information is strongly regulated and policed. The role of government expands as oil companies, water systems, and other strategic businesses are either nationalized or subjected to more state oversight. Trade is restricted, large amounts of money are invested in security systems, and technological change slows due to restrictions on the flow of goods and information. Regionalization exacerbates global inequality. Agreements on global climate change, international fisheries, and the trade in endangered species are only weakly and haphazardly implemented, resulting in degradation of the global commons. Local problems often go unresolved, but major problems are sometimes

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2 These short descriptions of the scenarios are taken from a background paper by Monika Zurek prepared for a Scenarios Research Workshop held at the FAO, Rome on 21 and 22 April, 2005.
handled by rapid disaster relief to at least temporarily resolve the immediate crisis. Many powerful countries cope with local problems by shifting burdens to other, less powerful countries, increasing the gap between rich and poor. In particular, natural resource-intensive industries are moved from wealthier nations to poorer and less powerful ones. Inequality increases considerably within countries as well.

Ecosystem services become more vulnerable, fragile, and variable in *Order from Strength*. For example, parks and reserves exist within fixed boundaries, but climate changes around them, leading to the unintended extirpation of many species. Conditions for crops are often suboptimal, and the ability of societies to import alternative foods is diminished by trade barriers. As a result, there are frequent shortages of food and water, particularly in poor regions. Low levels of trade tend to restrict the number of invasions by exotic species; however, ecosystems are less resilient and invaders are therefore more often successful when they arrive.

**Global Scenario 3: Techno Garden**

The *Techno Garden* scenario depicts a globally connected world relying strongly on technology and highly managed, often engineered ecosystems, to deliver ecosystem services. Overall efficiency of ecosystem service provision improves, but is shadowed by the risks inherent in large-scale human-made solutions and rigid control of ecosystems. Technology and market-oriented institutional reform are used to achieve solutions to environmental problems. These solutions are designed to benefit both the economy and the environment. These changes co-develop with the expansion of property rights to ecosystem services, requiring people to pay for pollution they create, and paying people for providing key ecosystem services through actions such as preservation of key watersheds. Interest in maintaining, and even increasing, the economic value of these property rights, combined with an interest in learning and information, leads to an increase in the use of ecological engineering approaches for managing ecosystem services. Investment in green technology is accompanied by a significant focus on economic development and education, improving people’s lives and helping them understand how ecosystems make their livelihoods possible.

A variety of problems in global agriculture are addressed by focusing on the multifunctional aspects of agriculture and a global reduction of agricultural subsidies and trade barriers. Recognition of the role of agricultural diversification encourages farms to produce a variety of ecological services, rather than simply maximizing food production. The combination of these movements stimulates the growth of new markets for ecosystem services, such as trade in carbon storage, and the development of technology for increasingly sophisticated ecosystem management. Gradually, environmental entrepreneurship expands as new property rights and technologies co-evolve to stimulate the growth of companies and cooperatives providing reliable ecosystem services to cities, towns, and individual property owners. Innovative capacity expands quickly in developing nations. The reliable provision of ecosystem services, as a component of economic growth, together with enhanced uptake of technology due to rising income levels, lifts many of the world’s poor into a global middle class. While the provision of basic ecosystem services improves the well-being of the World’s poor, the reliability of the services, especially in urban areas, is increasingly critical and increasingly difficult to ensure. Not every problem has succumbed to technological innovation. Reliance on technological solutions sometimes creates new problems and vulnerabilities. In some cases, we seem to be barely ahead of the next threat to ecosystem services. In such cases new problems often seem to emerge from the last solution, and the costs of managing the environment are continually rising. Environmental breakdowns that impact large numbers of people become more common. Sometimes new problems seem to emerge faster than solutions. The challenge for the future is
to learn how to organize socialecological systems so that ecosystem services are maintained without taxing society’s ability to implement solutions to novel, emergent problems.

