



# Future Scenarios

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Report on the cross-scalar social-ecological scenarios of the  
Guiana Shield



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## Executive Summary

This report centres on the use of scenarios in a cross-scalar analysis to help build shared understandings of potential futures. Scenarios can be used to compare the current state of a system with a number of prospective futures and provide a way for communities and other stakeholders to see how different interventions or activities may impact on people and the environment. Within the COBRA project, scenarios allow for the comparison of a wide range of international, national and local futures with a range of existing and emerging community-owned solutions.

In order to assess the relevance and potential impact of large scale scenarios, to the realities of the indigenous communities living in the Guiana Shield, we first undertook a comprehensive review of international and regional scenario studies and used a participatory consensus process to select a sub-set of these scenarios for further analysis. We then organised a participatory scenario workshop at the national level in Guyana and another with the COBRA case study indigenous community in the North Rupununi. The results from this local level workshop were then transformed into photostories and films and taken to wider community members for discussion and feedback. The different scales of scenarios were then used for a cross-scalar analysis. The cross-scalar analysis involved comparing and contrasting the selected scenarios at international, regional, national and local scales, in order to identify plausible multi-scalar scenarios and understand how they interact.

In order to be able to compare and contrast the scenarios from the different levels, we first identified the key drivers of change underlying each scenario and then classified these key drivers of change into overarching themes and scales through an iterative process. Once a final classification of drivers was agreed upon, information was synthesised into one single matrix. This then allowed the classification of the scenarios according to the major overarching themes to identify the synergies and conflicts. The conclusions drawn from this show that there is a clear disarticulation between the local-national scales on the one side, whose focus is primarily on governance and transparency issues, and the regional-global scales on the other side, focusing more on policies, attitudes and approaches to different key areas (e.g. environment, society, markets, technology). This reveals a contrast in scales between policy and practice. To bridge the gap, mechanisms focusing on governance issues at local-national scales have to be developed at regional/global scales.

Our analysis of international, regional, national and local scenario sets has also provided some useful insights that are relevant to decisions being made today. For example, there is a juxtaposition between national and higher scales focus on schemes such as Payments for Ecosystem Services, including REDD+, as potential pathways to a 'green economy', and the lack of this vision in any of the local communities' scenarios. We see good governance cited as prerequisite for any form of effective social-ecological management, yet past trends and the current political situation in the Guiana Shield does not provide optimism for positive future outcomes. Local communities as key stakeholders, and the potential of grassroots movements to make significant changes, do not feature in any of the scenarios except those created at the local scale. An overarching outcome of the analysis is the almost exclusive focus in global, regional and national scenarios on drivers responsive to short-term

intervention, such as economic patterns, technology, demographics and institutions, with little discussion of those drivers that shape society and the human experience, identified at the local level, and which will define the boundaries for change and the future.

The aim of this phase of the research was to identify a range of possible future scenarios with regards to the social-ecological systems at the international, regional, national and local community levels, and to compile and prioritise a range of win-win, win-lose and lose-lose options for local communities from among the different scenarios. This information can now be used to compare the current situation for local communities to potential futures in order to identify ideal actions initiated at community level which will avoid moving the current situation towards conflictual/worst-case scenarios, but instead maximises the chances of achieving positive synergistic outcomes.

## 1. Introduction

### 1.1 What are scenarios?

Scenarios are stories of what might be (Nemarundwe et al., 2003). They can help build a shared understanding of potential futures and allow communities and other stakeholders to engage with how interventions or activities may impact on people and the environment. In their simplest form, they can be a vision for the future and then by comparing potential futures to current state of the system, pathways can be developed to reach optimal outcomes.

Scenarios are generally one of two types: (a) future developments - a description of a future course of events, sequence of developments, often highlighting key events, decisions, or turning points (future history) or (b) future states - images of the future emphasising the final state, describing a future set of circumstances, a portrait of the state of affairs (at a specified date or period) (de Vries, 2006; de Vries and Petersen, 2009). In addition, scenarios can be either exploratory or normative; that is, they can produce images of expected futures or desired futures (Wollenberg et al., 2000):

- the exploratory (or eventualities) mode of thinking is characterised by an openness to several possible events and different developments. The strategic purpose is to be better prepared to handle emerging situations with the idea that it is impossible to predict what will actually happen. Exploratory scenarios respond to the question: *"What do you think the future might be?"*
- the normative (or visionary) mode of thinking envisages how society or some sector or activity could be designed in a better way than its present mode of functioning. This mode of thinking suggests solutions to fundamental societal problems by taking normative goals into account and exploring the paths leading to these goals. Normative scenarios respond to the question: *"What kind of future would you like to see?"*

However, in practice it can be difficult to clearly distinguish between what-if scenarios and exploratory scenarios, and many actual scenario studies do not belong to just one of the categories presented above but could be labelled as 'hybrids'. For example, the IPCC scenarios (see Section 2) are an example of a complex approach covering exploratory and normative elements (as well as predictive forecasting / modelling) and using both quantitative and qualitative approaches. Another possibility of mixing the two modes of thinking is where exploratory scenarios are defined first, and then this is followed by a discussion by participants on which of the alternative futures they prefer.

It is also important to create scenarios that reflect the actual non-linear complexity of the real world (Spangenberg, 2006). Many scenarios fail because they are a simple projection of current trajectories into the future, however, the nature inter-linked social-ecological systems is often characterised by sudden discontinuities and radical transformations that take society by surprise e.g. 11<sup>th</sup> September 2001 terrorist attack in New York. These unpredictable kinds of local events can lead to larger-scale, even global, consequences that can last for decades and beyond. Although it is impossible to predict the exact nature of these 'surprise' events



and their exact consequences, there is a need to have a deep understanding of the social and ecological context, and their dynamic inter-relations, in the development of scenarios.

### 1.2 Why use scenarios?

Considering that scenarios explore not only the implications of particular developments but also paths that might lead us to particular outcomes (desirable or not), they offer us understandings that are relevant to decisions being made today. Scenarios can inform action and give hope by providing insights into the scope of the possible. Ultimately, the use of scenarios can provide better policy or decision support and stimulate engagement in the process of change. This can come about through scenarios as a vehicle for recognising the 'weak signals' of change, preparing for 'living the future' in advance, challenging mind-sets, raising awareness, testing strategies for robustness using 'what-if' questions, presenting a common language and stimulating discussion and creative thinking (Ogilvy, 2011).

### 1.3 Scenario construction

Scenarios can be created for any geographic or temporal scale, can include both quantitative and qualitative representations and can be developed in very participatory or more 'expert-driven' approaches. Nevertheless, in general there are five basic steps used in most scenario studies (after Goeminne and Mutombo, 2007):

1. Decision focus: Identify the focal issue or decision: What are the central concerns and key issues of the users of the scenarios?
2. Key factors: Identify the driving forces that are likely to have the most important influences on these central concerns of the future. This would involve brainstorming a list of key internal and external factors and selecting the most critical ones which then form the basis of the scenario logics. This assessment is based on both the level of impact of the key factors and the uncertainty regarding their outcome. General categories, such as the STEEPV (social, technological, economic, environmental, political, values) could be used to help identify possible forces and trends.
3. Pre-determined elements and uncertainties: Which of these driving forces seem pre-determined and inevitable and which are the factors which seem likely to change the direction of the scenarios? The predetermined trends are common across all scenarios, but it is the critical uncertainties which are used to build credible alternative visions of what the future may hold. Important key factors with a low uncertainty (inevitable or pre-determined factors) should be reflected, implicitly or explicitly, in each of the scenario logics. For example, any set of scenarios about global development issues should deal with climate change, although this might assume a different shape or priority depending on political, regulatory and technological factors. New forces (value systems, ecological impacts etc.) that are both very important and very uncertain are crucial for the nature and direction the scenarios take; the most important will form the backbone of the scenarios.

4. Selecting the scenario logics (or scenario plots): Ranking of the drivers by their importance and their uncertainty and identifying two or three critical factors of the central themes of the scenarios. These four scenario logics; one in each quadrant of the scenario matrix.
5. Fleshing out. Elaborating the basic scenario logics into full-fledged scenarios. This is often done in the form of narratives that present a plausible sequence of events. While the two or three most critical driving forces shape the basic scenario logics, the other significant factors, identified in the developing phase, can be used to enrich the scenarios. Each of the key factors and trends should be given some attention in at least one scenario; some, including the inevitable or pre-determined factors are likely to show up in all the plots. In this way, the complexity that was squeezed out in whittling an infinite number of possible futures down to just a few basic scenario logics can be brought back in by posing the question: "What is the value of this factor in each of the four quadrants of the matrix?" Constantly making linkages and interactions between the drivers that comprise the entirety of the system under study is also important. For example, in the development of the Millennium Ecosystem Assessment scenarios (see Section 2.1.2.1) all possible links (direct links, feedback loops etc.) between direct and indirect drivers, ecosystems and human well-being were kept in mind (and checked) throughout the scenario development process. This also ensured the integration of ecological, cultural and other dimensions (demographic, economic, technological).

#### 1.4 Scenario use within the COBRA project

The overall aim of the COBRA project is to establish *how community-owned solutions for the management of natural resources have the potential to act as showcases for the world in determining the most effective and efficient use of emerging funding streams in order to maximise social justice and ecological sustainability*. In order to do this, it is essential to prepare an evaluation of community-owned solutions with respect to a range of potential future scenarios. There are community-owned solutions practised and planned by communities which may only be viable within specific local, national and international circumstances. Therefore, the aim of using scenarios is to surface a wide range of international, national and local futures and then compare their compatibilities with a range of existing and emerging community-owned solutions.

For example, developments at local level, including extreme weather events, such as flooding or drought, will have implications for the evolution of national and international policy, while at the other end of the scale, international policy developments, for example affecting the repartition of natural resources, will have an impact on local livelihoods. Considering the relatively intact status of the Guiana Shield ecosystems, there are still many possible directions in which the region could develop. Large and small scale mining, logging and agricultural activities that have been rolled out in the region over the past decades could infer possible future directions. In contrast, international policies directed towards better protection of forests and other natural resources, such as Payments for Ecosystem Services schemes, may potentially drive us away from large scale exploitation of the region's natural resources. These are the two extreme visions of the future which regional, national and

international decision-makers are contending with. Working through these extreme scenarios would enable decision-makers to identify potential losers and winners (including non-human actors), and therefore develop more appropriate strategies.

The scenarios described in Figure 1 for example, present four hypothetical but plausible future realities that the communities in the Guiana Shield region may face.

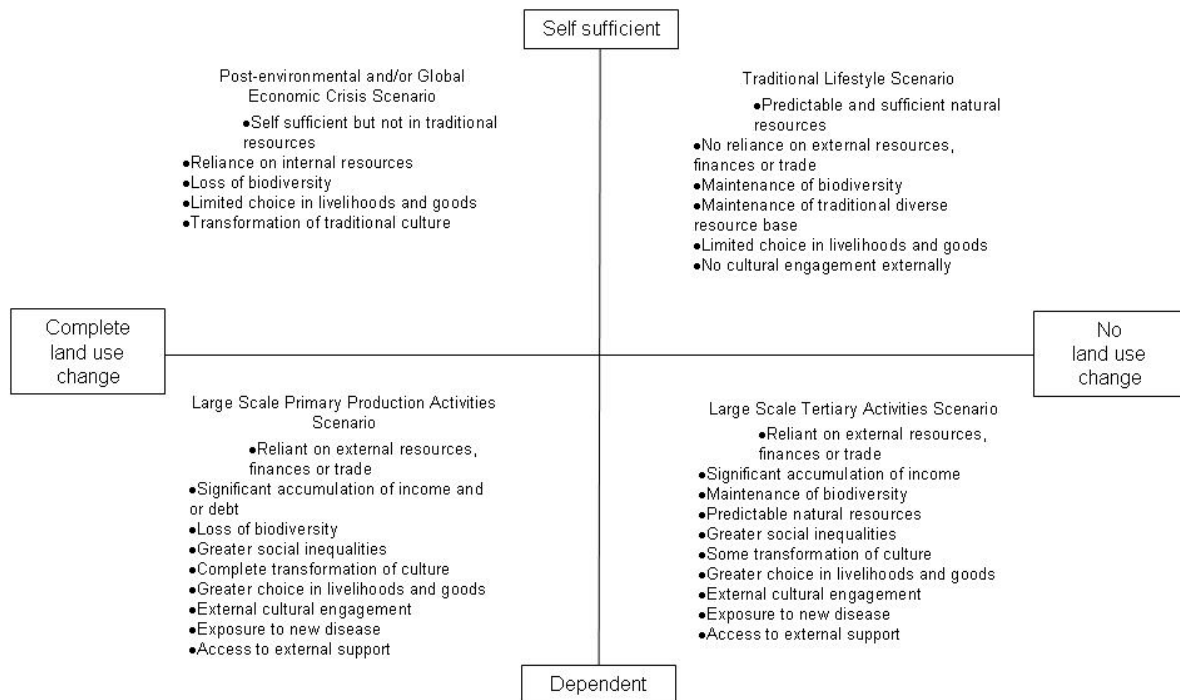


Figure 1. Hypothetical future scenarios facing communities within the Guiana Shield

These scenarios are separated along two distinct axes. The first describes a continuum between a completely self-sufficient community which is solely reliant on local natural resources, at one end of the axis, whilst at the other end is complete dependency for food and income from outside the region. The second axis describes the situation between no land use change at one end and complete land use change at the other. Land use change could occur as a result of agricultural or industrial development, logging, climate change or natural disasters. A typical Traditional Lifestyle scenario is one of a village community relying on subsistence farming and hunting without contact with external markets or funding. The Large Scale Tertiary Activities scenario could be one where the entire community is involved in sustainable eco-tourism using the natural resource base as a visitor attraction. The community is completely reliant on external trade and does not farm or hunt resources from their immediate environment. The Large Scale Primary Production Activities scenario would describe a situation where large scale, commercial agriculture, logging, industry or mining has transformed the landscape. All members of the community would be employed by these

commercial organisations and therefore would be solely reliant on external trade and commerce. The Post-environmental and/or Global Economic Crisis Scenario describes a situation after a major environmental change such as a hurricane or climate change. This would result in a complete transformation of the traditional resource base but without external support and/or reliance. Alternatively a collapse in the global economy or external trade could also result in this scenario developing. The above is a simple example of a range of scenarios that could play out in the Guiana Shield.

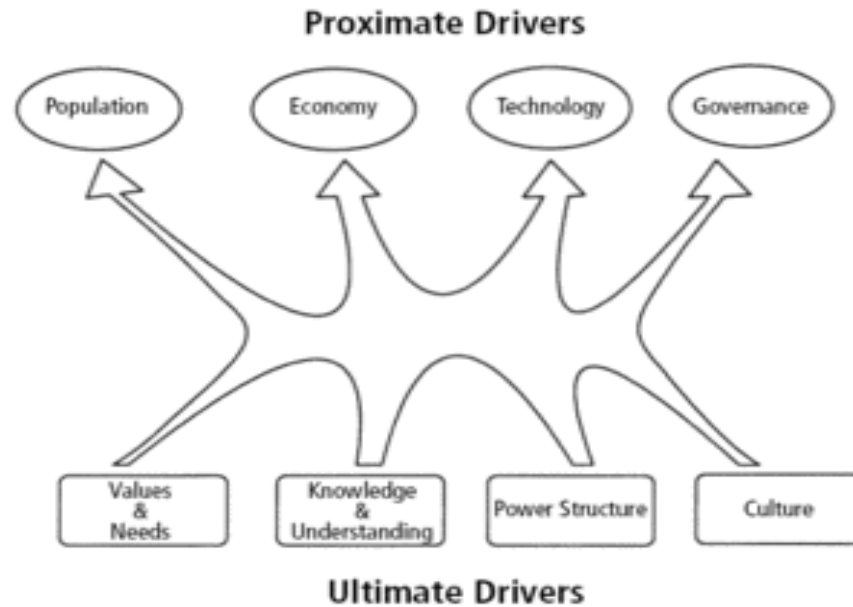
Another important use of the scenarios is linked to COBRA's participatory action research approach (PAR)<sup>1</sup>. A PAR methodology to engages a range of end-users in the research process right from the start, builds social capital of the participants and allows reflection and adaption while the research is being undertaken (Kindon et al., 2007). We will be involving different stakeholders in the process of scenario development and analysis with the objective of identifying where people imagine or want to arrive to in the future and how they can plan their journeys. This addresses Swart et al. (2004, p.143) assertion that:

*“scenario analysis in the context of sustainability science has a potentially important role to play with regard to the increasing demand for more public and stakeholder involvement in the scientific activities, driven by a complex mix of factors, including increased public distrust of expert-driven decision making, growing awareness of a diversity of opinions in the scientific community, and increased sophistication of NGO, private sector and public involvement in regulatory and other decision-making fora. These evolving dimensions of the policy–science interface suggest that participatory forms of scenario analysis could be particularly effective in addressing the strategic and normative elements of the sustainability questions by incorporating values and preferences into the scenario analysis process itself”.*

At the same time, we are aware of the varying 'mental models' of different participants engage in our scenario process (Spangenberg, 2006), and with this in mind, analyse their various contributions in detail in order to distinguish between 'ultimate drivers' and 'proximate drivers' of change (see Figure 2).

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<sup>1</sup> See <http://projectcobra.org/participatory-action-research> for more about the participatory action research approach in COBRA



*Figure 2. Proximate and ultimate drivers used in scenarios (from Goeminne and Mutombo, 2007)*

Whereas proximate drivers are the focus of mainstream development policies (where strategies are based on the direct levers of change that can influence economic patterns, technology, demographics and institutions), ultimate drivers concentrate on the root causes that shape society and the human experience and could fundamentally change society. These ultimate drivers include values, understanding, power and culture. Proximate drivers are responsive to short-term intervention, whereas the more stable ultimate drivers are subject to gradual cultural and political processes, defining boundaries for change and the future.

