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SD21 scenarios – note for discussion

Scenario component of the "SD21 project"

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Contents

1. Context

The proposed scenario exercise is a component of the SD21 project that aims to construct a coherent vision of sustainable development in the 21st century, in order to contribute to the UN Conference on Sustainable Development (UNCSD or "Rio+20") in 2012. The project is being carried out by the United Nations Department of Economic and Social Affairs (DESA) and co-funded by the European Union. It prepares a substantive contribution to the Rio+20 Conference which will take stock of progress since the Earth Summit in 1992 and will provide a vision for the way forward.[2] Under the SD21 project. nine in-depth studies (Annex C) are being carried out: (1) Progress in implementation of Agenda 21 and JPOI; (2) National sustainable development governance; (3) Emerging issues for sustainable development; (4) Global and regional scenarios for the long term and for transition paths; (5) Managing a sustainable economy; (6) Change in international institutions for a sustainable 21st century; (7) Menus of policy options for the transition to a sustainable economy at the national level; (8) Focus on challenges and risks in sectoral clusters; (9) The relationship between the 10YFP on SCP and Green economy. The current note describes ideas for Study 4 on scenarios.

The scenario exercise under the SD21 project builds on existing efforts. Since 1992, the international community has developed different visions of the world corresponding to different world views and approaches to addressing sustainable development. Prominent recent examples include the scenarios developed under IPCC; those currently developed under the Global Energy Assessment, and the push for a green economy promoted by UNEP.

[1] Disclaimer: The views expressed in this informal note are those of the authors and do not imply any endorsement by the United Nations or its management.

[2] The present notes takes into account suggestions made by participants of a teleconference on SD21 scenarios that was organized by DESA with selected participants of the UN-energy process.

2. Strategy for the Scenario Exercise

The scenario component of the SD21 project consists of three tracks, only two of which are covered in the present note:

(1) *Review of models and sustainable development scenarios* since Rio 1992, in particular with respect to their impact on decision-making.

(2) *Interactive scenario meta-analysis* to identify robust policies and actions, based on existing sustainable development scenarios and a scenario generator (meta-model), and carried out interactively with participating modellers. [Both the database and meta-model will be developed under the project.]

(3) *Development of SD21 sustainable development scenarios and description of representative "marker scenarios"*. The scenarios will build on existing scenarios (such as the GEA efficiency scenario) and cover the full range of sustainable development themes. This wide range will be covered through soft-linking ("harmonizing") model runs. Extreme scenarios will also be considered as variations on each scenario family. An open-source collaboration with open-assumptions will also be explored.

3. Scenario approach

There are a wide range of scenario approaches. For the SD21 project, the development of normative scenarios is suggested that describe feasible, internally consistent and coherent future paths of the global social, economic, and environmental system over the course of the 21st century. The scenarios are designed to achieve a series of desired "end-points" by 2030, 2050 and 2100, depending on the issues considered. Required policy measures and initiatives to achieve these end-points are compared to current patterns which are described in "dynamics-as-usual" and "business-as-usual" scenarios.[3] In addition, exploratory meta-analysis of existing "sustainable development"-scenarios (provided by various modelling groups) and generic scenarios from a scenario generator, will be carried out to identify "robust" policies and measures.

The scenario analysis approach typically categorizes scenarios along the most important factors that are the object of analysis. Conventional scenario analysis categorizes scenarios along the most important "driving forces". The emissions scenarios of the IPCC were categorized into four scenario "families" along two axis depicting the expected level of globalization and the relative importance given to economic and environmental objectives (IPCC SRES, 2000), with coherent assumptions for the direct driving forces of emissions, including technology, population affluence, energy resources, land use, etc. Scenario analysis that aims to emphasize the need for action have typically been categorized by action-inaction (e.g., contrasting a "wait and see"-scenario assuming no or only few new actions, with a "just do it"- scenario which assumes many new actions). Another common approach, which also informed the IPCC SRES scenario identification, is a categorization by "worldview", such as P. Raskin's "conventional worlds", "barbarism" and "great transitions" scenario families. Basically all scenarios can also be categorized into optimistic and pessimistic scenarios, depending on assumptions about the development of external factors.

The IPAT identity (Ehrlich and Holdren, 1972) in its modern version (Waggoner and Ausubel, 2002) links impacts (I) with the driving forces population (P), affluence (A), consumption patterns (C) and technology (T). Thus, in a conventional approach, sustainable development scenarios could be categorized along the axes of sustainability challenge (P*A) and eco-

[3] The broad differences between business-as-usual and dynamics-as-usual scenarios are described in the scenario storylines (see Appendix).

efficiency (C*T), both of which can be further subdivided into various sectors, themes, and consumption and production patterns, and settlement patterns (e.g., urban/rural). Such categorization will be used to structure the scenario meta-analysis.

However, at the broadest level, the SD21 scenario analysis aims to provide global guidance to member States, as to timing, relative focus on, and level of integration of the three pillars of sustainable development (economy, environment, social). In the case of energy-related development, historically, the emphasis typically began by satisfying demand for modern energy services among high-income households and in public areas, then on building infrastructure to support industrialization, then on widening access, and finally on dealing with the environmental externalities associated with energy use. Yet, the perceived challenge for developing countries today is how to move from this historical sequence to an integrated, concurrent approach dictated by the sheer scale of required change and the limits set by "planetary boundaries". In other words, the question is one of timing and magnitude of policy actions to achieve a range of normative "end-points", the relative importance of which will vary in the different scenarios.

Therefore, for the purposes of the SD21 project, it is suggested to start from a "business-as-usual scenario" and successively add normative "end-points", combinations of which will define scenario families. The following categorization is suggested in which each family reflects a representative view of the range of positions taken in the global sustainable sustainable development debate which aim to highlight the relative importance of focusing on one or a combination of pillars of sustainable development:

(1) Brown scenario family (1): Policy focuses on the economy pillar

- **Business-as-usual scenario ("Growth first!")**, describing a future world that would result from a continuation of current policies and practices primarily geared toward achieving a sufficiently high level of economic growth.
- **Dynamics-as-usual scenario ("Keep it up!")**, describing a future world that results from a continuation of incremental progress, in line with historical trends and patterns. It is the closest to a future "projection".
- **Catch-up scenario ("Growth first with catch-up")**, describing a future world which continues to focus on growth, but with special efforts to achieve catch-up growth of the economies of LDCs and Africa.