Global Scenario 4: Adapting Mosaic
In the Adapting Mosaic scenario, hundreds of regional ecosystems are the focus of political and economic activity. This scenario sees the rise of local ecosystem management strategies, and the strengthening of local institutions. Investments in human and social capital are geared towards improving knowledge about ecosystem functioning and management, which results in a better understanding of resilience, fragility, and local flexibility of ecosystems. There is optimism that we can learn, but humility about preparing for surprises and about our ability to know everything about managing ecosystems. There is also great variation among nations and regions in styles of governance, including management of ecosystem services. Many regions explore actively adaptive management, investigating alternatives through experimentation. Others employ bureaucratically rigid methods to optimize ecosystem performance. Great diversity exists in the outcome of these approaches: some areas thrive, while others develop severe inequality or experience ecological degradation. Initially, trade barriers for goods and products are increased, but barriers for information nearly disappear (for those who are motivated to use them) due to improving communication technologies and rapidly decreasing costs of access to information.

Eventually, the focus on local governance leads to some failures in managing the global commons. Problems like climate change, marine fisheries, and pollution grow worse and global environmental problems intensify. Communities slowly realize that they cannot manage their local areas because global and regional problems are infringing, and they begin to develop networks among communities, regions, and even nations, to better manage the global commons. Solutions that were effective locally are adopted among networks. These networks of regional successes are especially common in situations where there are mutually beneficial opportunities for coordination, such as along river valleys. Sharing good solutions and discarding poor ones eventually improves approaches to a variety of social and environmental problems, ranging from urban poverty to agricultural water pollution. As more knowledge is collected from successes and failures, provision of many services improves.

(2) Forum for the Future’s “The Future Climate for Development” scenarios

Reversal of Fortunes
This is a fraught world where the urgent need to cut carbon dominates international relations. Drastic measures to decarbonise the global economy spell crisis for many industries and no country is immune to the pain. Having rapidly developed – mostly on carbon-intensive pathways – many low-income countries of the 2010s are now middle-income. They speak with a strong, united voice on the world stage, holding wealthier nations to account for the problems of climate change. These new emerging economies are the least resilient and are suffering the most, and with the world focussed on cutting carbon there is little money in the pot for aid.

In this world...
• the 2026 Climate Treaty makes failure to meet emissions reduction targets as serious as failure to comply with a UN Security Council resolution. Countries that refuse to sign the treaty are threatened with sanctions and even military intervention;

• low-income countries are handicapped by ‘white elephant’ high-carbon infrastructure. Carbon emissions penalties make coal-fired power plants and similar installations prohibitively expensive to run;
• the pan-African grassroots ‘Elephant Movement’ campaigns for high-income countries to repay their ‘carbon debt’ to Africa. It unites the voices of low-income countries in climate change negotiations and funds lawsuits against companies and governments;
• multinational companies’ products disappear from many low-income countries. Entrepreneurs fill the gaps, offering locally-branded alternatives;
• the 2028 Olympics are cancelled for the first time since World War II, because of a lack of carbon credits to fund either the building of stadiums or travel;
• the UN sets up an office to coordinate geo-engineering initiatives to tackle climate change; China proposes the world’s largest programme of seeding rain-clouds to protect its agricultural investments in Africa;
• the number of climate refugees grows by the day and campaigners demand that developed nations make land available for settlement.

Age of Opportunity
This is a world where low-income countries have received significant and effective development assistance as part of a strong climate change deal. They play a growing role in the world economy and are spearheading a low-carbon energy revolution, leapfrogging the old high-carbon technologies in pursuit of a prosperous and clean future. Cultural confidence in these countries is high: their politicians take a prominent place on the world stage, and increasingly people reject high-carbon Western lifestyles as uncivilised. In many states power has devolved to regions and communities; in some countries this has brought positive change, but in others large areas have fallen under the control of local mafia and warlords.