In addition, we take a social-ecological systems approach (Berkes et al., 2003), recognising the deep links between ecological and socio-cultural systems, the nestedness of these systems, and the inherent complexity and non-linearity of processes. As such, allowing participants at each scale to articulate their views and opinions while at the same time linking scenarios between different scales is central to our research. Following from Zurek and Henrichs (2007), our approach to linking scenarios across scales was therefore complementary; “the logics and assumptions in complementary scenarios differ across scales, but this does not preclude selected information from scenarios at one scale to feed into scenarios at another. The scenarios can differ substantially at the various spatial scales, and even contradict each other—nevertheless by this they also complement each other as they illustrate how an issue may be perceived differently at different scales, or even how issues differ in their relevance” (p.1290).

Ultimately, the aim of using scenarios in COBRA is to identify win-win, win-lose and lose-lose scenarios that will enable us to evaluate how ideal actions initiated at community level will avoid moving the current situation towards conflictual/worst-case scenarios, but instead will maximise the chances of achieving positive synergistic outcomes.

### 1.5 Structure of the report

Following this introduction to scenarios, Sections 2 to 4 will report on the methods and results of the international and regional review of scenarios, the development of scenarios at the local and national scales and the cross-scalar analyses. Appendix 1 provides an account of the participatory action research enacted during the research at different scales. Section 5 presents a discussion which draws together the findings and identifies important policy and practical outcomes. The report will conclude by outlining how the results of this report will be used in the next phase of the project.

## 2. Future scenarios at International and Amazon scales

Considering the pristine state of a large part of the forests in the Guiana Shield, key political choices now will greatly determine the fate of these pristine environments. Guyana is striving to develop its Low Carbon Development strategy (LCD), and in several countries REDD+ readiness studies have been undertaken (Hall, 2012). At the same time, the mining industry is gaining ground in the region (Hammond et al., 2007), and similarly, there is a rapid expansion of oil palm plantations in the Colombian part of the Guiana Shield (Garcia-Ulloa et al., 2012).

To predict the effects of such developments, a range of scenarios have been produced by international bodies and regional or national institutes. These scenarios show a range of possible futures based on a series of assumptions, for example climatic changes or shifts in land use. For example, the International Panel on Climate Change (IPCC) has produced scenarios that make basic assumptions of greenhouse gas emissions and related global temperature rise. They have also published regional storylines for several geographical regions including the Amazon basin. In this report, we analysed a range of global and regional scenarios with the idea to discover the key underlying drivers. The drivers identified in these higher scale scenarios can then be compared with drivers of change identified at the community level in the COBRA project.

### 2.1. International and Amazon scale scenarios

#### 2.1.1. Literary review of scenarios and analyses

There are a broad range of scenario sets from international and regional levels that have been developed by the academic, policy and private sectors. A comprehensive review through a desk-based study was carried out on these, while at the same time compiling data and information on emerging trends that could help build pictures of potential future scenarios. Based on their relevance to the development of natural resources and underlying drivers such as climate change and economic choices with large scale impacts, a total of eight sources were selected to further assess in-depth. Most of these sources have defined several detailed scenarios or scenario groups (Table 1). Additionally, based on their relevance to the Guiana Shield or South America in a broader sense, and their thoroughness, six regional scenarios were assessed in detail. The processes and assumptions behind the scenario sets, the core drivers and the links and/or implications for the COBRA project, were carefully considered. Scenarios have been constructed for both short term and longer term, up until the year 3000 in the case of the Millennium Project Global scenarios, and using a range of different processes and participants.

*Table 1. Overview of global and regional scenario groups and scenarios considered in this report.*

	Source	Scenario name
Global level scenarios	Millennium Ecosystem Assessment	Global orchestration
		Order from strength
		TechnoGarden
		Adapting mosaic
	Millennium Project Global Scenarios	Business as Usual – The Skeptic
		Environmental Backlash
		Technology pushes off the limits
		Political turmoil
	GEO4 Global	Markets first
		Policy first
		Security first
		Sustainability first
	GBO-3	n.a.
	IPCC	A1FI
		A1B
		A1T
		A2
		B1
		B2
	Costanza scenarios	Mad Max
Star Trek		
Ecotopia		
Big Government		



	WBCSD	FROG!
		Geopolity
		Jazz
	Shell	Low Trust Globalisation
		Open Doors
		Flags
<b>Regional level scenarios</b>	GEO Latin America	Regulated Sustainability
		Sustainability Reforms
		Unsustainability and Increased Conflicts
		Transition to Sustainability
	GEO Amazonia	Emergent Amazonia
		Inching along the Precipice
		Light and Shadow
		The Once-Green Hell
	SIM AMAZONIA	Business as Usual
		Frontier Governance
	Millennium Project Latin America scenarios	God is Latin America
		Disintegration in Hell
	IPCC Latin America scenarios	n.a.
	US National Intelligence Council Latin America 2020 scenarios	n.a.

### 2.1.2. List of scenarios and comments

Table 2 below provides a summary of the different global and regional scenarios reviewed. Drivers that determine the main axes for scenario narrative construction are marked with an X. This shows that most frequently mentioned key drivers at the global level are “Globalisation”, “Governance”, “Ecosystem management and land use” and “Technology”. At the regional level, “Socio-economics”, “Globalisation” and “Technology” are mentioned as the key drivers. The IPCC global and regional scenarios were the only ones considering demographical changes as a major driver for environmental change. The regional scenarios of SIM AMAZONIA were the only ones explicitly paying attention to infrastructural developments as a key driver for change.

Table 2. The scenario sets reviewed in this report (left column) and the key drivers that underlie the differences between scenarios (top row).

	Socio-economics, Poverty reduction, Equity, Human well-being	Globalisation, Degree of market	Governance	Geopolitics and global security	Ecosystem management and land use	Infrastructure projects e.g. roads	Cultural values, Community sense versus Individualism	Demography, population growth	Technology	Climate change
<b>Global level scenarios</b>										
Millennium Ecosystem Assessment		X			X					
Millennium Project (Global Scenarios)		X	X	X					X	
GEO4 Global			X		X					
GBO-3					X					X
IPCC		X						X	X	
Costanza scenarios					X		X		X	
WBCSD			X						X	
Shell		X	X							
<b>Regional level scenarios</b>										
GEO Latin America	X	X			X					
GEO Amazonia		X	X						X	
SIM AMAZONIA	X					X				
Millennium Project Latin America scenarios	X								X	
IPCC Latin America scenarios		X						X	X	
US National Intelligence Council Latin America 2020 scenarios			X	X						

Below, a summary of each of the scenarios assessed in this report is presented.

#### 2.1.2.1 Global level scenarios

##### Millennium Ecosystem Assessment<sup>2</sup>

The Millennium Ecosystem Assessment (MA) was carried out between 2001 and 2005 to assess the consequences of ecosystem change for human well-being and to establish the scientific basis for actions to enhance the sustainable use of ecosystems and their contributions to human well-being. 33 sub-global assessments were undertaken as well, to meet the needs of users in the regions.

The conceptual framework for the MA posits that people are integral parts of ecosystems and that a dynamic interaction exists between them and other parts of ecosystems. Changing human well-being drive changes in ecosystems and their services and thereby cause changes in human well-being again. These interactions can take place at global, regional and local scales. In its conceptual framework the MA indicates where strategies and interventions can be applied to enhance human well-being and conserve ecosystems. The MA deals with the full range of ecosystems—from those relatively undisturbed, such as natural forests, to landscapes with mixed patterns of human use, to ecosystems intensively managed and modified by humans, such as agricultural land and urban areas..

The MA developed four scenarios to explore plausible futures for ecosystems and human well-being based on different assumptions about driving forces of change and their possible interactions. The storylines of the four scenarios are summarized in Table 3, according to the two axes for key drivers. This also includes projections of economic and population growth. The key drivers determining global development paths as axes are:

- Globalisation – ranging from an increasingly globalized to an increasingly regionalized world.

Ecosystem management policy approach – ranging from a reactive (most problems are addressed only after they become obvious) to a proactive (policies deliberately seek to maintain ecosystem services for the long term) approach in ecosystem management.

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<sup>2</sup> [www.millenniumassessment.org](http://www.millenniumassessment.org)

Table 3. Summary of the four MA scenarios (adapted from: <http://www.millenniumassessment.org/documents/document.329.aspx.pdf>)

	<b>Globalized path</b>	<b>Regionalized path</b>
<b>Reactive ecosystem management</b>	<p><b>“Global Orchestration”</b></p> <p>A globally connected society that focuses on global trade and economic liberalization and takes a reactive approach to ecosystem problems but that also takes strong steps to reduce poverty and inequality and to invest in public goods such as infrastructure and education.</p> <p>Projected economic growth in this scenario is the highest of the four, while it is assumed to have the lowest population in 2050.</p>	<p><b>“Order from Strength”</b></p> <p>A regionalized and fragmented world, concerned with security and protection, emphasizing primarily regional markets, paying little attention to public goods, and taking a reactive approach to ecosystem problems.</p> <p>Projected economic growth rates are the lowest of the scenarios (particularly low in developing countries) and decrease with time, while population growth is the highest.</p>
<b>Pro-active ecosystem management</b>	<p><b>“TechnoGarden”</b></p> <p>A globally connected world relying strongly on environmentally sound technology, using highly managed, often engineered, ecosystems to deliver ecosystem services, and taking a proactive approach to the management of ecosystems in an effort to avoid problems.</p> <p>Projected economic growth is relatively high and accelerates, while population in 2050 is in the midrange of the scenarios.</p>	<p><b>“Adapting Mosaic”</b></p> <p>Regional watershed-scale ecosystems are the focus of political and economic activity. Local institutions are strengthened and local ecosystem management strategies are common; societies develop a strongly proactive approach to the management of ecosystems.</p> <p>Projected economic growth rates are somewhat low initially but increase with time, and population in 2050 is nearly as high as in Order from Strength.</p>

Using these scenarios, projections were made for changes in indirect and direct drivers, changes in ecosystems and changes in ecosystem services and human well-being. In three of the four MA scenarios, between three and five of the components of well-being (material needs, health, security, social relations, freedom of choice and action) improve between 2000 and 2050 (MA, Chapter 11<sup>3</sup>).

<sup>3</sup> <http://www.unep.org/maweb/documents/document.335.aspx.pdf>

The MA focuses on the links between human well-being and ecosystem services, which is essential to the COBRA project. The main assumptions for the scenario axes refer to (i) the priority of ecosystem management for policy makers and society at large and (ii) the scale of open economies; both are very relevant factors for the future of the Guiana Shield and therefore for the policy analyses by the COBRA project. MA scenario analysis has been carried out across scales, from global to local, as COBRA intends to do as well.

#### Millennium Project scenarios<sup>4</sup>

The Millennium Project was founded in 1996 as an independent non-profit think tank on global futures. It collects and assesses judgments from over 2,500 people selected by its 40 nodes around the world. The Project has a number of ‘*on-going programs*’ and ‘*special studies*’. On-going programs include the ‘*15 Global Challenges*’ and the ‘*State of the Future Index*’ (SOFI). One of the special studies is ‘*Global Scenarios*’, which presents five different sets of scenarios:

- Global Energy Scenarios 2020
- Global Scenarios 2025 on future management policy issues for Science and Technology
- Global Exploratory Scenarios – 2025
- Global Normative Scenario – 2050
- Very Long-Range Scenarios - 3000

Most sets of scenarios deal with a very broad range of issues, at high levels of aggregation or abstraction at the global level. A Real-Time Delphi method was used for collecting and synthesizing expert opinions.

In this report we consider only the Global Energy Scenarios. These compile a set of four scenarios which are based on the understanding that the world increasingly needs fundamental changes to meet the growing demand for energy. These scenarios describe how alternative global energy conditions could emerge (Table 4). Each explores plausible cause-and-effect links and illustrates key decisions, events, and consequences throughout the narratives. The four axes of uncertainty for the scenarios were: rate of technological breakthroughs, strength of environmental movement impacts, status of economic growth, and conditions of geopolitics, including war, peace, and terrorism. Each of the axes could be high, low, or moderate between now and 2020 (Table 5). The scenario team selected the combination of conditions of axes that produce the most interesting and plausible scenarios for further discussion in the energy policy process.

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<sup>4</sup> [www.millennium-project.org](http://www.millennium-project.org)

Table 4. Description of the four Millennium Project Global Energy Scenarios (adapted from: <http://www.millennium-project.org/millennium/scenarios/energy-scenarios.html>).

Scenario	Description
<b>Business as Usual – The Skeptic</b>	This scenario assumes that the global dynamics of change continue without great surprises or much change in energy sources and consumption patterns other than those that might be expected as a result of the change dynamics and trends already in place.
<b>Environmental Backlash</b>	This scenario assumes that the international environmental movement becomes much more organized; some groups lobby for legal actions and new regulations and sue for action in the courts, while others become violent and attack fossil energy industries.
<b>High-Tech Economy – Technology Pushes Off the Limits</b>	This scenario assumes that technological innovations accelerate beyond current expectations and have impacts in the energy supply mix and consumption patterns of a magnitude similar to the Internet's impact in the 1990s.
<b>Political Turmoil</b>	This scenario assumes increasing conflicts and wars, with several countries collapsing into failed states, leading to increasing migrations and political instabilities around the world.

Table 5. Global Energy Scenarios 2020 developed by the Millennium Project and their axes of uncertainty.

	Business as Usual – The Skeptic	Environmental Backlash	Technology Pushes Off the Limits	Political Turmoil
Growth in technological breakthroughs	Moderate	Moderate	High	Moderate
Environmental movement impacts	Moderate	High	Low	Low
Economic growth	Moderate	Moderate	High	Moderate
Changes in geopolitics and war/peace/terrorism	Moderate	Moderate	Few	Major

The Millennium Project's web site is a rich source of information, inspiration and insights on the general process of scenario development, and on the analytical and conceptual framework of scenario construction. The annotated bibliography has summaries of global and regional scenario sets that can be relevant to the COBRA Project. However, none of the scenarios sets of the Millennium Project itself has a focus on the interaction between ecology and human well-being in a way which is as comprehensive and well-documented as the Millennium Ecosystem Assessment.

#### The Global Environmental Outlook<sup>5</sup>

The Global Environment Outlook (GEO) is a consultative, participatory process for conducting integrated environmental assessments that report on the state, trends and outlooks of the global environment. The rigorous assessment process facilitated by UNEP aims to make GEO products scientifically credible and policy relevant - providing information to support environmental management and policy development. GEO also supports multi-stakeholder networking and intra and inter-regional cooperation to identify and assess key priority environmental issues at the regional levels.

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<sup>5</sup> [www.unep.org/geo/](http://www.unep.org/geo/)



Using the integrated environmental assessment methodology, UNEP has produced five GEO reports thus far, which have analysed environmental state and trends at the global and regional scales, described plausible outlooks for various time frames and formulated policy options. Each GEO report builds on the assessment findings of its predecessor and draws from lessons learnt. GEO 4 has four scenarios that explore society's common future up to the year 2050 in terms of the environment and the impact of our lifestyle choices and policy responses to address various challenges (Table 6). They explore how current social, economic and environmental trends may unfold along divergent development paths in the future, and potential impacts for the environment, human well-being and development. The two main drivers and axes of uncertainty are policy- and governance- related: the balance between economic development and the environment as policy priorities, and the balance between government and the market.

*Table 6. Description of the four GEO scenarios as published in GEO4 (adapted from: <http://www.unep.org/geo/GEO4.asp>).*

Scenario	Description
<b>Markets First</b>	This scenario pays lip service to sustainable development in terms of the ideals of the Brundtland Commission, Agenda 21 and other major policy decisions. There is a narrow focus on the sustainability of markets rather than in the context of the broader human-environment system.
<b>Policy First</b>	This scenario introduces some measures aimed at promoting sustainable development, but the tensions between environment and economic policies are biased towards social and economic considerations.
<b>Security First</b>	This scenario focuses on the interests of a minority: rich, national and regional. It emphasizes sustainable development only in the context of maximizing access to and use of the environment by the powerful.
<b>Sustainability First</b>	This scenario gives equal weight to environmental and socio-economic policies, accountability, and it stresses transparency and legitimacy across all actors. It emphasizes the development of effective public-private sector partnerships not only in the context of projects but in the area of governance, ensuring that stakeholders across the environment-development discourse spectrum provide strategic input to policy making and implementation.

Besides the global report, the GEO web site has a range of regional reports, some very recent. Relevant to COBRA are reports on Latin America and the Caribbean, Brazil, Amazonia, and the Caribbean as such. The fact that the GEO 4 scenario set is based on differences in policy priority makes them quite useful for COBRA's policy analyses.

### The Global Biodiversity Outlook (GBO-3)<sup>6</sup>

Global Biodiversity Outlook (GBO) is the flagship publication of the Convention on Biological Diversity (CBD), on the status and trends of biodiversity, on key drivers of change and on progress made in mainstreaming biodiversity issues into the development agenda. The most recent, third edition of Global Biodiversity Outlook (GBO-3) was published in 2010.

Most governments reporting to the CBD cite the following five pressures or direct drivers as affecting biodiversity in their countries: Habitat loss and degradation; Climate change; Excessive nutrient load and other forms of pollution; Over-exploitation and unsustainable use; and Invasive alien species. The chapter "*Biodiversity Futures for the 21st Century*" discusses the future of three main types of ecosystems separately (terrestrial, inland water and coastal and marine), in terms of the 'current path' and its impacts for people, and several 'alternative paths'. The results are based on a combination of observed trends, models and experiments. GBO-3 does not include a new set of overall scenarios, but draws upon relevant previous scenario exercises conducted for the *Millennium Ecosystem Assessment*, the *Global Environment Outlook*, earlier editions of the *Global Biodiversity Outlook* and the *Intergovernmental Panel on Climate Change* (IPCC).