(2) Green scenario family (2): Policy focuses on major issues in the economic and environment pillars:

- **Green economy scenario ("Green growth")**, describing a future world which focuses on growth and (partial) environmental objectives. Economic instruments are the preferred means to improve eco-efficiencies, in particular through "getting-prices-right" and additional public investments for clean technologies.
- **Climate scenario ("IPCC world")**, describing a future world that sees climate change as the most important threat and takes decisive action in terms of mitigation and adaptation. Other objectives, such as development, are increasingly formulated in terms of the climate policy goals.
- **Planetary boundaries scenario ("One planet world")**, describing a future world that emphasizes action to ensure that humanity develops within a range of planetary boundaries (with climate change constituting one of them) to avoid global environmental collapse.

(3) Yellow scenario family (3): Policy focuses on the social pillar, but also takes into account selected economic and environmental issues:

- **Development scenario ("MDG+ world")**, describing a future world that emphasizes poverty reduction initiatives that primarily address social, education and health goals, but also take into account selected economic and environmental issues.

(4) Rainbow scenario family (4): Policy aims to integrate all sustainable development pillars:

- **Sustainable development scenario ("SD21 world")**, describing a future world in which policy follows an integrated approach to economic, social and environmental goals, and major institutional change, with the overall goal of development that "meets the needs of the present without compromising the ability of future generations to meet their own needs".

Appendix A provides a first draft of a "storyline" for each of these scenarios. Modellers will be encouraged to explore variations within each scenario family, which, however, will share the same desired "end-points" and a series of variables to be harmonized (see below). The scenario analysis should provide a good sense of trade-offs and synergies associated with pursuing several objectives in the three pillars, and their relative importance. It will provide an answer to the overall question of *which near- to medium term strategies will get the world on a path toward sustainable development over the course of the 21st century.* A comparison of the "green economy scenario" with the others will provide insight on whether an incremental move from "growth first" towards a "partial" focus on environmental objectives by "getting-prices-right" to reflect environmental externalities and by a relative decoupling of production and consumption from resource use and pollution would eventually to lead to achievement of the desired "endpoints" of a sustainable economy. It should also be noted that no priority ranking is implied in the listing of scenarios. The order is merely reflecting the successive adding of objectives for reaching particular endpoints (e.g., implemented in the model through constraints).

It is important to note, that the SD21 scenario exercise will aim to build on existing global scenarios to the extent possible. Table 1 provides an initial idea of major global scenarios that can serve as a starting point for the SD21 scenarios. Most of the major models in use today have grown over decades and have been used for analysing a range of diverse issues. As a result, model runs specifically created for answering a thematic question can often be further analyzed to understand impacts on other issues and sectors. For example, the GEA scenarios produced with the IIASA-MESSAGE and IMAGE modelling frameworks can be analyzed far beyond the energy sector, including in terms of land use, atmosphere, water, poverty, etc.

Table 1. Selected major global scenarios suggested as starting points for the SD21 scenarios.

SD21 scenario families	E3 scenarios	Water scenarios	Land use scenarios	Social and poverty scenarios	Extreme scenarios	Generic models
Business-as-usual scenario ("Growth first")	IEA current policies scenario; IPCC A1 or A2?	UN-water scenarios	IIASA land-use scenarios		IPCC SREX	
Dynamics-as-usual scenario ("Growth first with continued incremental improvements")	GEA scenarios; IPCC B2	UN-water scenarios	IIASA land-use scenarios		IPCC SREX	
Catch-up scenario ("Growth first with focus on catch-up development")	GEA scenarios; IPCC A1, A1T	UN-water scenarios	IIASA land-use scenarios		IPCC SREX	
Green economy scenario ("Growth with partial	GEA scenarios; IEA new policies	UN-water scenarios	IIASA land-use		IPCC SREX	UNEP green economy

environmental objectives")	scenario; GEA mix scenario;		scenarios			scenario
Climate scenario ("UNFCCC world")	GEA scenarios; IPCC TAR WGIII scenarios	UN-water scenarios	IIASA land-use scenarios		IPCC SREX	IMAGE
Planetary boundaries scenario	Extension of GEA mix scenario	UN-water scenarios	IIASA land-use scenarios		IPCC SREX	
Development scenario ("MDG+ economy")	GEA scenarios;	UN-water scenarios	IIASA land-use scenarios	DIE and WB scenarios	IPCC SREX	
Sustainable development scenario ("SD21 scenario")	GEA efficiency scenario; MESSAGE IPCC B1 and B1T	UN-water scenarios	IIASA land-use scenarios	GEA efficiency	IPCC SREX	IMAGE IPCC B1

Note: IPCC SREX and UN-water scenario process are ongoing. GEA scenarios have been completed but are expected for publication only by June 2011.

4. Endpoints

Normative "end-points" by 2030, 2050 and 2100 need to be agreed on by scenario analysts, which will serve as major identifiers of the scenario families (Table 2). At the very minimum, scenarios, which might be built with harmonized runs of a number of soft-linked models, need to cover the variables used to describe the endpoints.

Table 2 Types of "end-points" and related assumptions included in the scenarios

Types of endpoints / SD21 scenario families	**"Partial" environ-mental**	**GHG concen-trations**	**Other long-term environ-mental**	**Economic**	**Social**
Business-as-usual scenario ("Growth first")					
Dynamics-as-usual scenario ("Growth first with continued incremental improvements")					
Catch-up scenario ("Growth first with focus on catch-up development")				Yes	
Green economy scenario ("Growth with partial environmental objectives")	Yes				
Climate scenario ("UNFCCC world")		Yes			
Planetary boundaries scenario		Yes	Yes		
Development scenario ("MDG+ economy")					Yes
Sustainable development scenario ("SD21 scenario")		Yes	Yes	Yes	Yes

The list of endpoints will be agreed upon jointly by modellers and will also take into account model limitations. It should be kept as short as possible to allow for model comparability. It should be based on few variables that capture the full range of sustainable development, including economic, environmental and social dimensions. Endpoints could be described as single values for specific variables at a specific point in time (e.g. carbon emissions = XX, carbon concentrations = YY, ecological footprint=ZZ in 2050), or by ranges for these values (e.g., income disparity across regions below XX in 2050). For example, a starting point for the global environmental dimension could be the academic literature on planetary boundaries and risks (e.g., Rockström et al. 2009; Leggett, 2006).

Table 3 provides an indicative list of "end-points" to kick-start discussions. In particular, we believe that the overall timing of some of these end-points is critical and in some cases mid-term targets, such as for 2030 will be needed. This issue will be discussed in depth among the modellers.