In this world...
• billions of dollars are spent each year on emergency aid and measures to help countries adapt to climate change, funded by the ‘Climate Relief Tax’ – a 0.05% levy on international currency and commodity transactions (modelled on the so-called ‘Tobin Tax’);
• low-income countries generate 40% of the world’s solar energy, a huge increase since 2010;
• communities and businesses have unprecedented access to low-carbon electricity thanks to a boom in decentralised power generation. Broadband internet access is widespread and almost cost-free. This has boosted delivery of water and services like health and education;
• there is a widespread move to more devolved politics, and cities become powerful political entities: Nigeria’s protests are overruled when Lagos sends its own delegation to the United Nations;
• cultural confidence in low-income countries is high and rising: Kinshasa attracts musicians and artists from around the world; the Mali Film Festival receives as much coverage as Cannes;
• smallholder cooperatives have become the dominant agricultural model in low-income countries; these are linked into global supply chains and organised using collaborative online software;
• many multinational companies have moved their operations to low-income countries, attracted by cheap labour and low-carbon electricity. Home-grown businesses thrive, supported by microfinance and mobile phone-based payment systems.

Coping Alone
This is a world in which low-income countries feel increasingly abandoned. Two decades of high oil prices and economic stagnation have driven the global community apart. Attempts to coordinate action to reduce carbon emissions have been dropped. Regional blocs now focus on their own concerns, such as food security, resource shortages and adapting to climate change. Low-income countries face all these problems with few resources and limited support from
wealthy nations; some states have collapsed. New models of business and governance are starting to emerge from the shadows of increasing inequality.

In this world…
• the world is still recovering from the Middle East conflict of the 2010s which pushed the oil price above $400 and destabilised the whole region. Low levels of conflict over water persist;
• oil-importing countries have suffered hugely. Oil-exporting countries have built up huge sovereign wealth funds with massive influence over the global economy, and are starting to invest in renewable energy technologies;
• most global supply chains have contracted under the shadow of high oil prices; some are kept moving by biofuels, tar sands oil, and shipping powered by advanced kites systems;
• regional integration of low-income countries is a common strategy to increase resilience and political power: the Pacific members of the Alliance of Small Island States become a single state in 2023; the East African Union has a common currency;
• food security is a worldwide concern; vegetarianism is a global moral movement;
• ‘nuclear offshoring’ is becoming common: wealthy nations build nuclear plants in low-income countries, which are run by their own military; they export the power giving the host country a share;
• desktop manufacturing is beginning to take off in some low-income countries where energy is available: people use recycled plastics to make all sorts of products using 3-D printers to replicate blueprints available on the internet.

The Greater Good
This is a world where people understand that economies rely fundamentally on access to natural resources. Climate change is seen as the ultimate resource crunch, but there are equal concerns over water, food and soil depletion. States manage natural resources pragmatically to give the greatest good for the greatest number and are prepared to take draconian action to protect them. Individual liberties and choice have suffered, but most people feel that their future is at least being safeguarded. Those low-income countries with natural resources prosper; those without have little bargaining power. Tensions between rival resource blocs are intense, and sometimes spill over into violent conflict.

In this world…
• new political alliances form around natural geographic boundaries such as the Niger/Volta watershed collaboration. Regional blocs manage food, energy, biodiversity and even population;
• state-sponsored family planning and public health initiatives – and limits on numbers of children – are common;
• compulsory identity cards holding information about personal resource consumption are common all over the world; companies sell services (such as ‘personal carbon quota management’) to help people avoid falling foul of the strict legislation;
• ‘smart dust’ – a worldwide network of nanotech computers – monitors environmental conditions, resource use and pollution, providing governments and business with real-time information;
• international retailers, whose presence in low-income countries increases year-on-year, demand full ‘ecosystem integrity’ in the goods that they sell; entire product lines have been withdrawn for being unsustainable;
• insects, such as farmed grasshoppers, have replaced animals and fish as the main source of protein for hundreds of millions of people in Africa and Eurasia. Vegetarian diets are common – and enforced in some areas;
• rapid urbanisation and new planned cities create a huge market for flat-pack housing which can be constructed quickly and easily using government-approved materials.

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