The GBO-3 approaches biodiversity in an integrated fashion, with particular attention to the relationship between biodiversity change, ecosystem services and impacts on human societies. One added value of GBO-3 is its specific attention to threshold and tipping point concepts in biodiversity and ecosystem change. GBO-3 convincingly shows how essential it is for the future of terrestrial ecosystems to consider carbon emissions from land use change in climate change mitigation strategies.

### IPCC Special Report on Emissions Scenarios (SRES)<sup>7</sup>

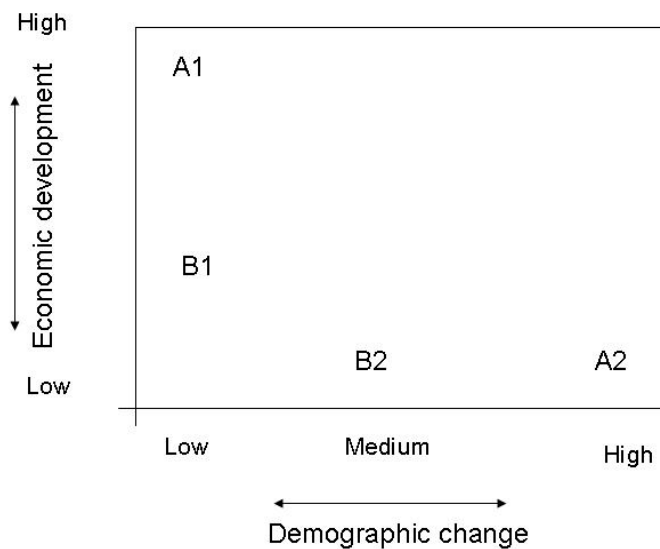
The Intergovernmental Panel on Climate Change (IPCC) used an 'open process', i.e. input and feedback from a community of experts to identify driving forces and trends. Six modelling teams were involved in developing emissions scenarios for the year 2100. Outlying 'surprise' or 'disaster' scenarios were excluded. No scenarios assume the implementation of UNFCCC or emission targets set by the Kyoto Protocol. However, other non-climate change policies (e.g. affecting demographic change etc.) that could affect GHG emissions are included.

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<sup>6</sup> [www.cbd.int/gbo/](http://www.cbd.int/gbo/)

<sup>7</sup> <http://www.ipcc.ch/ipccreports/sres/emission/index.php?idp=0>

Demographic change and economic development (income growth) are the primary driving forces or axes of variability in the scenarios. The rate and direction of technological change is incorporated as a secondary driving force, only in the A1 storyline. Four qualitative storylines yield four sets of scenarios called “families”: A1, A2, B1, and B2 (Figure 3). Altogether 40 SRES scenarios have been developed by six modelling teams. All are equally valid with no assigned probabilities of occurrence. The set of scenarios consists of six scenario groups drawn from the four families: one group each in A2, B1, B2, and three groups within the A1 family, characterizing alternative developments of energy technologies: A1FI (fossil fuel intensive), A1B (balanced), and A1T (predominantly non fossil fuel). Brief storylines of each of the scenario families are given in Table 7.



*Figure 3. Graphical presentation of the SRES scenarios. See main text for descriptions of each scenario.*

*Table 7. Description of the four scenario families (adapted from IPCC, 2000).*

Scenario family	Description
<b>A1</b>	This scenario family assumes rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income.
<b>A2</b>	The underlying theme in this scenario family is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing population. Economic development is primarily regionally oriented and per capita economic growth and technological change more fragmented and slower than other storylines.
<b>B1</b>	This scenario family describes a convergent world with global population that peaks in mid-century and declines thereafter, and with rapid change in economic structures toward a service and information economy, with reductions in material intensity and the introduction of clean and resource-efficient technologies. There is an emphasis on global solutions to economic, social and environmental sustainability, including improved equity, but without additional climate initiatives.
<b>B2</b>	This scenario family assumes 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 B1 and A1. While the scenario is also oriented towards environmental protection and social equity, it focuses on local and regional levels.

The IPCC scenarios use modelling to provide projections for future greenhouse gas emissions under different climate change predictions. These could be linked to different policy objectives. Some regional level scenarios are presented, but not in depth. Forest cover loss is explicitly used in the different scenarios to make emission projections. The robustness of options in terms of impacts, vulnerability, and adaptation was taken into consideration in the development of the scenarios.

### Costanza's scenarios<sup>8</sup>

Costanza (2000) addressed the question of what policies are most appropriate for society now, given alternative visions of the future and the enormous uncertainty about the reality of the assumptions underlying these visions. The author used Bossel's (1996, *Earth at a crossroads: paths to a sustainable future*) scenarios and ideas from Donella Meadows' *Limits to Growth*, as the basis of the scenarios for the year 2100. There are four visions of the future derived from two basic worldviews, whose characteristics are laid out in Table 8. These worldviews have been described in many ways (Bossel 1996), but an important distinction has to do with one's degree of faith in technological progress. The "technological optimist" world view is one in which technological progress is assumed to be able to solve all current and future social problems. It is a vision of continued expansion of humans and their dominion over nature. This is the "default" vision in our current Western society, one that represents continuation of current trends into the indefinite future.

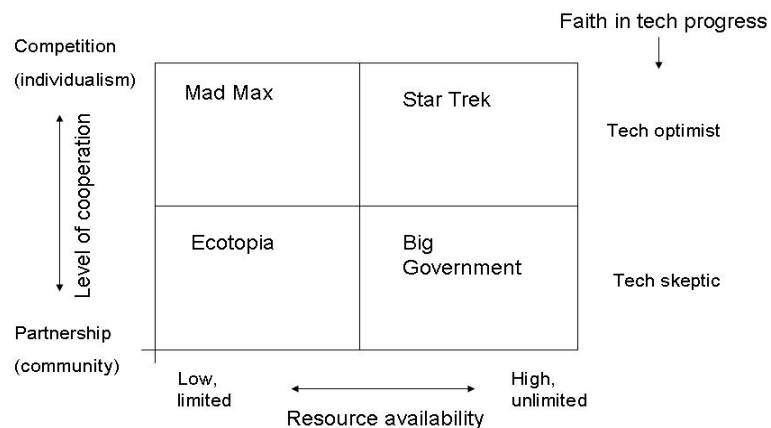
*Table 8. Worldviews used to construct Costanza scenarios (source: Costanza, 2000).*

<b>Technological optimist</b>	<b>Technological sceptic</b>
technical progress can deal with any future challenge	technical progress is limited and ecological carrying capacity must be preserved
competition	Cooperation
linear systems with no discontinuities or irreversibilities	complex, nonlinear systems with discontinuities and irreversibilities
humans dominant over nature	humans in partnership with nature
everybody for themselves	partnership with others
market as guiding principle	market as servant of larger goals

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<sup>8</sup> Costanza, R. (2000). Visions of alternative (unpredictable) futures and their use in policy analysis. *Conservation Ecology*, 4(1): 5

Resource availability and level of cooperation are the primary drivers or axes of variability in the scenarios (Figure 4).



*Figure 4 Model describing the four Costanza scenarios relative to the main axes of variability.*

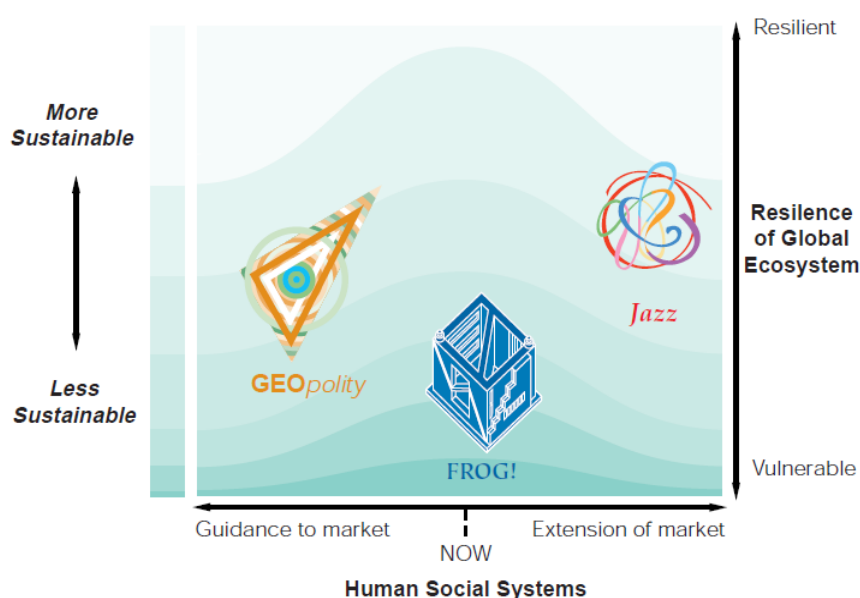
Costanza's scenarios use both storylines and plotlines (Table 9). While storylines are causal relationships between events that set out a movement towards fulfilment of the story's promise, a story's plotline is the events that make the story advance along its storyline in a dramatic and compelling way. One of the strengths of 'Costanza's scenarios are that they appeal to the human being as a whole: senses, emotions, thoughts, behaviours and so on. There is good focus on ultimate drivers within the scenarios i.e. those essential characteristics that could change society. Since they are based on Bossel's 1996 scenarios, links could potentially be made with system viability.

Table 9. Summary descriptions of the four Costanza scenarios (adapted from: Costanza, 2000)

Scenario	Description
<b>Star trek</b>	<p>This vision describes a world in which population pressure is mounting already in 2012 and natural resources are being strained. The greenhouse effect caused by burning fossil fuel causes major disruptions, but energy generation from 'warm fusion' allows a rapid reduction of global fossil fuel use to practically zero by the year 2050. The air pollution problem is essentially eliminated over the period from about 2015 to 2050. Although clean, unlimited energy lessens the impact of humans on the environment, the earth is getting pretty crowded. Humans react by migrating into space where they establish new communities.</p>
<b>Mad Max</b>	<p>In this vision the world's fossil fuel resources are being exploited to the last bit. The greenhouse effect and a global pollution crisis are completely disrupting the earth's climate and ecological systems. Financial markets burst. The world population peaks in 2020 at almost 10 billion and thereafter it drops due to regional famines, disease outbreaks and wars over water and other natural resources. National governments have become weak, almost symbolic, relics. The world will be run for some time by transnational corporations' intent on cutthroat competition for the dwindling resources. The distribution of wealth becomes more and more skewed.</p>
<b>Big government</b>	<p>This vision sketches a world in which governments and public have much more control over corporate behaviour. 'Warm fusion' as a new source of clean energy will be discovered but is only slowly developed. Global CO<sub>2</sub> emissions are gradually reduced with concerted government effort and high taxes. Government population policies manage to stabilize the global human population at around 8 billion. However, governments explicitly advocate slow or no-growth policies, preferring to concentrate instead on assuring ecological sustainability and more equitable distribution of wealth.</p>
<b>Ecotopia</b>	<p>This vision describes a world where people finally realize that governments need to take the initiative for sustainable development back from transnational corporations. The public forms a powerful judgment against the consumer lifestyle. All depletion of natural capital is taxed at the best estimate of the full social cost of that depletion. Fossil fuels become much more expensive, which will limit travel and transport of goods and encourage the use of renewable alternative energies. Human habitation comes to be structured around small villages that provide most of the necessities of life at close distance. Because of the reduction in consumption and waste, there is only moderate need for paid labour and income.</p>

### WBCSD Environmental Scenarios<sup>9</sup>

In 1998, the World Business Council for Sustainable Development (WBCSD) developed three scenarios to stimulate broad discussion on the challenges of sustainable development for business and to provide a platform for more focused industry and corporate scenarios incorporating local business issues. The main axes of the scenarios are (i) resilience of global ecosystems and (ii) level of governance versus market (Figure 5).



*Figure 5. Conceptual model of the three scenarios showing their position in relation to resilience of global ecosystems, human social systems and sustainability (source: World Business Council for Sustainable Development Global Scenarios 2000-2050 Summary Brochure).*

These scenarios (Table 10) provide insights into ideas and views on the long-term future of our planet developed by part of the business sector (e.g. attention to the social dimension and the license to operate; the role of governments and new global institutions; importance of public goods). Clearly, there is a strong belief in the economic opportunities and viability of PES-mechanisms (payments for ecosystem services). The long-term visions and strategies from the WBCSD can be used by civil society in their dialogues with the sector in general, for instance to confront them with gaps between their long-term visions and short-term actions. Visions and strategies can also be used for research purposes, or to identify

<sup>9</sup> <http://www.wbcsd.org/pages/edocument/edocumentdetails.aspx?id=143&nosearchcontextkey=true>



opportunities for alliances between civil society and companies to influence government policies.

*Table 10. Description of the three WBCSD Environmental scenarios (adapted from: WBCSD, 1997).*

Scenario	Description
<b>FROG!</b>	In this scenario economic growth is of major concern to nations, although the importance of sustainable development is acknowledged. Environmental NGOs demand enforcement of global standards, but developing nations argue that if the developed nations insist on raising environmental standards, they should “First Raise Our Growth!” Some nations leapfrog from underdeveloped status to benchmarker in particular areas of technology.
<b>Geopolity</b>	This scenario begins with a succession of signals that an environmental and social crisis looms. The prevailing “economic myth” is increasingly viewed as dangerously narrow. But the business sector seems unable or unwilling to respond adequately. In the absence of leadership from business and government to solve problems, people form new global institutions such with broad powers to design and enforce global standards.
<b>Jazz</b>	This scenario describes a world of social and technological innovations, experimentation, rapid adaptation, much voluntary interconnectedness, and a powerful and ever-changing global market. What enables the quick learning and subsequent innovation in Jazz is high transparency—the widespread availability of information about ingredients of products, sources of inputs, company financial, environmental, and social data, government decision-making processes, and almost anything else consumed with what consumers want to know.

### Shell Scenarios<sup>10</sup>

Since the 1970s and 1980s, Shell has become a leader in the scenario approach to business planning. During that period, the company has developed Global Scenarios to cast light on the context in which it operates, to identify emerging challenges and to foster adaptability to change. These scenarios are used to help review and assess strategy. In 2005 Shell’s has published three Global Scenarios running to 2025 (Table 11). The main axes considered in these scenarios are the role of states vs. the role of markets and people’s trust in globalisation (see Figure 6).

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<sup>10</sup> <http://www.shell.com/global/future-energy/scenarios.html>

Table 11. Description of the three Shell Global Scenarios (adapted from: SIL, 2005).

Scenario	Description
<b>Low Trust Globalisation</b>	The absence of market solutions to the crisis of security and trust, rapid regulatory change, overlapping jurisdictions and conflicting laws lead to intrusive checks and controls, encouraging short-term portfolio optimisation and vertical integration. Institutional discontinuities limit cross-border economic integration. Complying with fast-evolving rules and managing complex risks are key challenges.
<b>Open Doors</b>	“Built-in” security and compliance certification, regulatory harmonisation, mutual recognition, independent media, voluntary best-practice codes, and close links between investors and civil society encourage cross-border integration and virtual value chains. Networking skills and superior reputation management are essential.
<b>Flags</b>	Zero-sum games, dogmatic approaches, regulatory fragmentation, and national preferences, conflicts over values and religion give insiders an advantage and put a brake on globalisation. Gated communities, patronage and national standards exacerbate fragmentation, and call for careful country-risk management

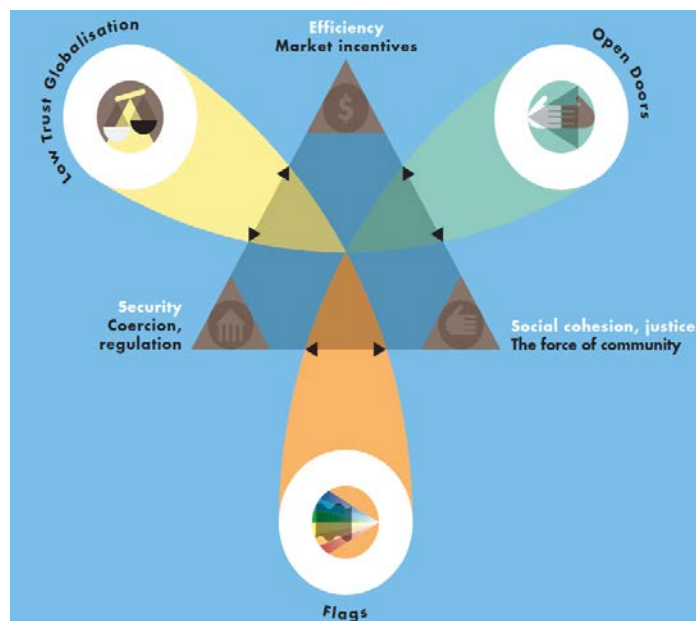


Figure 6. Illustration of the three global 2025 scenarios by Shell International: Low Trust Globalisation, Open Doors and Flags, and their position relative to the main drivers (source: SIL, 2005).

Shell's scenario reports contain interesting views, for multinational business standards, on redefining the role of government and on governance in general. The scenarios put a strong focus on globalizing forces, market mechanisms and governance; issues that we see in most of the other global scenarios considered here.

#### 2.1.2.2 Regional level scenarios

##### GEO Latin American scenarios (LAC3)<sup>11</sup>

The scenarios in “*Latin America Environment Outlook: GEO LAC 3*” (2010) explore four key hypotheses that group the identified determinant driving forces, as well as market incentives, policy choices and concerns related to security and sustainable development (Table 12). The scenarios are plausible images of the future defined by using different combinations of driving forces. The economic, social and environmental costs of each of the trajectories depend to a great extent on the speed with which the objectives of sustainability and human well-being are integrated into the decision making process. Key driving forces for the four scenarios are (i) the dominance of the market economy, (ii) priority given to environmental policy and (iii) the distribution of wealth. Their story lines are:

<sup>11</sup> United Nations Environment Programme (UNEP) 2010. GEO Latin America and the Caribbean Environment Outlook. UNEP Regional Office for Latin America and the Caribbean, Panama.