Table 3. List of potential endpoints for discussion

	Possible target	**Comment**
"Partial" environmental	Global eco-efficiency target for resource use and pollution, based on footprint per world GDP.	"Partial" means essentially: relative decoupling, and prices reflecting externalities better. (they are not "absolute" goals)
Relative decoupling	Resource efficiency and energy efficiency of production doubled (or quadrupled) compared to historical trends (sector by sector)	Ex-post taken into account in many energy-economy-environment models
Price system	Elimination of subsidies for fossil fuels, agriculture, and fisheries	Various ways of indirect or direct modelling of such elimination used.
Investment in natural assets	One percent of GDP invested in restoration and maintenance of natural assets	
Long-term environmental		
GHG concentration in atmosphere (in CO2-eq.)	Atmospheric GHG concentration: (a) 350 ppmv (350–550 ppmv); Energy imbalance:+1 W m^{-2} (+1.0–+1.5 W m^{-2}). (b) < 450 ppmv (c) < 650 ppmv (d) GHG emissions <3t$CO_{2\text{-eq}}$. for all people on the planet by 2050	Many done by many models. Target in terms of temperature perhaps more conflictual due to uncertainty on climate sensitivity parameter. (a) Rockstroem et al. (b) UNFCCC Cancun 2011: Limit global average temperature change to 2°C above pre-industrial levels by 2100 with a probability of greater 50%. Also GEA 2011. (d) WESS 2011
Land use	Land-system change <15% of global ice-free land surface converted to cropland (15%–20%)	Rockstroem et al.
Water use	Global freshwater use: <4000 km^3 per year (4000–6000 km^3 per year)	Rockstroem et al.
Deforestation	Net deforestation (in flow) <=0 in 2050 and beyond; or: Total net forest cover lost by 2050 <= XX percent or hectares	Both flows and stocks are important.
Ocean acidification	Sustain 80% of the pre-industrial aragonite saturation state of mean surface ocean, including natural diel and seasonal variability (80%–70%).	

Biodiversity	Rate of biodiversity loss: <10 E/MSY (10–100 E/MSY); or number of identified biodiversity hotspots unaffected by land use change.	Hard to include directly in most models - land use and LUC may be the best proxies. Necessary to track at least at the regional level. (ideal = agro-ecological zone). Rockstroem et al.
Anthropogenic interference with the P and N cycles	P: < 10× (10× - 100×); N: Limit industrial and agricultural fixation of N_2 to 35 Mt N per year, which is ~ 25% of the total amount of N2 fixed per annum naturally by terrestrial ecosystems (25%–35%);	Rockstroem et al.
Stratospheric ozone depletion	<5% reduction from pre-industrial level of 290 DU (5%–10%).	
Pollution from minerals extraction	????	Not sure how this is tracked, if at all. and what are the assumptions on changes over time.
Chemical pollution	????	Probably included in very few IAMs if any . Need to identify if included in at least one model.
Regional air pollution	Critical loads of SO_x and black carbon. No country-sized "brown clowds	Take from RAINS model and European air pollution conventions.
Economic		
GDP	Inter-country differences in GDP per capita between all countries by 2100 not different from those which prevailed between OECD countries in 1990.	IPCC SRES.
Specific focus on Africa and LDCs	Africa catches up with the other developing regions (in terms of GDP per capita); or absolute goal (GDP/capita in 2050 > XX). All LDCs graduate by 2020.	To mimic the "special attention" given to Africa in JPOI, various initiatives, and the fact that most LDCs are in Africa. Anticipated for the LDC conference in 2011.
Energy use	Primary energy use: < 70GJ/cap for all people on the planet by 2050.	Energy chapter of WESS 2011
Trade	No customs tariffs by ??. NTBs reduced to xx by xx?	See WTO agenda.
Social		
Global income inequality	I90/I10 from world income distribution does not rise	
Poverty (1)	People suffering from hunger <= XX in 2050	Problem: more an issue of allocation/ distribution than production. how is that covered in IAMs ?
Poverty (2)	Absolute poverty <=XX people	Issues with definitions, PPs, measurement, etc.
Primary education	Universal access by 2050	One of the MDGs
Access to modern energy	Universal access to electricity and modern cooking fuels by 2030	GEA 2011; and Recommendation of SG's advisory group on energy can climate change
Access to drinking water and sanitation	Universal access by 2050	One of the MDGs
Population	Global population growth rate negative by 2050	
Education	Achieve universal primary education by ??	MDG
Gender	Global gender equality by xx?	MDG

Health impacts of pollution	Reduce premature deaths due to air pollution by 50 per cent by 2030. Reduce child mortality Improve maternal health Combat HIV/AIDS, malaria and other diseases	GEA 2011. MDG

The clustering of scenarios should allow for a systematic exploration of the differences in terms of policy instruments, opportunities along the trajectories, and room for manoeuvre, between the sustainable development scenario and scenarios that focus only on a subset of endpoints (the "development scenario", "climate scenario", and the "one planet" scenario. Another aspect of interest is whether different models are "able" to simulate trajectories that eventually achieve all the endpoints, – a high frequency of negative answers to that question could be interpreted as implying the need for a complete overhaul of the economic system, inasmuch as models reflect the current economic structures and implied co-evolution of variables.

5. Indicators

Here we want to cover as many dimensions relevant to international policy-making as possible (for example, GDP per capita by world region, poverty at the regional level, access to energy/energy consumption, pollution, etc.). There is a trade-off between extensive coverage and what can be said by more than one model. We already know that social indicators such as income distribution are usually not well covered by many of these models. Thus, the idea might be to have a "core" or minimal set of indicators (those would be covered by most of the participating models) and "additional" indicators covered only by a small subset of models.

For key indicators, some thresholds indicating potential tipping points should be identified beforehand and used for scenario reporting to flag when paths corresponding to specific scenarios cross one or more of these thresholds.

Table 4. Preliminary list of "core" indicators for discussion.

Economic	**Environmental**	**Social**
GDP/capita at regional level	CO2 emissions at regional level; CO2 concentrations in the atmosphere	Income distribution intra-regional (including below global poverty line)
Energy use by type at regional level	Mineral extraction volumes and associated pollution	Population suffering from hunger
Net investment flows at regional levels (public and private)	Land use / land use changes by aggregated type, GIS when possible	Population by region
Agricultural production	Release of nitrogen, phosphorus, in natural cycles	Unemployment / working time
Trade flows between regions	Fish stocks	Migration flows (region to region)
	Temperature/rainfall changes	Human development (e.g. life expectancy, literacy)
	Water use,: water scarcity (m3/capita), state of aquifers, (GIS when feasible)	Access to energy/ electricity

	Ecological footprint per region	Access to drinking water and sanitation
	Biodiversity: indirect, from GIS mapping of biodiversity hot spots and climate change, urbanization, agriculture land use change, etc.	