Table 12. Description of the four GEO3 Latin American Scenarios (adapted from: UNEP, 2010).

Scenario	Description
<b>Relegated Sustainability</b>	In this scenario economic growth takes priority over social and environmental objectives so that policies and practices are fundamentally directed at developing markets. When it comes to reducing consumption of raw materials by product unit, the effects of dematerializing the economy are to a great extent compensated by increased economic activity. Everything becomes merchandise, including natural resources and basic goods such as water, biological diversity and culture. Environmental externalities, inequality and corruption increase.
<b>Sustainability Reforms</b>	New policies and regulations are introduced to mitigate the adverse effects of more than two decades when policies that gave preference to expanding unregulated markets predominated. High economic growth is combined with the application of Keynesian fiscal policies to ease the most serious social and environmental problems; however, because the market approach still predominates in this scenario, there are still tensions and limits when it comes to making a significant advance in this direction.
<b>Unsustainability and Increased Conflicts</b>	This is a regional context marked by socioeconomic and political fragmentation with “islands of wealth” surrounded by a “sea of poverty” as an expression of growing disparities. Natural resources are predominantly controlled and appropriated by the power elites and large corporations. Violence is exacerbated and there is a considerable increase in socio-political conflicts with great migratory pressures in border areas. As security conditions worsen repressive control mechanisms proliferate. Environmental degradation increases, although some natural resources of interest to the elites are preserved; and health problems increase.
<b>Transition to Sustainability</b>	This scenario describes an integrated development combining economic, social and environmental dimensions of sustainable development. There is more dematerialization and regional economic integration increases. Migratory pressures are reduced and more basic needs are met without depleting natural resources. The decision making structure is more balanced; there are significant changes in consumption patterns and good progress is made in solving priority environmental problems. Progress is also made on preparing a common regional environmental agenda.

The analysis of economic, environmental and social drivers and their interactions in GEO LAC3 scenario report is highly relevant to Cobra. Cultural drivers are probably considered as secondary and are hardly discussed.

### GEO Amazonia

Amazonian experts have made evaluations of the driving forces that led to four regional scenarios for 2026 (Table 13), notwithstanding national differences and a high degree of uncertainty due to a still limited knowledge base of the region. The scenarios are defined mainly by three regionally important forces (public policies, the market, and science and technology), which *GEO Amazonia* considers as both powerful and difficult to predict in terms of regional influence. In reality, *GEO Amazonia* expects the future of Amazonia to include elements of each of the scenarios. It is also possible that some of the countries will have a future similar to some of the scenarios and that others might await a totally different future. Table 14 shows how the driving forces are combined differently in each scenario.

Table 13. Description of the four GEO Amazonia scenarios (adapted from: UNEP & ACTO, 2009).

Scenario	Description
<b>Emergent Amazonia</b>	<p>This scenario assumes that public policies aim at improving social services and promote sustainable development based on effective environmental governance. The State has managed to reduce poverty and inequality of income distribution. Market forces provide incentives for developing sustainable productive activities, in such a way that the stability of the ecosystems is guaranteed and ecosystem goods and services are valued. However, science, technology and innovation have limited development.</p>
<b>Inching along the Precipice</b>	<p>This scenario assumes that Amazonian population growth increases. Amazonia has become very attractive for multi-national investors and contributes to alleviate the food crisis caused by drought due to climate change in traditional cereal and grain producing areas.</p> <p>Although public policies promote sustainable development, market forces provide incentive for developing unsustainable productive activities that affect ecosystem stability and place no value on environmental goods and services. Science, technology and innovation have limited development.</p>
<b>Light and Shadow</b>	<p>This scenario assumes that demographic growth in the Amazonian countries stabilises. There is an increase in innovative initiatives that take advantage of investment opportunities to promote social-environmental sustainability, but initiatives for the valorisation of ecosystem services and internalization of environmental costs in production have not been very successful. There is investment in science, technology and innovation which promotes the development needed to optimise the sustainable utilisation of resources.</p>
<b>The Once-Green Hell</b>	<p>This scenario assumes that the Amazonian part of each country is the area that has registered the largest demographic growth. Public policies fail to promote sustainable development; the environmental component is missing from the public decision making process. Furthermore, market forces provide incentives for developing unsustainable productive activities. Science, technology and innovation have limited development.</p>

Table 14. Assumptions on driving forces in GEO Amazonia scenarios.

	Role of public policies	Role of market forces	Role of science, technology and innovation
<b>Emergent Amazonia</b>	+	+	-
<b>Inching along the Precipice</b>	+	-	-
<b>Light and Shadow</b>	+	-	+
<b>The Once-Green Hell</b>	+	-	-

Note: "+" means improvement, while "-" means reduction or deterioration

The "*Environment Outlook in the Amazonia - GEO Amazonia*" (2009) report is rich in background information on the region, with extensive sections on history and culture, environmental change and its impacts on ecosystem services and human well-being, the past, present and future of indigenous people, emerging issues and the future of the region, and suggested lines of action for policy makers. This richness in information is not always matched by analytical depth and policy proposals have a very general character.

### SIM Amazonia<sup>12</sup>

The SIM AMAZONIA model was developed to explore Amazonian deforestation through to 2050 (Soares-Filho et al., 2006). The most important driving forces are seen to be socio-economic and demographic growth and infrastructural projects especially road building. The model was run under eight scenarios that encompass a plausible range of future trajectories of deforestation. At one extreme is the 'business-as-usual' scenario (BAU), which assumes that recent deforestation trends will continue, and at the other extreme, the 'governance' scenario assumes that Brazilian environmental legislation is implemented across the Amazon basin through the refinement and multiplication of current experiments in frontier governance. Table 15 briefly outlines the main storylines of both scenarios in terms of deforestation. Both scenarios are graphically presented in Figure 7.

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<sup>12</sup> <http://www.csr.ufmg.br/simbrasil>

Table 15. Description of the two SIM Amazonia scenarios (adapted from: Soares-Filho et al., 2006).

Scenario	Description
<b>Business as Usual</b>	This scenario assumes that the forces of environmental destruction continue unopposed. The network of parks and other protected areas in the region remains at 31% of the region's forests but up to 40% of these protected areas are subject to deforestation, and nearly 85% outside of protected areas are subject to deforestation. This translates to a loss of nearly 2 million km <sup>2</sup> , leaving only 56% of the original forest area.
<b>Frontier Governance</b>	In this scenario frontier expansion is effectively controlled and the ecological integrity of the basin is assured. Protected areas are expanded to 41% of the region's forests and are fully enforced. Only 50% of the forests outside of protected areas are subject to deforestation. Furthermore, the deforestation rate, although rising initially due to road paving, declines over time, based on models simulating the effects of emerging markets for carbon retention in native forests. Under this scenario, 73% of the original forest would remain in 2050.

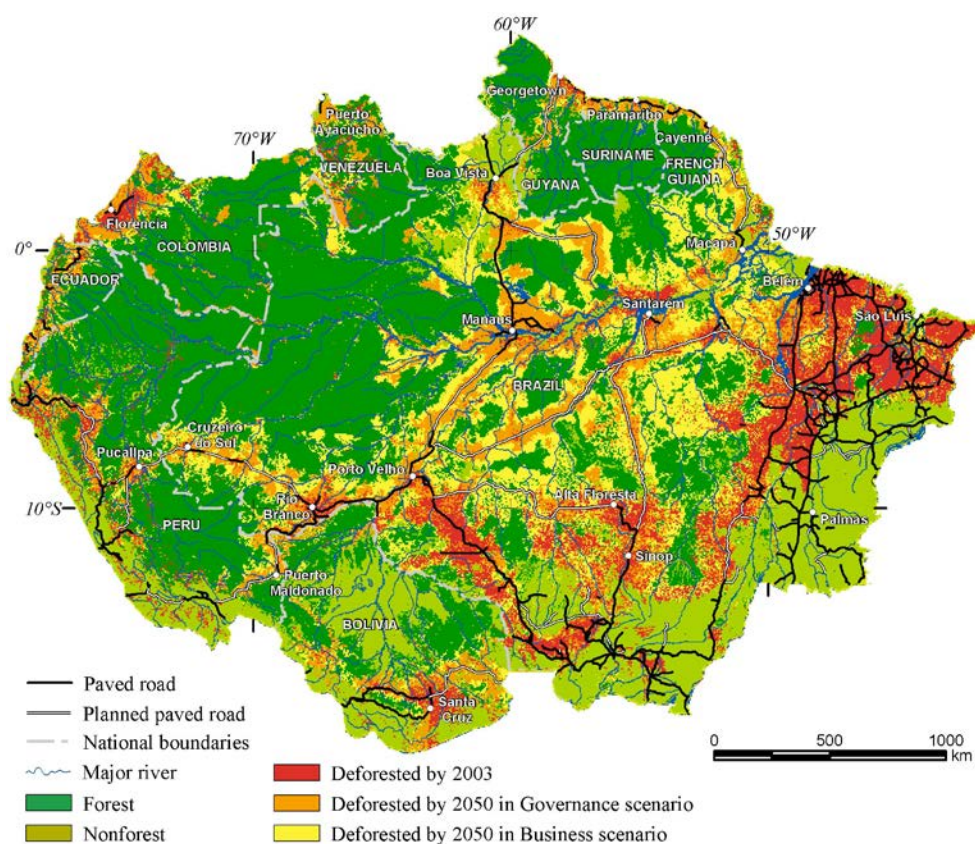


Figure 7. Deforestation scenario results from SIM AMAZONIA (source: Soares-Filho et al., 2006).



The SIM AMAZONIA scenarios provide an excellent large-scale analysis that puts the Guiana Shield into the broader geographic context, with a focus on infrastructure and agricultural expansion as two major drivers of deforestation. Other subregions in the Amazon plus Caribbean coast basin can become a living example of good or bad ecosystem management for the Guiana subregion, where pressure is less intense.

#### Millennium Project Latin America scenarios<sup>13</sup>

The Chairs of the Millennium Project Nodes in Latin America used a Real-Time Delphi to collect judgments (through questionnaire) of knowledgeable individuals about the likelihood and impact of developments that might affect Latin America over the next 20 years and the potential course of variables important to the region (Table 16). Scenarios were constructed for the year 2030 (Table 17).

Both international and Latin American developments were used to identify the driving forces, and long lists were made with those developments categorised as 'likely' (>60%) and 'significant' (>6.8); these are "good bet" assumptions for scenario development. "Surprises" are developments that have low probability (>50%) but high impact (<6.6); these are developments that can "flavour" any scenario. In addition, participants were asked how important it is to stress society, technology, environment, economics, and politics in both international and Latin American scenarios over the next 20 years. Results found that when prioritising the most important 'disciplines', Society and Technology come out as most important.

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<sup>13</sup> <http://www.millennium-project.org/millennium/ScenariosLatinAmerica2030.html>

*Table 16. Driving forces categorised as 'likely' and 'significant' in the Millennium Project Latin America scenarios (source: Millennium Project, 2012).*

<b>Development</b>	<b>Likelihood</b>	<b>Significance</b>
Food prices double in real terms (for example, from production of crop-based fuels)	63.3	7.67
Regional organized crime is more powerful than some Latin American governments	60.9	7.54
Free, wireless, broadband networks connect all major Latin American cities	63.4	7.50
Latin America becomes the world leading producer of biofuels	60.3	7.40
Tourism increases fivefold from 2010 levels (including eco-tourism)	64.9	7.37
90% of the world's population over 11 years of age uses Internet	74.3	7.30
Human migrations at twice today's levels occur from causes such as water shortages	64.2	7.03
Glaciers in the Andes mountains are reduced by 75% compared to 2000	61.0	7.01
Genetic manipulation (GM) is used in the production of 2/3 of the world's food	66.1	6.85

Table 17. Description of the two Millennium Project Latin America scenarios (adapted from: <http://www.millennium-project.org/millennium/ScenariosLatinAmerica2030.html>).

Scenario	Description
<b>God Is Latin American</b>	This scenario assumes that education and social development softens the negative impacts of accelerated growth. Latin America bridges the economic gap with advanced economies and GDP increases substantially. Democratic governments create a great Latin American union with strong popular support. Latin American natural resources and ecological advantages make it unique in the world. CO <sub>2</sub> emissions per capita become the lowest in the planet.
<b>Disintegration in Hell</b>	In this scenario the gap between rich and poor grows dramatically, and the standard of living drops. Hyperinflation returns, unemployment rises, and the economy stagnates. GDP drops under heavy stagflation. Environmental degradation and pollution continues and CO <sub>2</sub> emissions rise. Crime, terrorism, ethnic upheaval, and demagoguery disrupt most nation states in the region. Latin America reaches the worst corruption levels in the world.

The Latin American scenarios of the Millennium Project would cover the Guiana Shield region of the project. A range of drivers from different disciplines are presented and there is interesting data about their likeliness and significance. However, the scenarios are somewhat basic and only focus on two extreme positions.

#### IPCC Latin America scenarios<sup>14</sup>

This IPCC Latin America “Climate Change Impacts, Adaptation and Vulnerability” (2007) report was prepared as part of the 4<sup>th</sup> Assessment of the IPCC (2007). Regional assessments were done using a range of data sources, many based on the SRES scenarios. No specific scenarios are presented, only a discussion of likely projections to 2050 and the limitations of the modelling outcomes:

- There is uncertainty for regional climate change scenarios associated with different projections from different global circulation models. In summary, the current global circulation models do not produce projections of changes in the hydrological cycle at regional scales with confidence. In particular the uncertainty of projections of precipitation remain high.
- If the 2002-2003 deforestation rate (2.3 Mha/yr) in Brazilian Amazonia continues indefinitely, then 100 Mha of forest (about 25% of the original forest) will have

<sup>14</sup> [http://www.ipcc.ch/publications\\_and\\_data/ar4/wg2/en/ch13s13-3.html](http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch13s13-3.html)

disappeared by the year 2020, while by 2050 (for a business-as-usual scenario) 269.8 Mha will be deforested. By means of simulation models, Soares-Filho et al. (2005) estimated for Brazilian Amazonia that in the worst-case scenario, by 2050 the projected deforestation trend will eliminate 40% of the current 540 Mha of Amazon forests, releasing approximately 32 Pg (109 tonnes/ha) of carbon to the atmosphere (see section 4.2). Moreover, under the current trend, agricultural expansion will eliminate two-thirds of the forest cover of six major watersheds and twelve eco-regions.

- The population of the Latin American region has continued to grow and is expected to be 50% larger than in 2000 by the year 2050.

The modelling used in these regional scenarios could be linked to different policy objectives. There is however a lot of uncertainty in the predictions as a consequence of the limited reliability of the models at this level of analysis. Specific natural resource management predictions and changes are subject to a multitude of factors of which only a subset can be taken into account in models. Nevertheless, the IPCC regional projections provide relevant storylines for the Guiana Shield.

#### NIC Latin America<sup>15</sup>

The National Intelligence Council (NIC) is a centre of strategic thinking within the US Government, reporting to the Director of National Intelligence (DNI) and providing the President and senior policymakers with analyses of foreign policy issues that have been reviewed and coordinated throughout the intelligence community. The main focus of their activities is on national security.

In the 2020 scenarios, democratic governance and the quality of institutions, the region's international insertion including its relationship with the United States and the main world powers, and the region's sense of security from new threats, are the main driving factors determining the future of Latin America. No specific scenarios are presented, but a range of predictions for 2020 are put forward:

- Latin Americans will be both more mature and more cautious in terms of democratization and macro-economic policies, but they will struggle with social problems, low institutionalization and recurring governance crises. Few countries will be able to take advantage of opportunities for development. Chile, Mexico, Costa Rica and Uruguay are heading for a scenario of that sort.
- Brazil will seek to consolidate a regional role that will entail a lower level of interaction with the United States. In countries like Paraguay, Bolivia, Guatemala or Venezuela

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[http://www.dni.gov/files/documents/Global%20Trends\\_Mapping%20the%20Global%20Future%202020%20Project.pdf](http://www.dni.gov/files/documents/Global%20Trends_Mapping%20the%20Global%20Future%202020%20Project.pdf)

there are certain tendencies away from democracy and toward a new militarism in the years ahead.

- Latin America as a region will see the gap separating it from the most advanced nations of the planet grow wider.
- Those countries and regions that fail to find an economic, political and social direction will be immersed in crises and will experience reversals. All this will take place within the framework of mounting regional heterogeneity, in which relations with the United States and the quality of domestic democratic governance will mark the great differences among Latin American countries.

These scenarios consider many interesting governance related driving forces including indigenous rights issues, relevant in the Guiana Shield region. There is specific mention of Brazil and potential future pathways for the country. Obviously, developments in Brazil can have major implications for the Guiana Shield.

### 2.1.3. Summary of global and regional scenarios

The great number of scenarios produced sketch a broad range of possible futures. Some of the global scenarios provide estimates of likelihood. In the case of the IPCC Global Scenarios, for example, the most realistic scenario family A1 is for that reason further developed into detailed scenarios sets.

Although predictions of scenarios are variable, there is much overlap in the underlying drivers of change. Some of these drivers such as socio-economics, poverty reduction and infrastructure development are bound to a small geographical context, whereas others like climate change affect broader areas. The Amazon scale scenarios incorporate mainly those regionally bound drivers. Generally there are two extremes of scenarios: 1. Market driven world in which environmental degradation continues; and 2. Government controlled world with great environmental awareness and sustainable solutions.

## 2.2. Process of selection of one set of scenarios for each scale

Following the review of international and national level future scenarios, the task in this stage was to arrive at a practical number of international and national scenarios out of the initial pool, which together with local community scenario work (see Section 3), would allow us to undertake a cross-scale analysis for identifying cross-scalar synergies, conflicts and worst-case futures. In order to do this, we used the consortium and advisory group members as an expert group to help distinguish which drivers were the most relevant and appropriate to the goals of the project, and then compared these results to the published data (as reviewed in Section 2.1 above).

### 2.2.1. Building consensus on the scenarios

To arrive at a practical number of international and regional scenarios out of the initial pool, we used an adapted and simplified version of the Delphi technique (Goodwin and Wright, 2009; Linstone and Turoff, 1975), an established tool for consensus-building. Its purpose is to elicit information and opinions from participants to assist planning and decision making and was an ideal technique for our project since it involved a panel of people who would participate in the process at a distance, usually by email. Using examples from well-established scenario building organisations (e.g. Millennium Project, 2012), we developed and administered a questionnaire on global and national/regional drivers to the COBRA project consortium and advisory group members. These members constitute a range of academics, practitioners and policymakers with both international and regional expertise in the field of sustainable development and natural resource management (Table 18).

Table 18. Composition of 'expert' group

Participant	Subject background	Experience background
1	Systems thinking	Academia
2	Anthropology	Academia, activist
3	Hydrology, ecosystem management	Academia, CSO
4	Health geographies	Academia
5	Environmental economics	Academia
6	Community participation, visual methods	Academia
7	Heritage and cultural studies	Academic
8	Environmental management, law	CSO
9	Environmental management	Academia
10	Environmental management	Consultancy, academia
11	Environmental management and restoration	Consultancy, CSO
12	Conservation	CSO
13	Environmental management, political economy	International government advisor
14	Development, community participation	Activist, CSO
15	Environmental security	CSO
16	Environment and political science	CSO
17	Sociology, development	Academia, government advisor

The questionnaire asked the following questions:

- How important do you think it is to stress society, technology, environment, economics, politics and values<sup>16</sup> in both global and South American scenarios of change over the next 20-30 years?;

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<sup>16</sup> This refers to the Society, Technology, Environment, Economics, Politics and Values (STEEP) model of drivers.

- Taking into account the different categories of society, technology, environment, economics, politics and values, what are your top five global drivers of change over the next 20-30 years (add new ones yourself)?;
- Taking into account the different categories of society, technology, environment, economics, politics and values, what are your top five regional drivers of change over the next 20-30 years (add new ones yourself)?

Respondents were requested to rank their answers in terms of importance and certainty and to provide explanations for their choices. Once all questionnaires were completed, data was compiled and then analysed to identify top ranked drivers.

### 2.2.2. Analyses and results of questionnaires

In order to select the scenarios that would represent the majority view about the main drivers of change, the drivers ranked first and second by questionnaire respondents were analysed first. At the same time, the qualitative comments rationalising the choice and ranking of drivers was also examined, as it provided valuable insights into the meaning attached to the drivers. Tables 19 and 20 show the top drivers selected by participants and examples of explanations for their choices. It must be highlighted that our main interest lay in the drivers that people felt were more uncertain (as described by scenario analysis) and determined the differences between scenarios. Both at international and regional scales, the top drivers of change identified by partners were 'population growth' and/or 'climate change'. Yet, most published scenario sets do not include these two drivers in their analyses as in terms of certainty they are generally considered highly certain and inevitable over the next 20-30 years (the timeframe of the analysis). Consequently, after discussions between partners, it was decided to exclude these first two top answers, and to focus our attention on the drivers that would have greater uncertainty.



Table 19. Top global drivers from questionnaire analyses, including example quotes explaining choice and ranking

Drivers	No. people ranking it 1 <sup>st</sup> or 2 <sup>nd</sup>	Explanations for choice and ranking
Overconsumption	4	<p><i>International consumption as countries become developed will continue to grow putting pressure on natural resources.</i></p> <p><i>Global sink capacities are the main limiting factor; most are at or near tipping point.</i></p> <p><i>The decrease in the rate of population growth is offset by the increase of consumption by the world populations. The externalities associated with consumption and over populations stress natural systems that provide crucial environmental services and change our environment to a degree where it may not be liveable for our society anymore.</i></p> <p><i>Disposable consumption culture must end.</i></p>
Globalisation	4	<p><i>Causes over-exploitation of world's resources/economic instability</i></p> <p><i>Main threat to loss of cultural diversity.</i></p> <p><i>A political-economic process that dominates most other drivers.</i></p> <p><i>Negative impact globally.</i></p>
Individualism	3	<p><i>Values are at the core of all our decisions and increasing individualism leads to many problems and hampers finding solutions for global problems.</i></p> <p><i>'Values' is for me by far the most important factor which drives progress. Indeed, this very exercise in ranking is a good example of how 'values' determines choice. In South America, and with indigenous communities in particular, the greatest challenge that they have faced is a confrontation between their traditional value systems (holistic, Earth centred, cooperative) and the value systems of the West (reductionist, anthropocentric, individualistic, competitive). Scenarios should certainly reflect the dominance of different value systems. Will it be more of the same in the future, or, will we rapidly evolve a new value system?</i></p> <p><i>I think that if the dominant value at the global level, if the value that is actually favoured, is "survive the fittest", individual development at the possible expense of others (other countries, other people), it can possibly drive to the worst-case scenarios.</i></p>
Bad Governance	2	<p><i>Big risk for everything going wrong.</i></p> <p><i>I would argue that this is a "values" issue rather than a "politics" one, and a subset of the individualist/egalitarian gradient. Bad governance is a result of an extreme in individualism.</i></p>
Geopolitics	2	<p><i>Political decisions (considering economics, social, environmental etc factors) control the key priorities of governments (which may not be the same as other global players). Dominant powers are concerned about their sphere of influence. Chinese regime may collapse.</i></p>

Table 20. Top regional drivers from questionnaire analyses, including example quotes explaining choice and ranking

Drivers	No. people ranking it 1 <sup>st</sup> or 2 <sup>nd</sup>	Explanations for choice and ranking
Mining	6	<p><i>Including oil, gas &amp; energy generation infrastructure.</i></p> <p><i>As already explained under Question 1, and described in WP2 gold mining is currently the most important driver change in the GS. The second one is bauxite, especially in Guyana and Suriname, and it seems that the Chinese are now also looking for manganese in Southern Suriname.</i></p> <p><i>Expansion of foreign mining companies.</i></p> <p><i>Mining is one of the greater factors in the region's exploration and will increase in importance as congress creates the regulatory framework for allowing mining in indigenous territories.</i></p>
Bad Governance	5	<p><i>Non-transparency of the political system leads to corruption and lack of accountability and lack of law enforcement (police/army etc).</i></p> <p><i>I think bad governance is one of the key drivers of change for the next decades at the regional level. I believe that with good governance even the toughest environmental situations can potentially be handled. Furthermore, even with the best political intentions, these cannot be effective if there is no good governance.</i></p> <p><i>Due to bad governance mining, oil and gas and expansion of biofuel crops risk to deteriorate the regional system.</i></p> <p><i>The lack of governance in the region will make it vulnerable to degradation of its natural resources whether through uncontrolled extraction of timber, mining or through the creation of roads into its interior.</i></p>
Ecosystem loss and degradation	4	<p><i>Pressures of supply and demand: Global trade (logging&amp; mining). A potential disaster, given the natural wealth in the area.</i></p>
Infrastructure, urbanisation	3	<p><i>Driver of deforestation.</i></p> <p><i>The building of roads, railroads, bridges, hydropower stations and the diversion of rivers to "feed" the hydropower lakes, and transmission lines the GS, are and will be major drivers of change. This infrastructure is associated with the transportation of the minerals mentioned below and with the need of Brazil to transport its agricultural products to the Caribbean ports.</i></p> <p><i>Access roads, large-scale incursion.</i></p>

The analysis of the global ranking and associated statements shows the following:

- Overconsumption is not only about "Economics". In people's minds, it is in fact highly linked to its environmental impact, with a certain focus on ecosystem services. This

suggests that scenarios should particularly focus on preservation of ecosystem services and/or on the link between economic growth and environmental protection;

- Globalisation is tightly linked to over-consumption and production, although it is presented as a threat to cultural diversity as well;
- Values/Individualism are drivers of human decisions;
- Bad governance is highly linked to values, therefore it was decided to link it to “Values” in the final set of drivers chosen by participants;
- Geopolitics only has two voices, therefore is not necessarily a priority for the choice of scenarios.

The analysis of the regional ranking and associated statements shows the following:

- Mining is linked to a globalised market and policies to control it. It also links to the more general theme of extraction of natural resources, ecosystem management and land use.
- Governance is mostly related to its impact on natural resources.
- Ecosystem loss is presented as a consequence rather than a driver, and is closely linked to the theme of natural resources extraction, particularly mining. Therefore it was decided to link it to “Mining” in the final set of drivers chosen by participants
- Infrastructure, urbanisation is focused on big infrastructures, such as dams, threatening the natural environment rather than urbanisation.

### 2.2.3. Linking questionnaire results to published scenarios

Using the results from the questionnaires, the next step was to compare the ranked drivers, and their attached rationale, to scenarios viewed in Section 2.1. Tables 21 and 22 show the drivers chosen by questionnaire respondents in the columns, and the reviewed scenarios in rows for the global and regional levels. A scoring system was used to assess the degree to which identified drivers were present in the published scenarios. This proved challenging, as some drivers were very specifically mentioned in the scenarios whereas in others, the importance was more implicit. Therefore, a score of 2 was given when the driver was explicit and 1 when the driver was present in the narrative but in a more embedded and implied nature. The tables show that there are no scenarios that exactly match the respondents’ views. The option of combining the different set of scenarios was considered. However, each set of scenarios, at the global and regional level, was built according to a different methodology and different logics, so combining them would have meant mixing different approaches, thereby making them less valid.

Table 21. Comparison between questionnaire responses and scenario sets at global level, where a score of 2 indicates explicit mention and 1 indicates implicit mention of the driver in the scenario narratives

	Overconsumption / Ecosystem management and land use	Individualism	Globalisation	Geopolitics	Total score
MA	2		2		4
Millennium Project Global Energy Scenarios	1	1		2	4
IPCC SRES	1	1	2		4
Global Environmental Outlook 4	2	2	1		5
Global Environmental Outlook 5	2	2			4
Millennium Project Global Exploratory Scenarios			2		2
Costanza Scenarios		2			2
World Business Council for Sustainable Development		1	1		2
Shell Scenarios			2		2
Global Biodiversity Outlook 3	1				1

Table 22. Comparison between questionnaire responses and scenario sets at regional level, where a score of 2 indicates explicit mention and 1 indicates implicit mention of the driver in the scenario narratives

	Mining / Ecosystem loss	Governance	Infrastructure	Total score
GEO Latin America 2010	2			2
GEO Amazonia	1	2	1	4
SIM Amazonia		2	2	4
Millennium Project Latin America		1		1
IPCC Latin America			1	1
NIC Latin America 2020		2		2
CREAS Scenarios				0
Caribbean Climate				0
UNDP Climate Change				0

Nevertheless, the comparison of drivers and scenarios using the scoring, allowed us to identify scenarios that strongly integrated at least two of the questionnaire drivers. At the global scale, this includes the Millennium Ecosystem Assessment (MA)<sup>17</sup> (2005) and the GEO<sup>18</sup> group of scenarios. The MA Scenarios take 2 out of the top 4 drivers quite strongly into account, but Individualism (Values) is only very vaguely touched upon in the expression of scenarios. The GEO4 (2007) and GEO5 (2012) both do not explicitly take Globalisation into account, although it is strongly implied in its Economic and Social drivers, in terms of levels of intervention. GEO4 therefore take 3 out of the top 4 drivers quite strongly into account.

Table 22 shows that GEO Amazonia and SIM Amazonia are the two scenario sets that best represent the respondents' views. SIM Amazonia has strong scores for 2 out of 3 drivers.

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<sup>17</sup> Note that the MA scenario creation was a participatory process involving nearly 2000 international experts.

<sup>18</sup> Note that the GEO scenario creation is a bottom-up participatory process, linking scientists and politicians, 100 governments and 50 partners. In the case of GEO5, it involved 600 scientists nominated by their governments.

However, it does not integrate the top driver of Mining (Ecosystem loss). The GEO Amazonia takes into account all 3 drivers.

#### 2.2.4. Global and regional scenarios for cross-scalar analysis

The results of our analyses show that overall there are no clear scenario sets that match or reflect the results of the questionnaire results. However, the questionnaire scores, together with the accompanying qualitative comments, indicate that at the global scale, the GEO scenario sets are more representative of the priorities of the COBRA project. This is especially so for GEO4 which covers all of the COBRA top three drivers. Therefore, at the global level, the GEO4 scenario sets were used for the cross-scalar analysis. At the regional level, the GEO Amazonia scenario sets were the most representative of COBRA objectives and were therefore used for the cross-scalar analysis.

### 3. Future scenarios at national and local scales

In order to assess the relevance and potential impact of the regional and global scenarios outlined in Section 2, to the realities of the indigenous communities living in the Guiana Shield, it was necessary to study local and national level scenarios. Working in Guyana as a case study, first a review of the literature was carried out to identify any published scenarios for the country. This found that, at the national level, there were some very context-specific scenarios, for example, climate change and its impacts on the coastal/urban regions (e.g. Bovolo et al., 2009; ECA, 2009; ECLAC, 2011; McSweeney et al., 2012), but there are no scenario studies that brought together a range of expertise and opinions from across the social and environmental disciplines, to develop potential futures. In addition, there were no scenario sets developed at the local levels, let alone by indigenous groups. It was therefore decided to organise a scenario workshop at the national level and another with the COBRA case study community in the North Rupununi.

#### 3.1. Participatory scenario workshops at national and local scales

We used a participatory approach to develop scenarios at the national and local levels ( see for example, Berkhout et al. 2002, Hulse et al. 2004, Kok et al. 2007, Patel et al. 2007, Enfors et al. 2008, Bohensky et al. 2011, Kok et al. 2011). Our view was that a participatory scenario process could provide a platform for dialogue among different interest groups, learning amongst participants and help develop shared visions to address sustainable development challenges (Johnson et al., 2012).

##### 3.1.3. Participatory scenario workshop in Georgetown, Guyana

A workshop on the development of future scenarios for Guyana was held in May 2012 Georgetown, Guyana. Over 30 participants representing a combination of government agencies, non-governmental organisations, academics and independent consultants attended the two day event facilitated by the COBRA team. Working in four groups broadly classified as environmental scientists, indigenous representatives, government bodies and government ministries and using the methodology outlined in Section 1.3, participants were asked to reflect on the current drivers important for the future of Guyana and what Guyana would look like in the future (next 20 years). Possible drivers and trends could be identified using the STEEPV (Society, Technology, Economy, Environment, Politics and Values) framework or groups could use their own methods to identify key drivers. Groups were also asked to say if the key factors identified would lead to positive or negative developments.

Once drivers had been identified, groups were asked to rank them on two scales: (a) level of uncertainty and (b) level of importance. The groups were then asked to determine two drivers (from within their derived lists) that they considered to be the most important for the future of Guyana but that also had high uncertainty in potential futures. Using these two drivers, four possible scenarios were developed. However, with limited time, each group described at least two of the four scenarios identified. The whole process and results of

different stages of the scenario development process are explained in depth in Davis et al. (2012). The main scenarios developed are described in Section 3.2.

### 3.1.2. Participatory scenario workshop and consultations in the North Rupununi, Guyana

In the North Rupununi, Guyana, a future scenarios workshop took place in May 2012 and was attended by 32 women, men and youth members of the sixteen communities that comprise the North Rupununi District Development Board (NRDDB)<sup>19</sup>. In this local level workshop, a slightly different approach to developing scenarios was undertaken compared to that at national level. In 2007, the Darwin Initiative funded Wetlands Project<sup>20</sup> had facilitated a visioning workshop in the North Rupununi, where participants put forward their visions for the North Rupununi's future within a 10-15 year span. The results from this 2007 workshop were used as the basis of discussions at the COBRA scenarios workshop. Participants were tasked with examining the situation in 2007 to see what had changed, which visions for the future had come through, what visions were still relevant and what new visions they wanted to add. Using the methodology outlined in Section 1.3, and carried out in the same focus groups as in the 2007 workshop, participants were also asked to identify what issues they were uncertain about that could affect the future of the North Rupununi. The groups were composed of men, women and youths, groupings that would allow participants to honestly present their knowledge, perspectives, and needs, without being influenced by community power relations (Wollenberg et al., 2000; Rawluk and Godber, 2011). Using the two most important but uncertain drivers, four possible scenarios were developed. However, with limited time, each group described at least one of the four scenarios identified, and storyboarding was used as a technique to develop the narration for each scenario. The whole process and results of different stages of the scenario development process are explained in depth in Jafferally et al. (2012). The main scenarios developed are described in Section 3.3.

During the workshop, all activities and discussions were recorded using video and photos. Following the workshop, participatory films and photostories were developed about the local scenarios and then through two cycles of community consultations in sixteen villages, the scenarios were presented by the Guyana COBRA community researchers to wider community members for feedback. The final participatory video films and photostories are available on the COBRA Project Media Gate at <http://projectcobra.org/category/media>.

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<sup>19</sup> The NRDDB is the indigenous association representing the case study community in the North Rupununi and is a partner of the COBRA Project. For more information about the NRDDB, please see here: <http://projectcobra.org/macushi-wapishiana-people/>

<sup>20</sup> Formal title of the project was Sustainable management of the Rupununi: linking biodiversity, environment and people. UK Government (DEFRA) Project Reference Number: 162/12/019. More information can be found here: <http://darwin.defra.gov.uk/project/12019/>



## 3.2. National level COBRA scenario results

### 3.2.1. National scenarios developed by environmental scientists

Although the group identified a range of ecological, social and political drivers, for the purposes of building the scenarios, the drivers of renewable energy and natural resource management (categorised under man-made disasters) were chosen as scenario logics and were used as axis points in the development of scenarios. Only one scenario is discussed here, although this group did briefly present all four scenario logics.