The full suite of different models would capture a broader range of indicators which might include, for example:

- Economic issues: development and economic growth; trade, investment, and financial flows; migration; income distribution; infrastructure; energy; R&D and intellectual property.
- Social issues: poverty and development; health; universal infrastructure services (energy access; access to sanitation and clean drinking water; transport and communication services); internal and external conflicts, human security.
- Environmental issues: resources and material flows, eco-efficiency; climate change; ocean acidification; stratospheric ozone depletion; atmospheric aerosol loading; biogeochemical flows: interference with P and N cycles; global freshwater use; land-system change; rate of biodiversity loss; chemical pollution; regional air, water and land pollution.
- Global extreme risks: tipping points of the climate system (e.g., methane release from methane clathrates; collapse of the global conveyor system; super eruptions, etc.); global health disasters; impacts of geo-engineering and other large-scale human experiments; Global military or social conflicts.

Environmental thresholds (for monitoring along the trajectories):

- CO_2 concentrations in atmosphere >>> XX
- PH oceans < XX
- Global forest cover < XX (or regional values)
- % of biodiversity hotspots affected by more than XX percent land use change

Social thresholds (for monitoring along the trajectories):

- GDP per capita decreases for more than 3 years in a row in any region
- Food calories per capita decreases for more than 3 years in a row in any region
- Unemployment rate > 1.5 time current value in any region for more than 3 years in a row

6. Policy Instruments

Policy instruments: Here the goal is to see which instruments are well covered by existing models and which are not. For those that are well covered, assess what the different models say about their usefulness in reaching the desired endpoints. Ideally, we would also like to say something about "good" combinations of many instruments. Types of policy instruments that might be considered include:

- Level: Global, regional, national, local
- Market-based vs. command-and-control

- Multi-level portfolios of instruments

Examples (for further discussion):

- *Population:* changes to family planning, immigration policies.
- *Innovation policies*
- *Technological change:* slower, more discriminating, preventative rather than end of pipe, through technology assessment and changes in the education of scientists and engineers.
- *Government expenditures*: a declining rate of increase.
- *Investment:* shift from investment in private to public goods through changes in taxation and expenditures.
- *Trade policies*
- *Labour policies:* shorter work week, more leisure through changes in compensation, work organization and standard working hours, and active market labour policies.
- *Poverty, Safety nets:* focused anti-poverty programs that address the social determinants of illness and provide more direct income support.
- *Consumption:* more public goods fewer positional (status) goods through changes in taxation and marketing.
- *Climate change policies:* green taxes, tax incentives, energy efficiency standards, feed-in tariffs, cap-and-trade, etc.
- *Environment and resources:* limits on throughput and use of space through better land use planning and habitat protection and ecological fiscal reform.

Another objective is to be explicit on how competing claims on resources are adjudicated in the model. For example, for land use, policy priorities should be made explicit regarding the competition between agriculture and forest cover; in agriculture, between food and biofuels; in food, between feed for meat and poultry, and human food consumption.

7. Guidelines for reporting on scenarios

These questions should provide a framework/ grid for reporting on the various scenarios. The goal is to ensure consistency of the reporting of results from different models, and to ensure that the areas of interest for the study are systematically covered.

1) **Feasibility of sustainable endpoint**. Is the model able to generate a transition path that reaches the "sustainable" endpoints?

2a) If No: What is the binding constraint in the model that prevents it from reaching a sustainable endpoint? How "close" to the sustainable endpoint can the model reach? Does the attempt result in a collapse of the economy, in another sudden/ non-smooth transition?

2b) If Yes:

Transition paths – description. What are the transition paths in terms of core indicators (e.g. emissions, GDP, population – see proposed list above, final list to be agreed at the meeting with

modellers)? Does the model forecasts any abrupt transition for one of the core indicators? What environmental thresholds are trespassed on the transition path, if any?

3) **Drivers of change in the model**. What in the model allows for the transition from BAU ? (e.g. technological progress, gains in energy efficiency, redistribution policies,...). Which of these are built-in exogenous parameters / endogenous parameters, which depend on policy decisions? If the latter, are political/ technical feasibility barriers relating to this area realistically addressed in the model?

4) **Macro-economic/ institutional implications**. What would be the main macro-economic (or economy-wide) consequences / prerequisites of the transitions implied by the scenario? (e.g. complete re-structuring of the electricity grid ; change in land use patterns / human density; change in production and distribution structures for some goods/ services ; changes in structure of incentives for specific sectors; etc.).

5) **Policy instruments**. What policy instruments need to be mobilized to achieve the sustainable scenario, in what intensity, in what sequence? Are some instruments necessary, sufficient? Is the timing of instruments important/ critical? Why? How are priorities set for settling competing claims on resources (e.g. land use)?

6) **Co-benefits**. Are there identifiable co-benefits in addressing goals/targets from environmental, social and economic dimensions simultaneously? How do they compare to trade-offs? (for example, with/without the MDGs).

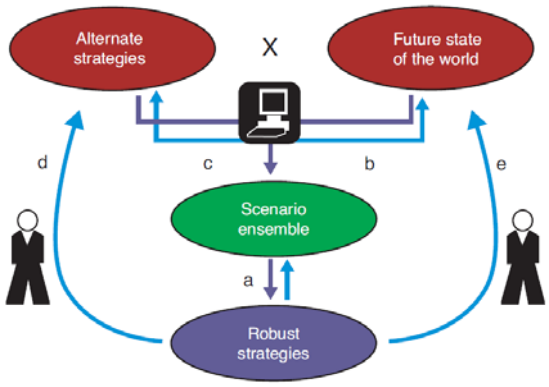
7) **Political acceptability**. What social thresholds are trespassed on the transition path, if any? For example, in a particular scenario, does GDP/capita decrease for some regions at some point? For long periods/permanently? Does unemployment go beyond XX percent? Is there a convergence or divergence of GDP across countries (in scenarios without convergence constraints).

Annex B the suggested template for reporting scenario results and assumptions, in order to ensure comparability of scenario contributions to the SD21 scenario process. It includes the following broad elements: (a) scenario storyline; (b) list of variables describing model inputs and outputs (exogenous and endogenous); (c) key model assumptions and relationships; (d) policy measures modelled.

8. Interactive scenario meta-analysis

Once a database of sustainable development scenarios is established, using the above reporting templates, it can be used for interactive scenario meta-analysis. It is anticipated that a scenario generator (meta-model) will be developed based on these scenarios. Database and scenario generator will be used to explore adaptive strategies (e.g., near-term, flexible milestones) and policy packages that are “robust” under a wide range of scenario assumptions (Figure 1). Driving forces classified in terms of a hierarchy of ImPACT identities (Waggoner and Ausubel, 2002) and investment and cost functions linked to these identities. An explorative (“what if?”), interactive (computer-human) approach will be used to rank scenarios in terms of “performance standards” and the desired “end-points” explained above. The overall aim is to identify robust, near-term measures to achieve normative goals, while allowing for “surprises” by including extreme scenarios. Potential analysis steps, as suggested by Lempert (2003) are summarized in Table 5.

Figure 1. Schematic overview of scenario meta-analysis, using computers and modellers



NOTE: Central lines (a, b, and c) represent computer calculations. Lines on the left and right of the figure (d and e) represent new information added by humans.

Source: Lempert (2003).

Table 5. Steps to find "robust" strategies.

Lempert (2003) suggests the following steps, in order to identify robust strategies:

- *Identify initial candidate robust strategies*: decision makers proposal initial strategies and ranked them by the regret approach mentioned above although the initial ranking may change as these strategies are examined with different probability weightings.
- *Identify vulnerabilities*: the clusters of future states, which candidate strategies perform poorly, are identified by statistical or sensitivity analysis, i.e. finding futures where strategies exceed satisfactory levels by using patient rule induction method (PRIM) (Friedman, Fisher 1999).
- *Suggest hedges against vulnerabilities*: alternative strategies are ranked again based on the performance of each future cluster. The ranking forms vulnerability frontiers.
- *Characterize deep uncertainties and trade-offs among strategies*: as the strategies in the trade-off curve is dependent on the vulnerable future states. Therefore, this information will be utilised to characterise deep uncertainty and to choose new candidate strategies.
- *Consider improved hedging options and surprises*: repeat these steps and consider characteristics of surprises.

Appendix A: First draft of SD21 scenario "storylines"

This Appendix provides initial ideas for "storylines" for the SD21 scenario clusters, for further discussion with modellers, including:

- Policy focuses on the economy pillar
  - Business-as-usual scenario ("Who cares?")
  - Dynamics-as-usual scenario ("Growth first!")
  - Catch-up scenario ("Growth first with catch-up")
- Policy focuses on major issues in the economic and environment pillars:
  - Green economy scenario ("Green growth")
  - Climate scenario ("IPCC world")
  - Planetary boundaries scenario ("One planet world")
- Policy focuses on the social pillar, but also takes into account selected economic and environmental issues:
  - Development scenario ("MDG+ world")
- Policy aims to integrate all sustainable development pillars:
  - Sustainable development scenario ("SD21 world")

Brown scenario family (1): Policy focuses on the economy pillar

Business-as-usual scenario ("Growth first")

The business-as-usual scenario ("Growth first") describes a future world that would result from a continuation of current policies and practices which are primarily geared toward achieving a sufficiently high levels of economic growth. It provides a conservative benchmark for comparison with the other scenario families.

It is essentially a world dominated by the "Washington consensus" characterized by privatization, limited regulation, liberalization and ever increasing globalization and regionalization. Institutional changes are driven primarily by the private sector rather than governments. No commensurate government-driven globalism or regionalism emerges. Multilateral solutions continue to be sought on selected economic and environmental issues, but in general voluntary commitments by the private sector are the main avenue taken.

The one success criteria against which economies and governments measure themselves continues to be GDP growth. The belief is that economic growth is the most efficient way of reducing poverty and addressing social objectives through the "trickle down" effect. Similarly, the belief is that economic growth itself will take care of environmental pollution and inequity (through the "Kuznets curve"), and that price signals will efficiently take care of resource scarcities.

Population follows the UN median projection.

Technology transfers result in overall improvement of technology performance, in line with user demand and preferences. Research, development and demonstration are considered as a private sector issue, and public investments are seen as unwelcome distortions of the market. Without additional government support for R&DD, overall technology change is driven strongly by technology transfer, rather than technology performance improvements. Essentially, the

performance of individual technologies is “frozen” for decades, while that of the global mix continues to improve, albeit at a slowing rate. “Green” sectors develop as they become competitive but receive no extra “push” from governments.

Renewable energy develops at the rates of the past, and fossil fuels remain the dominant. Current biofuel mandates are implemented, potentially leading to conflicts in land use. Water efficiency slowly or hardly improves, but better use is achieved through reallocation. In agriculture, global crop yields only slowly improve, mainly through re-allocation of crops across arable land.

No significant efforts are made to directly change consumption towards more sustainable patterns. Instead, governments refer to price signals to generate the most efficient consumption behaviour. The same applies to production patterns, associated pollution loads, chemical pollution and waste. In terms of nature conservation, protected land and marine areas continue to increase slowly, and there are no government-driven solutions to global fisheries management.

Global warming and resulting water scarcity, land degradation, desertification, soil erosion, and extreme weather events become increasing challenges, especially for the poor. Economic growth is seen as the optimal solution, as higher incomes are expected to make communities more resilient to these challenges.

Limited GHG mitigation efforts are being made, but no binding global post-Kyoto agreement is achieved. Efforts are mainly based on implementation of the present voluntary pledges by developed countries.

Investments in education, health, water and sanitation do not change much. Social safety nets evolve only slowly in developing countries and are limited to the formal economy. No efforts are made to mitigate income disparities between countries and regions. The resulting conflict potential is apparent, but governments justify their inaction in this respect by invoking the general need for rapid economic growth which comes at a “cost”.

There is no significant reform of the global trade system, neither in terms of social, development or environmental objectives. Some progress might be achieved in terms of tighter global investment guarantees and development of strong IPR systems in the emerging economies. There is no change in the mandates, procedures, and operations of the IMF and the multilateral development banks. ODA flows are gradually reduced in line with higher incomes in developing countries.

Dynamics-as-usual scenario (“Keep it up!”)

The dynamics-as-usual scenario (“Growth first!”) describes a future world that results from a continuation of incremental progress, in line with historical patterns and trends. It is the closest to a future “projection”. It provides a less conservative and more dynamic benchmark than BAU for comparison with the other scenario families. In line with current trends, economic growth remains the top policy priority in most countries, but an increasing number of social and environmental issues are increasingly taken seriously and are being addressed within the given growth-focussed paradigm. This will also be reflected in an increasingly complex and wide ranging system of regional and global institutions.

Incremental technology progress proceeds in line with historical patterns, including in terms of eco-efficiency. This is achieved with ever increasing public commitments and investments, as gaps become increasingly evident. As a result, “green” sectors are supported by governments and develop faster than other sectors, but do not receive support commensurate with the social and environmental efforts. Many of the planetary boundaries, including in terms of climate change, are expected to be breached. Irreversible environmental events and social strife are of increasing concern. Governments focus on crisis response rather than structural change. More extreme

scenario variants might also be explored where governments react massively in the face of environmental disaster or social conflicts. For example, a collapse of the global thermohaline circulation might trigger large-scale geo-engineering, migration flows, and military conflicts.