#### What if good natural-resource management practices dominated and there was a low dependence on fossil fuels?

This is the ideal position whereby there would be, by 2030, a commitment to renewable energy technologies, such as hydro-power, wave energy, geothermal energy and solar power) and their implementation. Capacity building and training at all levels would occur and there would therefore be incentives for companies to retain their trained staff. This would lead to less emigration and to greater in-country benefits. Public campaigns and incentives would increase national awareness so that energy efficiency would increase at the household and community level. Due to good natural resource management and effective use of resources, Guyana would be better off financially leading to better infrastructure development. The government would be accountable for its actions and would therefore govern wisely. There would be a general uptake of new technologies and new facilities for waste disposal and recycling. Wise investments would maximize the sustainability of resources and would foster innovation, therefore research and technological developments would increase. Unknowns which could alter the applicability of this scenario include the discovery of oil and gas, high energy tariffs and non-receipt of Low Carbon Development Strategy<sup>21</sup> payments for ecosystem services.

### 3.2.2. National scenarios developed by indigenous representatives

The two drivers identified by the indigenous representative group that were of high importance but low certainty were oil and community spirit. In terms of oil, the group felt that although exploratory concessions had already been given and some drilling activities had taken place, there was still considerable uncertainty about whether oil in profitable quantities and location was available, and that if oil was found, the potentially profound changes in Guyanese society and environment. The group also strongly articulated the individual versus community nature of Guyanese culture. They felt that in the past, people were much more community spirited and worked collectively to achieve their goals. They spoke about changes to society where people were becoming selfish and reluctant to help others around

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<sup>21</sup> LCDS - Low Carbon Development Strategy developed by the Government of Guyana to promote a green economy and payment for ecosystem services. For more information visit [www.lcds.gov.gy](http://www.lcds.gov.gy)

them. As a group, they saw a great deal of uncertainty in whether a future Guyana would be based on individual or community values.

#### Scenario A – What if Guyana does not find oil and individualism dominates?

By 2030 in this scenario, Guyana would be completely dependent on oil imports. The high price of oil has led to key sectors, such as the private sector, individual business and foreign investors, dominating the oil import market, especially those living close to national border areas. In these same areas, illegal fuel smuggling by criminal gangs prevails. With the increased cost of living, the government is forced to give ease of accessibility through subsidies, but favours those politically aligned with them. This allows political and ethnic divisions to become entrenched in society, leading to civil unrest and local interior communities aligning themselves with bordering nations/communities (Brazil, Suriname, Venezuela). Loss of human capacity and skilled workers to other countries continues, leaving those behind to accept inadequate low paying jobs. Inadequate investment in education and healthcare means there are more school dropouts, the University of Guyana has closed, there are no staff to run major hospitals and there is an increasing ageing and morbid population. The government has increased production and export of minerals and timber to generate revenue and many communities in the interior are overrun by illegal miners and loggers, as well as irreversible environmental degradation. In some areas, there are hydro, bio-fuel and renewable energy projects, but these are generally dominated by private business.

#### Scenario B – What if Guyana does find oil and individualism dominates?

By 2030 in this scenario, Guyana is a divided country of the rich and poor. The discovery of oil and its associated income has led to large financial benefits for the elite and those politically aligned with the government. There is little transparency and accountability of the oil income, while at the same time, investment in sectors such as education, technology, tourism, infrastructure, transport, agriculture and policy reform are neglected. People lack motivation to work and a vibrant black market in goods has emerged. There have been drastic changes in cultural life where prostitution, crime, drugs and human trafficking are norms and people live in ghetto-like districts or in fenced communities. Communities living in close proximity to oil industries, wells or worksites depend entirely on those activities for their livelihoods, and abandonment of traditional lifestyles has increased health problems and cultural loss. In other areas, illegal mining and logging continue and here there is little law enforcement or government intervention, leading to slum communities. Waste disposal issues and oil spills are regularly in the news, but although irreversible ecosystem change is occurring and the international community raises its concerns, the government is self-centred, and has poor relations with its neighbours and Caribbean Community countries. There are small protest movements, but mainly underground and through the Internet, as any protest gatherings are quickly stamped out through police force.

#### Scenario C – What if Guyana does find oil and community spirit dominates?

By 2030 in this scenario, Guyana has realized its motto of 'one people, one nation, one destiny'. The income from oil exports means there is more money to invest in key sectors such as education, infrastructure and healthcare. The University of Guyana is now the Caribbean hub for research and development activities and boasts world-class educational

and research facilities. Communities in the interior regions have greater access to vital services and markets. The economy is able to diversify, and technology plays an increasingly important role as a service industry. Advocacy and organised pressure groups demand accountability and stewardship of oil income, and civil society organizations sit on all levels of government hierarchy and decision-making. Specialist groups with representation from all sectors of society have been established to effectively manage and monitor oil extraction activities and the companies responsible. This ensures that environmental issues are at the forefront of government policy and that any waste and spill problems are dealt with quickly and effectively. In addition, while mining and logging activities continue, they are also closely monitored. This all attracts tourists to the country and there is an increasing influx of skilled Guyanese migrants back to their homeland.

### 3.2.3. National scenarios developed by government body representatives

The two drivers of change that were considered by government body representatives as the most important and uncertain for Guyana's future were both governance-related. This underlines how much the group felt that the country's future depends on the continuity and effective enforcement of policies, and on transparent and accountable government institutions. These two governance drivers were taken as the axes for the development of alternative scenarios.

#### Scenario A – What if Guyana has transparent governments and continuity in policies?

The stable governance context allows for the development of PES (Payments for Ecosystem Services) schemes, with considerable payments in the coming decades by countries that want to compensate their high carbon emissions. Sustainable forest management becomes the rule in Guyana and deforestation, land degradation and biodiversity loss remain very low. There is consistency in Guyana's energy policy that moves away from fossil fuels towards renewable and greener sources. Mining continues, but under reduced-impact conditions and with environmental and social safeguards in place. Increased government investment in education leads to stronger institutions and higher education levels, and to a reduction in the brain drain. Government investment in infrastructure also increases, but based on sound land use planning. This improved infrastructure makes the country more attractive to powerful foreign investors in search of land and natural resources.

#### Scenario B – What if governments are not transparent and there is no continuity in policies?

The lack of continuity and transparency in government policies leads to growing exploitation of natural resources (timber, agriculture, mineral resources) by foreign companies, with little control by government agencies. As a result, land use changes rapidly in some regions, and the rates of deforestation and land degradation increase. These foreign companies do create employment opportunities, but foreign workers compete with Guyanese. With government conditions not favouring innovation and a long-term vision, the country remains dependent on fossil fuels and the implementation of environmental policies is poor. The potential to benefit economically from ecosystem services is hardly utilized and Guyana loses its pioneer position. The lack of innovation leads to a decreased awareness of best practice techniques in resource exploitation and to the use of outdated technologies that

affect Guyana's competitive power on the regional and global markets. Since investment in sound land use planning is low, infrastructure development does not consider the need and opportunities to adapt to climate change. The consequences are a loss of agricultural potential, loss of biodiversity and unstable food security. Government policies do little to address the inequitable distribution of resources and wealth, which leads to increased poverty.

#### 3.2.4. National scenarios developed by government ministry representatives

For this group, drivers which were classed as having high importance and low certainty of occurrence included oil production and agricultural diversification. It was felt that if oil was found in Guyana, this could bring substantial economic benefits and reduce Guyana's reliance on foreign imports. However, although neighbouring countries to Guyana are oil producers, it is at this moment highly uncertain if petroleum resources will be found in Guyana and to what level. Although the exploratory wells are currently being drilled, no reserves have been found to date.

Agricultural diversification would be beneficial for Guyana as it would reduce Guyana's dependence on importing food supplies and would increase export markets. Diversification here was not intended to suggest an expansion of Guyana's agricultural lands but rather increase levels of diversification in already existing agricultural lands such as sugar fields, where the markets have been decreasing.

#### Scenario A – What if Guyana finds oil?

The prospect of finding oil in Guyana is highly uncertain but if it is found it would have a huge impact in Guyana. There are currently oil companies digging exploratory wells offshore however deposits of oil have not yet been found. Assuming oil was found tomorrow, by 2030 positive impacts would include the creation of new training and job opportunities and emerging industries. There would be an influx of foreign exchange following foreign investments and a rapid increase in disposable income. Investment by the oil companies and other associated industries would lead to improved transport and communication infrastructure. Additionally, as oil companies usually bring benefits to the local area when they are established in a country, there may be improvements and expansion of education facilities and improvements in availabilities of green technologies. Generally, there would be an improved standard of living leading to less emigration, and a potential re-introduction of Guyana's diaspora.

Negative impacts may occur however, through environmental disasters such as oil spills, and there would be general increases in pollution levels. Guyana's 'green' status may also be negatively affected due to the rapid, high release of carbon from the burning of the fossil fuels, leading to a 'carbon-spike' in Guyana's carbon quota. This may negatively impact Guyana's Low Carbon Development Strategy and affect potential Payment for Ecosystem Services mechanisms and carbon trading budgets. Social values would be negatively impacted due to the rapid increase in disposable income leading to 'social ills' such as prostitution, gambling and alcoholism. Family units would also be disrupted as (traditionally) males would be working away from the family for large amounts of time on oil rigs. Although

the oil industry would introduce new skills to Guyana's workforce, other industries, such as mining or agriculture, may find that there are insufficient workers for their needs.

### Scenario B – What if Guyana increases its agricultural diversification?

Currently, large sections of agricultural land on the coast are used for sugar and rice production, however the sugar industry is no longer profitable and agricultural land is either going fallow or handed over to new housing schemes. Aiming for agricultural diversification rather than mono-culture, would enable Guyana to produce its own food and lower its reliance on food imports giving it food security. It may also be able to export various food items to the rest of the Caribbean and the world leading to increases in GDP. The introduction of new technologies could increase production levels and establish a new knowledge base. Agroforestry would also be established and cleared lands would be rehabilitated or re-vegetated thereby establishing a more productive land use. Agricultural diversification would lead to a rebirth of a cooperative spirit amongst the population and improvements in transportation networks. Negative impacts would be relatively low as most of the land would already have been used for agricultural purposes, however some deforestation or degradation of forested land may occur with associated disruptions of ecosystems if agricultural expansion were to happen.

### 3.3. Local level COBRA scenario results

#### 3.3.1. Local scenarios developed by women

For the women, their key concerns and uncertainties lay around the continuation of the NRDDDB as an institution and the kinds of values people had in the future. Using these, they developed three scenarios as follows:

##### 1. Conflict and Divide

If the NRDDDB failed in the future, the women's group predicted that the communities would go their separate ways as seen in Figure 7. This means they would have to deal with issues on their own and there would be less representation at the national level. With no guidance, churches and political parties would now play larger roles in community development and could cause division with their different opinions. Areas such as natural resource management and promoting culture would fall to the wayside and greed and selfishness could become the new norm. There would be few opportunities developed for people, especially women, and this would increase the migration rate to Brazil and to the mining areas. Without an NRDDDB there would not be a Radio Paiwomak (the local radio station which serves many of the 16 local communities) for centralised communication, there would not be Bina Hill Institute for training and there would be little support for the local secondary school. The threats from big companies coming in and setting up operations without consultations would increase and so would conflicts between communities who may support such ventures. In other words there would be division and conflict among the communities.

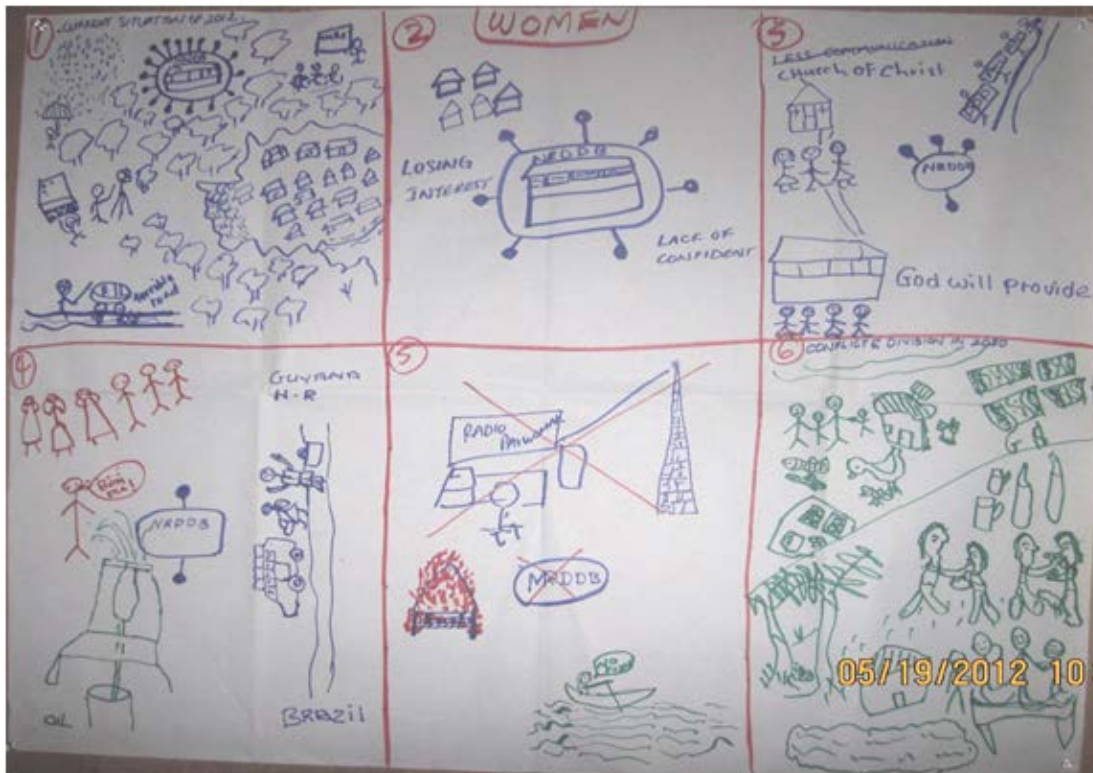


Figure 8. Storyboard of women's Scenario 1 Conflict and Divide

## 2. Blackmail, Corruption and Bribery

Represented in Figure 9, what would happen if the NRDDDB became more associated with a political party? It would lead to "Blackmail, Bribery and Corruption". While there may be positives from having such an association, such as more money and more employment, the negatives would mean more alcohol in communities, the rise of prostitution and increases in trafficking of persons. While there would be support in time of crises, communities may fight more among themselves, as those who support a particular (ruling) party may benefit more. This would mean that those communities may become more financially developed. To become more political would mean that the NRDDDB would become less self-ruling, there would be less transparency in decision making and in the allocation of jobs. There would be more of a leaning towards bribery as community leaders would be pressured into following the desires of their party. There would be an increase in crimes and favouritism within the NRDDDB. There would also be weak leadership both at the Board and community level. As this happens, the results would be over-harvesting of natural resources for short term gain, social values would continue to break down and there would be less safe guards. Large companies would move in as state lands are allocated to Brazilians and the Chinese on a larger scale. This would lead to pollution and changes in the wetland ecosystem from these operations. With the influx of money, peoples' diet would change as they would have little time to farm.



Figure 9. Storyboard of women's Scenario 2 Blackmail, Corruption and Bribery

### 3. Self-sufficiency of the NRDDB

NRDDB is self sufficient! This scenario explores the NRDDB becoming a self sufficient entity in 2030. The NRDDB would now have the financial security to retain technically trained staff to carry out their work especially providing opportunities for the young people of the North Rupununi. Being self sufficient, the NRDDB would provide more representation and have a stronger negotiating position. They could promote and support a number of activities for communities, such as helping small businesses to develop, securing markets for North Rupununi made products, especially in Lethem and Brazil, and they would be able to self-promote North Rupununi tourism. Without dependency, the NRDDB could help to provide more safe guards for community resources. There would be more enforcement of rules as a biodiversity monitoring system would be in place. There would also be a more efficient way to deal with emergency situations. A more capable NRDDB would promote gender equity at the Board and community level. There would be more opportunities for women and the promotion of traditional practices both in public and private traditional based institutions. This may bring some conflict with the churches for promoting traditional beliefs. A self sufficient NRDDB would be a model for Guyana and the world as shown in Figure 10.



Figure 10. Storyboard of women's Scenario 3 Self Sufficiency of the NRDDB

### 3.3.2. Local scenarios developed by men

For concerns and uncertainties for the men were about mining, specifically oil, and issues of governance. Using these, they developed a narrative outlined in the storyboard in Figure 11 and as follows. If oil was discovered and developed in the North Rupununi what would the communities do? What would be the impacts? From a social stand point, it was believed that there would perhaps be less unity among communities and an increase in greed. In addition, with more money circulating there would be more alcohol, increase in drugs and prostitution. Who would get the jobs? Would training be provided for local persons? Would the administration of the operations be manned only by outsiders? For the technological aspects, there would be both positives and negatives. Communication would improve and there would be regular electricity but with this would come changes in local lifestyle and culture. Depending on the technology used in the refining process, there could be pollution and waste products to be disposed. This would have an impact on the ecology of the wetlands and contribute more to climate change. On the economic side, it would mean more money in and around the North Rupununi. There would be a reduction in fuel costs but the prices for food would increase with less people farming and higher demand in shops.