There are only isolated national examples of systematic, direct efforts to change consumption patterns by mid-century. Instead, policy makers rely primarily on price signals to impact consumer behaviour, but prices remain too low to achieve eco-efficiency changes commensurate with the challenges, in view of the successful lobbying efforts of special interest groups and strategic gaming behaviour of market actors.

Pollution loads by industry continue past trends, including for pollution from toxic chemicals. Transfer of chemical and electronic waste to developing countries is progressively restricted to reflect stricter regulations or enforcement in some regions.

Protected land areas continue to increase slowly, as well as marine protected areas. No global management of fisheries is reached. Limited effort is made on climate (continuing the increase in voluntary emissions reductions), reflecting lack of a binding multilateral agreement post Kyoto.

Renewable energy diffuses slowly into the global primary energy mix, with large differences among countries. Until at least the mid 21st century, fossil fuels remain the dominant energy source. Governments fully implement the present biofuels mandates for 2020-2025, but thereafter there is potentially a significant backlash, in view of ensuing land conflicts and rising food prices. Progress toward universal access to electricity and modern cooking fuels continues, but its pace differs greatly among countries. Global universal access is not achieved before the end of the 21st century. Energy efficiency, water efficiency, and crop yields continue to improve as per past trends.

Population follows the UN median projection.

Public investments in education, health, water and sanitation tend to increase in today's developing countries, and especially emerging economies, but are gradually reduced in today's developed countries. Social safety nets in developing countries evolve slowly towards increased coverage, but remain limited to the formal economy, whereas the coverage is gradually reduced in today's developed countries. There are no special efforts to reduce income disparities between countries or within countries. The trade, IPR, and investment and financial systems, including ODA flows follow the assumptions in the business-as-usual scenario.

Catch-up scenario ("Growth first with catch-up")

The catch-up scenario ("Growth first with catch-up") describes a future world which continues to focus on economic growth as the primary objective, but makes special efforts to achieve catch-up economic growth in the Least Developed Countries, especially in Africa. The world witnesses a formidable catch-up growth, essentially assuming a replication of the East Asian experience and development model since 1980 across the world. By the end of the 21st century, differences in GDP per capita between countries worldwide will be similar to the prevailing such differences between OECD countries today. This leads to much lower differences in incomes across countries, but large intra-country differences with significant conflict potential. In the short term (e.g. to 2030), income disparities across world regions do not increase, and that the least developed countries reach a threshold level for GDP per capita. In the longer run (2100), there is a slow convergence of aggregate incomes across the globe.

Over the course of the 21st century, these developments puts even more pressure on the global resource base, surpassing local and regional critical loads and breaching the planetary boundaries. This exacerbates intra-country differences even further, but does not lead to a significant change of course. The solution is economic growth and (where necessary) migration. While the marker

scenario assumes a "muddling-through" the social and environmental challenges, a more extreme scenario variant will be explored in which irreversible and dramatic changes are triggered in the biophysical system that lead to social and political strife in many parts of the world.

The catch-up scenario family will provide a perspective on proposals for a significant an conscious effort to put macroeconomic policies in place that would lead to long-term convergence in per capita incomes between developed and developing countries. Macro-economic tools explored include increased ODA, preferential trade treatment for developing countries, and incentives for private investment in developing regions. The particular combination of such instruments might be idiosyncratic to scenario variants in this family.

In contrast to the "development scenario"-family, the catch-up scenario family assumes no additional efforts to achieve and sustain MGD-style goals and or to implement them on the micro-level, nor are social issues at the forefront of government policy. There are no additional efforts to mitigate GHG emissions beyond the current trends. The limited efforts are based on voluntary commitments and market-based carbon finance, which reflect a stalemate in international climate change negotiations. Other planetary boundaries are not addressed at all, as they are seen as "unfair green protectionism" and ideological constraints on economic growth aspirations of poor countries. In particular, renewable energy diffuses into the global market at the current slow rate, driven mainly technology cost and performance factors.

Green scenario family (2): Policy focuses on major issues in the economic and environment pillars

Green economy scenario ("Green growth")

The green economy scenario ("Green growth") describes a future world which focuses on growth and (partial) environmental objectives. Economic instruments are the preferred means to achieve policy objectives which are increasingly framed in terms of eco-efficiency, in particular through "getting-prices-right" and additional public investments for clean technologies.

One variant of this scenario family will explore the normative path suggested by the UNEP's Green Economy Report, published in 2011. The scenario follows dynamics-as-usual in a wide range of variables, but goes further in terms of a number of selected environmental targets. The primary means to achieve the envisaged environmental goals are economic and market instruments, in order to "get prices right", i.e., to fully account for environmental externalities.

The green economy scenario emphasizes the potential for additional public investment devoted to speeding-up deployment of renewables, improvements in energy efficiency, resource efficiency, and pollution abatement in all sectors and all countries. Additional public investments in natural assets lead to more rapid increases in agricultural yields, and a significant increase in the surface covered by protected terrestrial and marine areas. Changes in greenhouse gas emissions and other pollutants are assumed to be achieved through market-based incentives, including a moderate price of carbon, reflecting regional GHG markets rather than a science-based global agreement on climate. One scenario variant might also explore the impacts of a global carbon tax regime. Similarly, changes in forest cover result from market arbitrage reflecting changed prices that incorporate a price for carbon.

Coordination is achieved with respect to the management of fish stocks, but a number of planetary boundaries are expected to be breached.

There are no significant efforts made to limit the world population increase, nor to directly interfere with consumption patterns. Governments rely mostly on price signals to direct consumption behaviours, pricing out lower income groups but hardly impacting consumption patterns of the rich. There are also no significant, direct efforts made to reduce income disparities

between countries and regions. There are no significant, direct efforts made to achieve major social objectives other than those related to energy and water, reflecting the assumption that improved resource efficiency and investment in natural assets will automatically generate welfare gains for the poor. In particular, international institutions governing financial and capital markets as well as trade are not significantly reformed.

The main emphasis of governments is on technology and market-based incentives. Due to increased investments, improvements in energy and resource efficiency are faster than the most recent trends since 1990. Most of the new financial incentives benefit modern renewable energy. In particular, current mandates for biofuels are fully implemented and new mandates are taken in emerging regions. There is a push for faster universal modern cooking fuels in developing regions through ODA and contributions of private and NGO sectors.

Climate scenario ("IPCC world")

The climate scenario ("IPCC world") describes a future world that considers climate change as the most important threat to humanity and takes decisive action in terms of mitigation and adaptation. Other objectives, such as development, are replaced or increasingly formulated in terms of the climate policy goals.

The scenario family reflects a focus on climate change and other planetary limits as the main threats to the pursuit of current dynamics. While economic growth is still given priority, serious coordinated efforts are made to curb greenhouse gas emissions to achieve scientifically recommended targets (e.g. 350 ppmv, 450 ppmv, and 550 ppmv), through the whole range of possible policies, technologies, and regulations. The mix of instruments to achieve environmental objectives and their timings in this century are determined on a least-cost basis, in contrast to the Green Economy scenario. Only few environmental limits are exceeded in the long term by 2100.

The efforts to mitigate climate change and limit pollution take precedence over social goals. There are no specific efforts made to reduce disparities in per capita income across countries and regions. There are no additional efforts made to achieve MDGs or to sustain them is the future. One variant will explore a climate constrained world in which full catch-up growth of developing countries is achieved by the end of the 21st century.

Planetary boundaries scenario ("One planet world")

The Planetary boundaries scenario ("One planet world") describes a future world that emphasizes action to ensure that humanity develops within a range of planetary boundaries (with climate change constituting one of them) to avoid global environmental collapse. It is essentially a variation of the IPCC world which, however, aims to address all the "planetary boundaries" described in Rockstroem et al. (xx).

Yellow scenario family (3): Policy focuses on the social pillar, but also takes into account selected economic and environmental issues

Development scenario ("MDG+ world")

The development scenario ("MDG+ world") describes a future world that emphasizes poverty reduction initiatives that primarily address social, education and health goals, but also take into account selected economic and environmental issues.

The scenario family reflects a strong commitment by the international community to achieve MDG-related goals relating to basic access to energy, water and sanitation, services, education, and health and sustain them over the long term. Such social goals are given top priority together

with economic growth. However, no specific efforts are made to reduce disparities in per capita income across countries and regions. Environmental goals are not explicitly pursued further than the current trends suggest, reflecting a failure to achieve coordinated agreements on greenhouse gases and management of other global commons. In the long term (2100), poverty is "eradicated", social outcomes at the micro level are considerably improved, potentially at the price of largely exceeding human demand on natural sources and sinks. Possibly, the least developed countries reach a threshold level for GDP per capita. In the longer run (2100), there is a slow convergence of aggregate incomes across the globe.

Rainbow scenario family (4): Policy aims to integrate all sustainable development pillars

Sustainable development scenario ("SD 21 world")

The sustainable development scenario describes a future world in which policy follows an integrated approach to economic, social and environmental goals, and major institutional change, with the overall goal of development that "meets the needs of the present without compromising the ability of future generations to meet their own needs".

The scenario family reflects an integrated focus on the three pillars of sustainable development, as well as an explicit integration of planetary limits to ecosystems capacity. Conscious efforts are made by the international community to achieve and sustain MDGs-related goals relating to basic access to services, education, and health, and to reduce aggregate income disparities across regions in the long term. Coordinated efforts are made to curb greenhouse gas emissions in order to achieve scientifically recommended targets (e.g. 350 ppm), through the whole range of possible policies, technologies and regulations. In the long term (2100), sustainable development is achieved in the sense that all regions are developed, poverty is eradicated, and the demand on natural sources and sinks does not exceed their regeneration capacity.

This scenario implies new economic structures, different allocation of capital and investment among public and private sectors, cooperative management of the commons at the global and national levels. By the end of the 21st century, differences in GDP per capita between countries worldwide will be similar to the prevailing such differences between OECD countries today. This leads to much lower differences in incomes across countries, as well as conscious efforts to limit intra-country income differences, and thus significantly lower conflict potential. Possibly, in this scenario the 500 million richest people, regardless in which developing or developed country they live, take a leading role in changing their consumption pattern and contribute resources to eradicate poverty. The high willingness to pay for technology performance by these "rich" leads to accelerated technology change toward cleaner clusters that are thereafter gradually adopted by lower income groups.

Scenario variants will explore various combinations of policies to reach long-term sustainable endpoints, and look at their (relative) timings. This cluster should also inform the possible modes for, as well as the feasibility of, a "great transition".

Appendix B: Suggested template for reporting scenario results and assumptions

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Appendix C: Overview of studies in the SD21 project

This Annex provides a brief overview of the proposed outline of the SD21 study which is the main output of the project "Sustainable development in the 21st century (SD21)". Under the project, nine work packages or background studies will be carried out which will feed into the SD21 study as follows. The scenario activity described in the present concept note primarily contributes to studies 4 and 7.

Outline of SD21 report	Background studies feeding into the report
Chapter 1: Progress in implementation of Agenda 21 and JPOI	
Progress on the three pillars	
Coherence: Integration of the three pillars	
Implementation of sustainable development commitments	
International level	Study 1
National level	
Emerging issues since Rio	Study 1 and 2
Focus on sectoral clusters	Study 3 Study 8
Chapter 2: Envisioning sustainable development in the 21st century	
What are the conditions that must be respected for long-term sustainability?	Study 4
Sustainable futures: what are the outlines of societies that meet the conditions?	
How to manage a sustainable economy?	
Institutions for a sustainable world: beyond market and state	Study 5
Changes in values	
Chapter 3: Paths to and policy options for sustainable development	
Envisioning the transition: possible paths	Study 4
Green economy and green growth: policy options and institutions for the transition	
Options relevant to different groups of countries	Study 7, as well as Green Economy report, TEEB, OECD Green Growth report, Study 8, and results from studies done by the Green Economy Coalition
International level	Study 6, Study 8
Building on ongoing initiatives (10YFP on SCP) to speed up the transition	Study 9
Chapter 4: International sustainable development governance	
The present	
Introduction: The Rio principles 20 years later	Study 1
International economic governance	
Environmental governance	Study 6
International standards	
Voluntary practices	
Conclusion: remaining gaps	
The future	
Long-term: international institutions for a sustainable world	Study 5
Medium term: reforming institutions to support the transition	Study 5 and 6.

In addition to quantitative and qualitative modelling work, eight other background studies will be carried out on topics that are not well covered by existing and ongoing work. Material from these papers will be used in different parts of the report, in particular chapters 1 (assessment of the past), 3 (paths and policy options), and 4 (SD governance). This will ensure that the report sends consistent messages on specific issues (e.g. management of global commons).

Study 1: Progress in implementation of Agenda 21 and JPOI

This study will comprise two parts. The first part will take a deeper look at the arguments developed in the SG's report prepared by UN-DESA for the first Preparatory Committee. It will use statistical data, in particular those collected under the work on MDG indicators, to examine how countries have fared along the three dimensions of sustainable development. The study will also aim to identify clusters of countries grouped according to their progress with respect to the 3 pillars. The second part of the study will examine progress made on the implementation of sustainable development commitments at the international, regional, and national. It will systematically review the commitments made in Agenda 21 and the JPOI, including the Rio principles, and assess the extent to which those have been delivered. It will also highlight key constraints existing in national, international levels and key players (including business), changes that could help overcoming these constraints.