With oil development, benefits from the LCDS would reduce and communities may lose negotiation power as the District would no longer be operating on a green economy platform. From the political side, what would the negotiation and agreement between the company, Government and the communities be like? Would the communities through the NRDDB be invited to the negotiating table? Would the process be fair and transparent or would there be bribery and avoidance of free, prior and informed consent? With the finding and development of oil, values would be affected. There would be changes to the community



way of life. There would be improvements in infrastructure, but villagers may continue to lose their language and other cultural practices, the communal way of life would go, the way people dress would change, respect for elders could change, religion would have more influence on people, the rights to land and resources both human and natural maybe affected as there is more development. To counter act these changes and answer some of the questions, it was felt that communities would need to become more familiar with the laws governing oil exploration and development in Guyana. From an NRDDDB level, all communities should come to a level of agreement for better negotiating power. There should be an environmental impact assessment done that would help to answer community concerns. Communities should agree to a benefit sharing agreement that would be proposed to the Government and the company and discuss any other assistance the communities would like. There should be shared governance and transparency; locals should be involved in the whole process so that there is a sense of ownership of the venture. The technology used in the operations should be low impact.



Figure 11. Storyboard of men's Scenario of Oil Discovery and Development

### 3.3.3. Local scenarios developed by youth

One of the key concerns of the young people in the workshop was the lack of opportunities in the region and local governance. They expressed these uncertainties in the form of recreational facilities for youths in the communities. The youths saw three possible outcomes to their uncertainties:

#### 1. Having a recreation facility and it functioning well

In this scenario (Figure 12), the youths are successful and were able to build their recreational facilities. With the recreational centres in place, the youths would be happy, they would become more involved in other activities and there would be better representation in community activities. As a consequence, youths would be more disciplined and involved in

activities that generate income. Youths would be encouraged to develop their athletic skills and could represent the North Rupununi at sporting tournaments at national and international levels. Having exercise equipment would promote more active and healthy youths and elders.

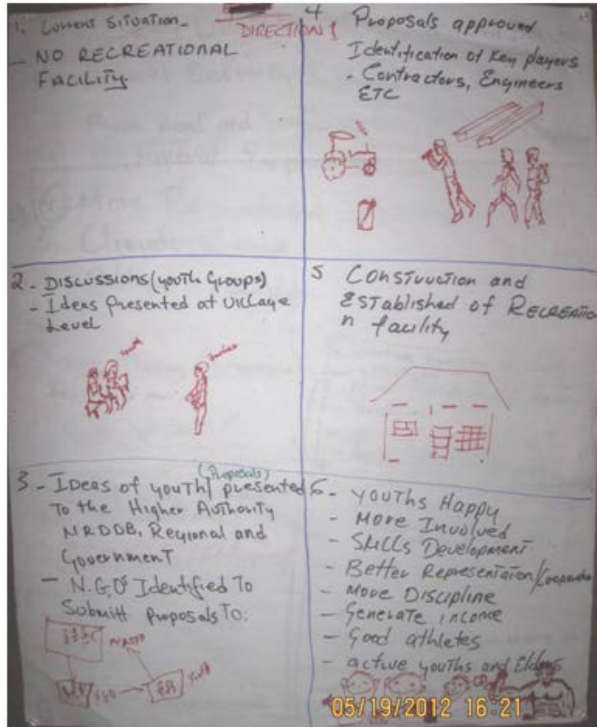


Figure 12. Storyboard of youth's Scenario 1 Completion and use of recreational facilities that will improve discipline among youths

## 2. Not having a recreation facility

The second potential future scenario is that there is little interest in the needs and desires of the youths (Figure 13). Their proposals are not accepted and funding is not obtained to build the recreational facilities. This would result in youths getting involved in criminal activities such as stealing, drugs, guns and rape; human trafficking would perhaps increase, there may be sex abuse and increases in teenage pregnancies. More youths may migrate to Brazil and the mining areas. In general, their lives may stay the same or become worse.

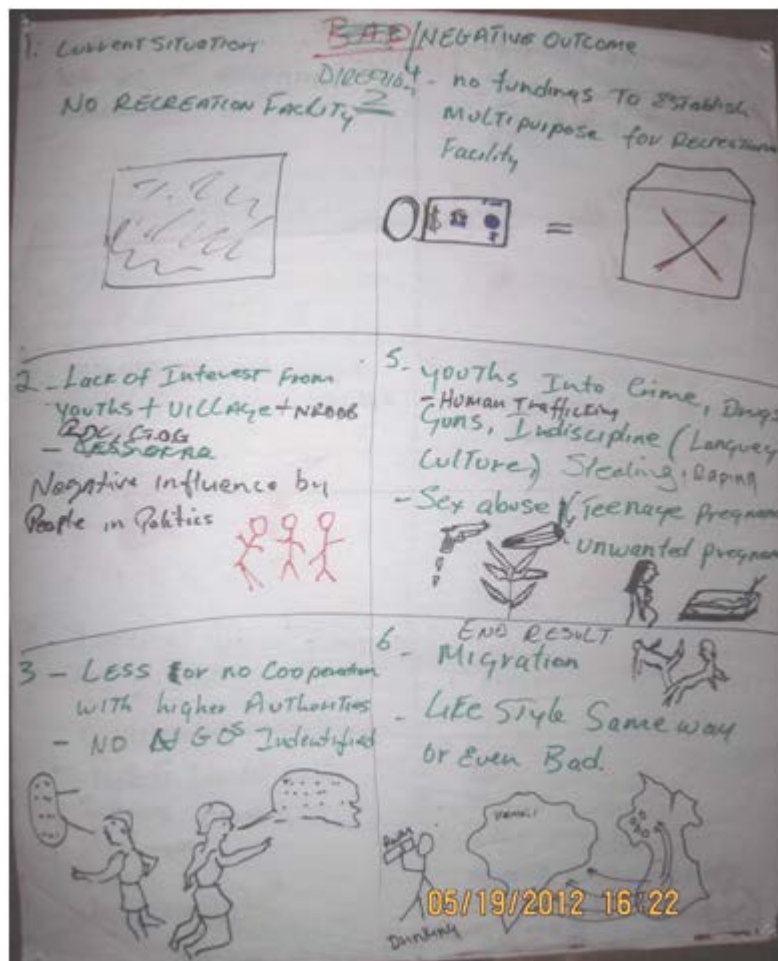


Figure 13. Storyboard of youth's Scenario 2 Recreational facilities are not built.

### 3. Having a recreation facility and it failing

The third potential future would be that there would be enough interest to find funding for the recreational facilities. However, as progress is made, interest is lost by the key players. There is poor management, poor governance and lack of communication. This would result in the facilities not functioning properly and money and time would have been wasted as shown in Figure 14.

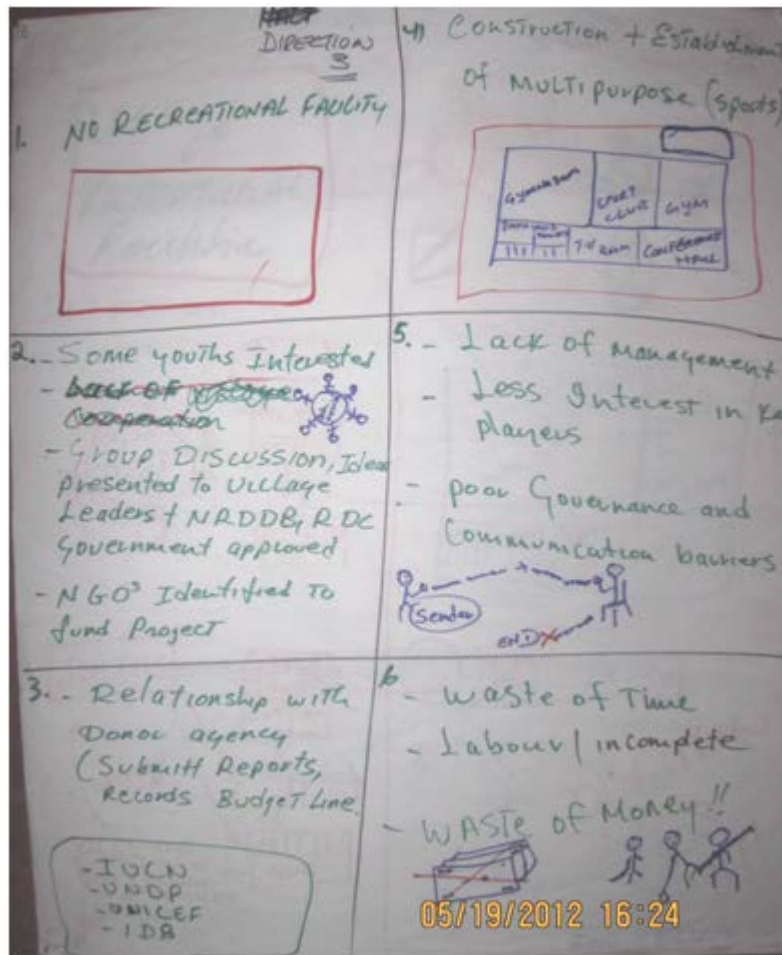


Figure 14. Storyboard of youth's Scenario 3 Development of the recreational facilities but failing

### 3.4. Conclusions on development of local and national scenarios

Diverse groups developing the scenarios at different levels emphasised discrete drivers, yet there was also a degree of correspondence in the themes of the drivers. Governance, whether it be through local leadership or government policies, features highly, as does resource extraction, namely in the form of mining. Values are also identified as critical, especially for the indigenous groups. Further discussion on scenario development at the national and local levels can be found in Section 5.

## 4. The cross-scalar analysis

The cross-scalar analysis involved comparing and contrasting the selected scenarios at international, regional, national and local scales, in order to identify plausible multi-scalar scenarios and understand how they interact. One of the objectives was to identify virtuous and vicious cycles amongst different scales where developments feedback to make situations worse, better or counteract change at other levels. The other objective of the cross-scalar analysis was to compare the indicators of social-ecological viability collected in the initial stages of the project<sup>22</sup> to these worst to best case scenarios, in order to extract the most valid and useful community-owned best practices which will be later disseminated in the Guiana Shield<sup>23</sup>.

### 4.1. The process of cross-scalar analysis

In order to be able to compare and contrast the scenarios from the different levels, we first identified the key drivers of change underlying in each scenario and then classified these key drivers of change into overarching themes and scales. This was an iterative process involving much time and discussion. Once a final classification of drivers was agreed upon, information was synthesised into one single matrix. This then allowed the classification of the scenarios according to the major overarching themes to identify the synergies and conflicts. Further details are given below.

#### 4.1.1. The identification and coding of drivers of change

In the GEO4 Global report the key drivers of change, as well as the trends for each driver, were clearly identified within the actual report. This enabled us to easily identify what trend characterised each scenario according to the key drivers. This was verified by carefully reading through the narratives and cross-checking the drivers identified. However, in the regional, national and local scenarios, such clear articulation of the drivers was not present. Thus, our method consisted of reading through each scenario narrative thoroughly, identifying the key drivers and the associated trends that were being mentioned, and cross-checking across different scenarios within the same set (Table 23). This step of the analysis led to the building of four databases, one for each scale<sup>24</sup>.

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<sup>22</sup> See COBRA Report on Cross Scalar Actions and Compatibilities at <http://projectcobra.org/report-on-cross-scalar-actions-and-compatibilities>.

<sup>23</sup> See COBRA website for different stages of the project: <http://projectcobra.org/research>.

<sup>24</sup> These tables are available on request

Table 23. Data present for each scenario database

Scenario sets	Scale	Number of scenarios	Number of drivers
GEO4 Global	International	4	21
GEO Amazonia	Regional	4	16
Guyana Scenarios	National	8	38
North Rupununi Scenarios	Local	8	26

#### 4.1.2. Mapping out the drivers through a grounded theory process

The first step leading to the cross-scalar analysis consisted of identifying overarching themes within the drivers. Similar to the cross-scalar analysis of social-ecological system viability in prior stages of the project, a visual mapping exercise was carried out to organise all 101 scenario drivers according to emergent themes. The approach adopted for the visual mapping exercise was inspired by Grounded Theory (Charmaz, 2006) where no *a priori* hypothesis was in place before the mapping exercise took place. All drivers were formatted according to the structure presented in Figure 15, printed out and cut into individual pieces of paper.

<b>GEO4 Global</b>	<b>Markets 1st</b>
Dominant scale of decision making → International	
<b>GEO4 Global</b>	<b>Policy 1st</b>
Dominant scale of decision making → International	
<b>GEO4 Global</b>	<b>Security 1st</b>
Dominant scale of decision making → National	
<b>GEO4 Global</b>	<b>Sustainability 1st</b>
Dominant scale of decision making → None	

Figure 15. Example of format of drivers for coding process.

Mapping<sup>25</sup> commenced with the local drivers of change, where drivers sharing similar themes were grouped together. This was followed by national drivers, and then regional and international level drivers. The aim was to arrive at a coherent set of cross-scalar themes which could be easily identified by a non-academic audience. The process was carried out by three COBRA researchers and involved extensive discussions, together with iterative mappings (Figure 16). Following three cycles of analysis, an agreed final classification was produced within which 14 themes were identified<sup>26</sup>. These were: Values; Participative Democracy; Corruption; Public policies; Social policies; Environmental policies; Cohesion with other communities; Dominant stakeholders; Dominant scale; Markets approach; Investments in infrastructure; Approach to innovation; Energy; and, Aid (Figure 17). The themes that were mentioned mostly at the local level can be found more towards the centre of the diagram (e.g. 'Cohesion between communities' or 'Corruption'). The themes that are closer to the margins of the diagram are the themes that were mostly mentioned at the highest levels (e.g. 'Markets approach', 'Aid'). However, it must be noted that the theme of 'Values' crosses all scales, which is why it stands on its own on the top right of the diagram. This diagram shows that themes related to governance are in great majority.

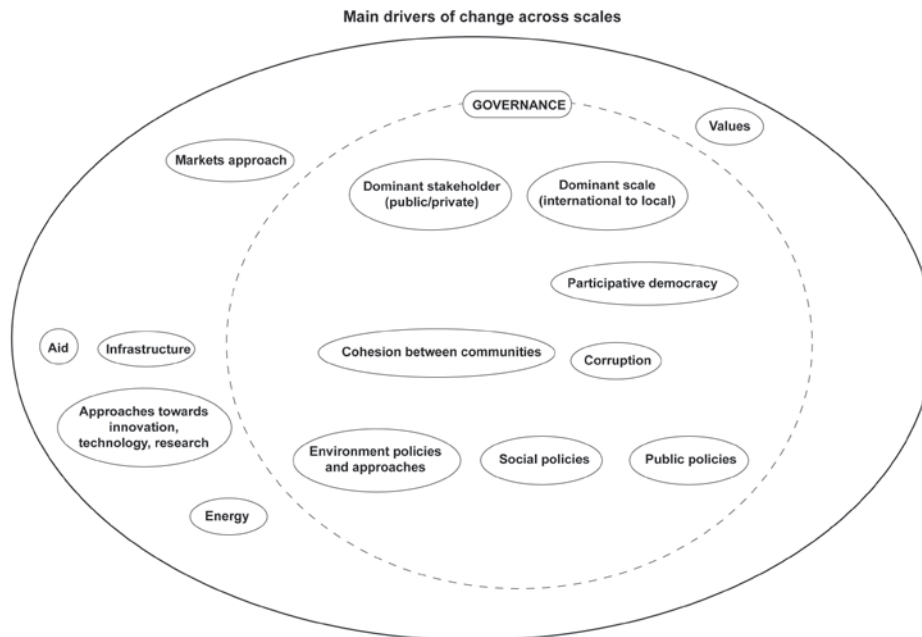


*Figure 16. Photo showing the coding and mapping process*

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<sup>25</sup> For further details on the actual diagramming technique used for presenting the results, the *Systems Map*, see <http://systems.open.ac.uk/materials/T552/>

<sup>26</sup> See <http://prezi.com/ratxwv7hany1/indicators-map/?kw=view-ratxwv7hany1&rc=ref-29470975>



*Figure 17. Map of the drivers classified into themes*

Once the themes had been established, the next stage involved studying the scales and linkages present within the different themes. This enabled us to begin making tentative cross-scalar interactions. Already at this stage, certain cross-scalar synergies and incoherencies became apparent. Table 24 provides some insight about the meaning given to each category, and about these first synergies and incoherencies. The 'x' means that this theme was not found at this scale. For instance, 'values' was not mentioned at the Regional (Amazon) level.



Table 24. Overarching themes and their focus at the different scales, where X represents a theme not mentioned at this scale

	Local	National	Regional	Global
<b>Values</b>			X	
<b>Participative Democracy</b>	Leadership, autonomy, voice of youth, rule enforcement, political awareness	Accountability, stability	X	Participation
<b>Corruption</b>	Level of corruption and transparency	Elitism, favouritism, criminality	X	The level of corruption in economy pushes people to work in formal or informal economy
<b>Public policies</b>	x	x	Integration of policies at Amazon scale, rule enforcement	Integration of “focus areas” (e.g, environment, society, economy, technology)
<b>Social policies</b>	Opportunities for all groups, also women and young people	Education (capacity building, training, jobs)	Include society in development of the Amazon or not, respect of local societies	Cultural integration, demography
<b>Environmental policies</b>	Safeguarding of natural resources, protection from pollution (power from national scale)	Safeguarding of extraction, planning, focus on environment, interest for PES, land use	Planning, safeguard, pro/re-active approaches, land use, PES, green business, focus on environment or not	Views of the environment: profit, conservation, benefit sharing
<b>Cohesion with other communities</b>	Networks and cohesion	x	X	x
<b>Dominant stakeholders</b>	Public / private / community	Government / private	Public / private dichotomy, focus on	Public / private, government intervention in

			investment	economy
<b>Dominant scale</b>	Inclusion of community in decision	x	Regional focus	International focus
<b>Markets approach</b>	x	Focus on export	Market approaches are inevitable	Open trade or closed, specialisation vs. diversification
<b>Investment in infrastructure</b>	x	Focus on road	X	x
<b>Approach to innovation</b>	x	Prioritisation and investment uptake	Information, intellectual property, who's leading the innovation	Private vs. public leaders of innovation, who's promoting and benefitting from the innovation
<b>Energy</b>	x	Renewable technology, who's leading	X	Who's leading the decisions in terms of energy
<b>Aid</b>	x	x	X	General nature and level of official development assistance

A first analysis of this table shows that out of 14 themes, only three are covered at all scales: social policies, environmental policies and dominant stakeholders. Most gaps are identified at the Amazon level (7 gaps), which often seems to create a break between the local and the international levels. Six gaps can also be identified at the local level, which seems to highlight clear incoherencies in focus areas between the local and the highest scales. The global level scenarios seem to cover most themes, but are strongly characterised by 'Aid', a theme that is not covered at any other scale. Investment in infrastructure is specific to the national level. The theme that features strongly at the local level but is not taken into account at other scales is 'cohesion with other communities'. Finally, there seems to be synergies, from local to global, on policy and governance themes. However, themes related to markets, innovation and energy seem to be only a 'high' level concern (from national to international).