Study 2: National sustainable development governance

This study will examine progress made in governance relating to the implementation of sustainable development at the national level. It will aim to produce a typology of countries according to their strategic frameworks for macroeconomic planning, budgeting, institutional coordination and public participation in relation to sustainable development objectives, in particular poverty eradication, management of natural resources, sustainable consumption and production, and contribution to the management of global commons including climate change. It will also review how specific institutional structures at the national level are conducive to the implementation of the Rio principles, in particular the polluter pays principle and the precautionary principle. Strengths and weaknesses of the various arrangements identified in the study in delivering these objectives will be analyzed. Options to ensure better sectoral coordination, to accelerate the shift to sustainable practices, and to ensure participation of citizens in governance will be provided.

Study 3: Emerging issues for sustainable development

The study will take stock of the status of the most important emerging issues, i.e. issues having emerged since the Rio Summit or having become more prominent on the international agenda. It will assess the importance of those issues according to a range of criteria such as the impact on poverty and human development indicators, the impacts on the environment, the number of people negatively affected, etc. The study will also assess how international institutions have performed in addressing those challenges and suggest ways in which global responses could be improved, with an integrated perspective in mind.

Study 4: Global and regional scenarios for the long term and for transition paths

This study will produce scenarios for a sustainable economy in the medium to very long term and examine possible transition paths from the present to 2030, 2050 and 2100. The scenarios will be based on a global, regionally disaggregated model, informed by qualitative assessment. The long-term states of the world will be determined by sustainability conditions based on the latest knowledge in terms of global limits (for example, planetary boundaries as defined in the article by Rockstrom et al. in Nature in 2009), including in particular CO_2 and other greenhouse gas emissions. They will to the extent possible be designed to be comparable with other prospective exercises done by the International Energy Agency, the IPCC, and other recent global

assessments. Results for the future will be presented in terms of macro-economic variables such as GDP, inter-regional financial flows, employment, human development, food production, energy generation, forest cover, and CO_2 emissions. Transition paths will be highlighted in terms of their implications for variables having direct relevance to policy such as energy production and consumption, financial transfers between regions, trade, income distribution within regions, land use and pollution outcomes at the regional level.

Study 5: Managing a sustainable economy

This study aims to provide a long-term reference framework for a sustainable society. The study will examine macro-economic strategies and tools to manage an economy that respects sustainability conditions, as reflected in Study 4 (e.g. in some of the scenarios, an economy with non-increasing material footprints and throughput). The study will consider questions such as: the nature of investment and its allocation between the public and private sectors; employment and other social outcomes; institutional set-ups to promote and encourage sustainable outcomes (including market and non-market incentives, choice editing, and use of information); institutions to promote inclusiveness, participation and better management of common goods; and institutions geared to human development, in particular education, awareness of sustainable development. The study will produce concrete recommendations in terms of functions that institutions at the national level should deliver in a sustainable economy. It will also consider the functions that international institutions should deliver in order to support such national institutions, and illustrate the gaps between those functions and those delivered by the current set of international institutions.

Study 6: Change in international institutions for a sustainable 21st century

This study will examine how international institutions could be transformed in order to remove barriers identified under study 8 and enable and support the transition to a sustainable economy, as described in study 3 and study 5. The study will identify key functions that are not delivered adequately by existing institutions (including UN institutions), including to deal with emerging issues and implement the Rio principles. The study will also suggest ways of having these functions delivered (e.g. by reforming existing institutions or by restructuring the international architecture). Included in the scope of the study will be: (a) Trade institutions and intellectual property rights; (b) Environmental governance institutions, including carbon markets and other price mechanisms for environmental services; (c) International standards (e.g. ISO 14000, ISO 26000, labour standards, environmental and social accounting standards, organic standards for agriculture, other environmental standards); (d) Official development assistance: lending framework of multilateral and bilateral financing institutions; (e) Global financial and capital market regulations; (f) Voluntary practices (e.g. CSER, environmental and social reporting, Fair trade).

Study 7: Menus of policy options for the transition to a sustainable economy at the national level

This study will aim to provide feasible and attractive menus of policy options for developing countries at different levels of development. The study will consider several groups of countries according to development level and sources of growth (natural resource versus non-natural resource driven) and provide feasible policy options that can facilitate the transition to a green economy. The study will thus complement existing work, in particular, UNEP's forthcoming Green Economy report, lessons learnt from its Green Economy Advisory Services, the OECD Interim Report on Green Growth Strategy (OECD, 2010), and others, which provide menus of policy options suited for developed countries. The study will include a sample of 5 countries reflecting different stages of development, regions and priorities. It will be based on a combination of quantitative and qualitative participatory research. Quantitative research analyzing the macro-economic impacts of green policy options (e.g. carbon taxes, green energy

subsidies) will be mobilized. The quantitative assessments will be complemented by desk research as well as in-country interviews with key decision-makers and representatives from government, civil society and industry to identify common views on priorities for green policies. Depending on timing, the study will also incorporate early results from work being undertaken by the Green Economy Coalition, which aims to hold national stakeholder workshops to identify realistic and feasible options for transitioning to a green economy in developing countries.

Study 8: Focus on challenges and risks in sectoral clusters

The study will aim to identify the risks and challenges of a shift to a "green economy", with an emphasis on developing countries. The study will aim to address concerns expressed by Member States at the first Prepcom for UNCSD, which have been presented above. The study will consider 5 sectoral clusters, as enumerated in footnote 6 above: Cities, buildings, and transport; Agriculture, water, and forests; Industry and waste management; Energy; Fisheries and tourism. For each group, an assessment will be made of the impacts on sustainability of the main changes having affected the sector in the past two decades, looking in particular at social impacts along supply chains, trade impacts, access to financing and capital, technology, and impacts on poverty eradication, other MDGs and human development indicators.[4] The study will also examine the main barriers and the actors involved at different geographical levels. The study will then assess the challenges and risks to developing countries of transitions such as those outlined in the UNEP and OECD reports in terms of: impacts on poverty and livelihoods; impacts on trade; impacts on competitiveness; need for resources to implement green policies and ways to mobilize those resources; needs in terms of national capacity building, knowledge sharing, and technology access and transfer; and criteria for the delivery of official development aid.

Study 9: The relationship between the 10YFP on SCP and Green economy

This study will examine how the 10YFP on SCP can support a transition to a green economy, region by region. It will also propose ways by which the contributions of business and civil society could be fully mobilized to accelerate the transition to sustainable development, and identify complementary measures that could be adopted under Green Growth or Green Economy programmes to strengthen the impacts of the 10YFP on SCP.

[4] Some of what has happened in these sectors might already entail "green" policies and practices.