Considering the large number of scales, themes and trends involved in the analysis, it was decided to undertake quantitative analyses of the drivers and themes (see below) to produce more precise linkages between the scales. Not only would this allow us to ascertain the win-win, win-lose and lose-lose groupings more accurately, but would also verify and triangulate our initial qualitative results.

#### 4.1.3. Making the links between scenario scales

To identify the synergies and conflicts between scenarios, we used a combination of Factorial Correspondence Analysis (FCA) and Hierarchical Ascendant Classification (HAC). A FCA was chosen primarily for the qualitative nature of the variables and for its capacity to summarise the information while simultaneously considering all the possible interactions between the variables' categories (also called modalities). In other words, this statistical method helps us to visually group the scenarios on a graph, according to their profiles. For example, if two scenarios (regardless of their scales) are both characterised by community values, high participative democracy, low levels of corruption, etc., the FCA will group them together in the same area of the graph. Scenarios with a radically different profile (individualist values, poor participatory democracy, high corruption, etc.) will be grouped far away from them, on the other side of the graph. It is sometimes hard to determine what the groups are on the graph. Indeed, scenarios can stand in an 'in-between' position. Sometimes also, the graph needs to be looked at in three dimensions, which is impossible on a two dimensional piece of paper or computer screen. In order to help us group scenarios, therefore, a HAC was then performed on the coordinates of the modalities in the factorial space, considering the first three axes, using the Ward criterion. This criterion is based on the minimum of variance within each class (Lebart et al., 1997; Sanders, 1989). These analyses were carried out using the Statistica 7 software. In other words, this statistical method looked at how the scenarios and their profiles are placed in the graph (by looking at their coordinates) and suggests cut-off points to determine the groupings according to their distance from one another. It is then possible to observe the dominant characteristics per category.

The FCA was carried out on a synthesised table of all the scenarios<sup>27</sup>. This table comprises the different scenarios in rows. They were each given a code; for example, LGWSA is the scenario corresponding to the Local level (L), Women's Group (GW), Scenario A (SA). The overarching themes identified through the mapping exercise appear in columns (e.g. Values, Participative Democracy, Corruption, etc.). It was decided to exclude one theme: 'Cohesion with other communities'. This was because its coding was exactly the same as the 'Values' coding, which would have given a double weighting to this specific variable and potentially skew the results. Also, as shown in the table, the variable 'Level' was added in order to identify more easily in the results how 'close' or 'far' the different scales were from one another. Each cell then contains the trend of these overarching themes within each scenario. For example, in the 'Values' theme, scenarios mentioning individualism were coded 'ind', scenarios mentioning community spirit were coded 'comm', and those not mentioning this theme at all were coded 'nm' ('not mentioned'). Table 25 shows the different categories created for each of the themes, providing some justification for the coding.

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<sup>27</sup> This table can be provided on request

Table 25. Coding of the different themes identified in the scenarios

Variable	Codes: trends in each scenario	Number of scenarios corresponding to this category	Further explanation
<b>Level</b>	Local	8	
	National	8	
	Regional	4	
	Global	4	
<b>Values</b>	Individualism	5	
	Community	4	
	Not mentioned	15	
<b>Participatory Democracy</b>	High	7	
	Medium	1	
	Low	10	
	Not mentioned	6	
<b>Corruption</b>	High	6	
	Low	4	
	Not mentioned	14	
<b>Public policies</b>	High	3	A “high” level corresponds to a high level of integration, crossing countries and disciplines
	Medium	3	
	Low	2	
	Not mentioned	16	
<b>Social policies</b>	High	9	A “high” level corresponds to a degree of inclusiveness (of women or youth for example) in social policies; fair opportunities for all members of society, public policies taking into account social services.
	Limited	3	
	Poor	8	
	Not mentioned	4	

<b>Environmental policies</b>	High	6	A “high” level corresponds to efficient safeguards, sustainable resource management, high focus on environmental issues.
	Medium	5	
	Low	7	
	Not mentioned	6	
<b>Dominant stakeholders</b>	Balance between government and private	4	
	Government dominates over private	6	
	Private dominates over government	5	
	Not mentioned	9	
<b>Dominant scale of decision</b>	Balanced	5	
	International	2	
	Regional	1	
	National	5	
	Not mentioned	11	
<b>Markets approach</b>	High	3	A “high” level corresponds to inclusion of fair trade principles, diversification of activities and open markets (which has a strong positive connotation in the international scenarios if it goes along with fair trade)
	Medium	2	
	Low	5	
	Not mentioned	14	
<b>Aid</b>	High	1	A “high” level corresponds to a high level of official development
	Medium	2	
	Low	1	

	Not mentioned	20	assistance, especially as grants rather than loans
<b>Investment in infrastructure</b>	High	1	
	Low	3	
	Not mentioned	20	
<b>Approach to innovation</b>	High	5	A “high” level corresponds to a high level of investment in innovation and a high level of sharing across society
	Medium	3	
	Low	5	
	Not mentioned	11	
<b>Energy</b>	High	5	A “high” level corresponds to the high investment in renewable energy, a low dependency on energy imports, shared benefits
	Medium	2	
	Low	4	
	Not mentioned	13	

The results of the FCA show that the first three axes account for 42.7% of the total inertia of the data. In other words, the first three axes will enable us to understand the primary drivers affecting the distribution of the scenarios and themes. It is not a very high share of the total information contained by the cloud, but very often the percentage of inertia calculated through FCA is underestimated and can still be interpretable and original (Sanders, 1989; Lebart et al., 1997). Interpretation of these axes show that Axis 1 relates to local scale vs. global scale, Axis 2 is bound to ‘worst’ case vs. ‘best’ case scenarios, and the weaker Axis 3 has is linked to Regional (and rather negative) scenarios versus ‘intermediate’ (between ‘worst’ and ‘best’ case scenarios) Global scenarios. This third axis might be underlining main incoherencies between Regional and Global scales. In the HAC analyses, the first cut-off point used for distinguishing classes was ten classes. This number of classes provided a detailed differentiation and also allowed us to be able to aggregate some classes if necessary. By going through each class individually, similarities and inconsistencies were identified which led to the aggregation of some classes. The final agreed number of classes for the grouped scenarios and themes was therefore seven. These HAC classes were then overlaid on the FCA to visually display the results (Figure 18).

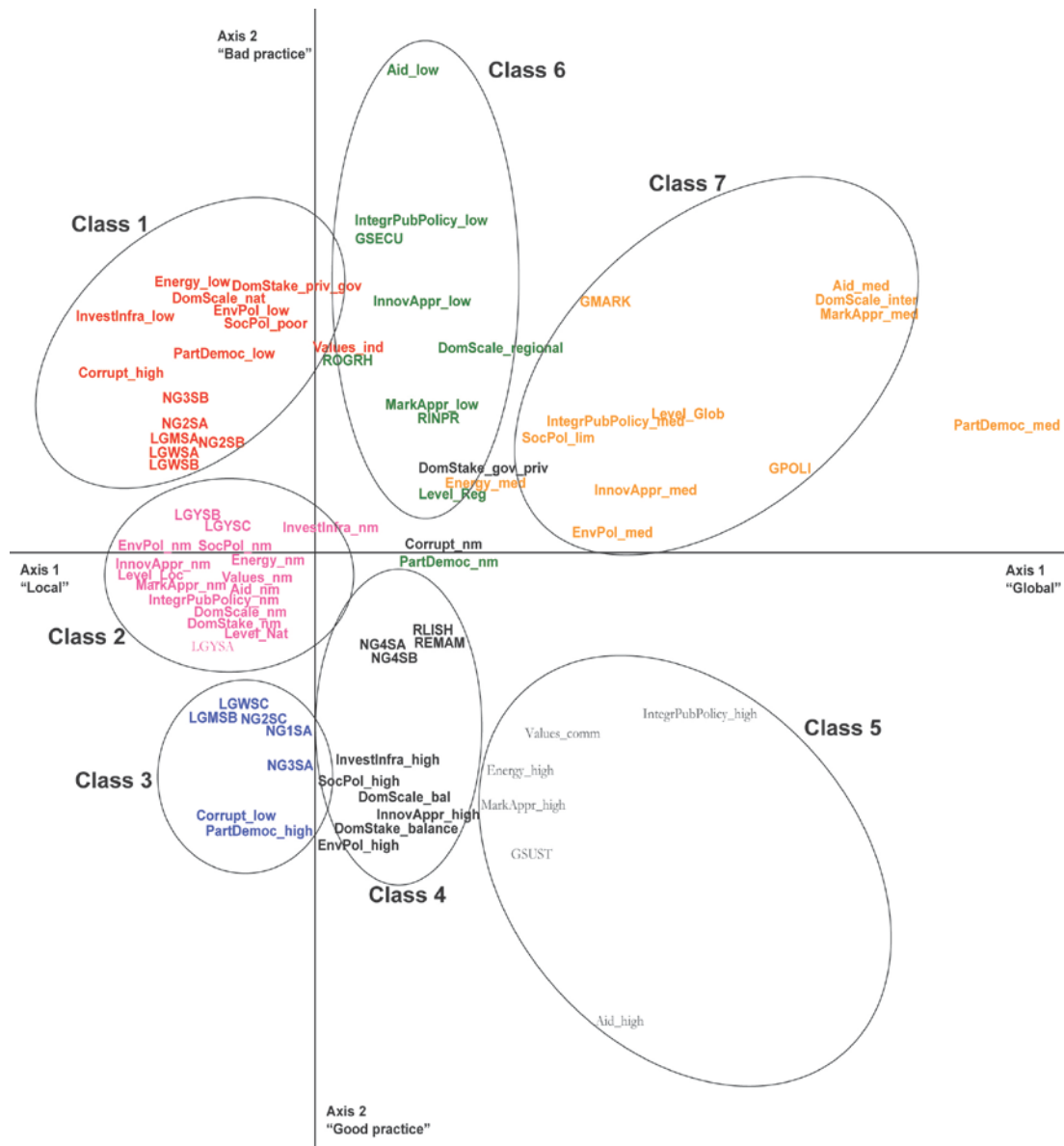


Figure 18. Factorial Correspondence Analysis of the scenarios and themes showing the groupings according to the Hierarchical Ascendant Classification analysis

#### 4.1.4. The development of a typology of scenarios

Using the qualitative and quantitative analyses outlined above, the following describes the first classification of the scenarios.

### Class 1: Lose-lose scenarios from local to national scales

Class 1 links local and national scenarios. These scenarios have the following in common: individualism, low participative democracy, high corruption, poor social and environmental policies, low benefit sharing, and the dominating scale is the national scale. At the local level, these scenarios lead to conflict and divide, blackmail, and corruption. At the national scale, there is no continuity in the government and its policies, and very poor transparency as well. These scenarios do not link up to regional or global scenarios because they focus on very context-specific variables, whereas the regional and global scenarios tend to have a much larger scope. The 'negative' scenarios at regional and global scales are to be found in Class 4 and 6, where we underline the fact that their 'negative' focus is quite different and related to the market, aid and public policies. At local and national scales, values, corruption, investments, energy use, social and environmental policies are highlighted. The scenarios included in this class are: Failure of the NRDDDB, Politicisation of the NRDDDB, Domination of the oil industry in the North Rupununi, Oil is found and Individualism dominates in Guyana, No Oil is found and Individualism dominates, No Transparency and No Continuity in Guyanese politics.

### Class 2: The youth in the North Rupununi

Class 3 represents exclusively the North Rupununi youth's scenarios (see Section 3.3.3). It shows that the youth's aspirations (mainly to have voice and have opportunities), that could be reached through effective participative democracy and inclusive social policies, find no echo at higher scales. However, if we focus only on the two variables of Participative Democracy and Social Policies, most scales, except perhaps the regional scenarios, take them into account.

### Class 3: The youth in the North Rupununi

The two main variables that bring together five scenarios (two at local level and three at national level) are low corruption and participative good participative democracy. Here again, we notice that the focus areas that would determine a best-case or a worst-case scenario for the future of the North Rupununi and Guyana are these two main variables. This class includes the following scenarios: Self-sufficiency of the NRDDDB, a Positive relation with the oil industry in the North Rupununi, Good Environmental management in Guyana, Oil is found and there is Community spirit in Guyana, Transparency and Continuity in Guyanese politics.

### Class 4: Win-win scenarios between national and regional scales

Some national and regional scenarios seem to find synergies on the themes of good social policies, good environmental policies, even balance of power between stakeholders and scales (but with the government slightly dominating), dynamic



approach to innovation and high investment in infrastructure. This class includes the following scenarios: Guyana finds Oil but there is no agricultural diversification, Guyana has no Oil and there is agricultural diversification, Light and Shadow (Regional), Emergent Amazonia (Regional).

#### Class 5: Sustainability first at global scale

Interestingly, what is presented as the best-case scenario at global scale (Sustainability First) ends up isolated in one class. Although there is some overlap with best-case scenarios at lower scales, the focus areas that characterise so much the global level (markets approach, innovation, energy) are not considered at the lower scales, which create this gap.

#### Class 6: Low collaboration (regional to global)

This class is characterised by low collaboration and integration between countries, between scales, between policies, between peoples. It mainly concerns one global level scenario (Security First) and two regional level scenarios (A Once Green Hell, Inching Along the Precipice).

#### Class 7: The “intermediate” situations at global level

Finally, the global level scenarios “Policy First” and “Markets First” constitute this last class. These two scenarios are characterised by a very specific “intermediate” status, belonging to neither best or worst case scenario. Most themes are thus defined as “medium”.

The first striking result from analyses is that there seems to be extremely few synergies between the local and regional-global scales. Local and national scales can be found in similar categories, regional to global as well, and in one class, there are also national and regional scenarios. However, there seems to be no common vision of the future between the ‘smallest’ and ‘biggest scales’. At the same time, the results highlight how the national scale plays a crucial role as a link between the local and regional/global; as a mediator for the different visions of the future. Lastly, and importantly, regional scenarios tend to stand out on their own. As this represents the Guiana Shield scale, there are important implications for the cohesion of the region, discussed further in Section 5.

This analysis enabled us to group scenarios according to their characteristics. This provided solid ground for identifying win-win, lose-lose, and potentially win-lose scenarios across scales.

## 4.2. Win-win, win-lose and lose-lose scenarios

Building on the groupings identified in the previous section through the cross-scalar analysis, this section will now investigate how these different characteristics interact or could interact, creating vicious or virtuous circles between scales.

### Win-win scenarios

The win-win scenarios from the North Rupununi to the Guyanese scales involve low corruption and high participative democracy. These focus areas are completely absent at the Amazon scale. At the global level, only the 'Sustainability First' scenario (present on its own in Class 5) involves high participative democracy. Some national and regional scenarios seem to find synergies on the themes of good social policies, good environmental policies, even balance of power between stakeholders and scales (but with the government slightly dominating), dynamic approach to innovation and high investment in infrastructure. However, as we see, these best-case scenarios might not develop into a win-win situation at all scales, if, at the local level, governance issues are not dealt with.

### Win-lose scenarios

Considering the major gap identified between the local-national scenarios on the one hand, and the regional-international scenarios on the other hand, it becomes clear that win-lose situations could easily develop. Interestingly, it could be plausible that negative developments at the highest levels have a relatively limited impact at the North Rupununi scale if the Guyanese government remains disarticulated from these drivers, as the pathway from class 6 to 4 shows on Figure 18. These two classes are radically opposed in terms of "best" and "worst" scenarios, since they are opposed on Axis 2. However, scales matter little in this development since these two groups are situated at a very similar level on Axis 1. So one possible win-lose scenario could be the development of the Security First scenario at global level (class 6, Figure 18), leading to rather negative developments at the Amazon level (e.g. Inching along the Precipice scenario, class 6). However, this would not necessarily lead to negative developments at the Guyanese level depending on how the government manages the discovery of oil or its agricultural diversification (Class 4), an attitude which can then easily trickle down positively to the North Rupununi level.

The opposite situation can also very easily occur: positive developments at the highest levels can be blocked on their way to the national and local levels because of governance management at national and local scales. Here again, the trickling process between the Global level 'Sustainability First' (Class 5) and the local worst-case scenarios (in Class 1) goes through the COBRA national level scenarios 'Guyana finds Oil but there is no agricultural diversification' and 'Guyana has no Oil

and there is agricultural diversification'. In other words, the key player in these win-lose pathways is the national government.

### Lose-lose scenarios

From the North Rupununi to the Guyanese scales, lose-lose scenarios involve individualist values, a poor participative democracy and high corruption, poor social policies and little focus on the environment. Dominant stakeholders would be private, the dominant scale would be national (with little consultation at local scales), low investment in infrastructure and a poor focus on energy solutions and development. Transparency, benefit sharing, political continuity are crucial for the future of the country and its peoples.

Although falling in a different class because of a very distinct overall profile, the only scenarios at higher scales that mention a poor participative democracy, individualist values and poor social policies are "Markets First" and "Security First". Although Markets First has a slightly better approach to environmental policies and energy, the link to local scales is very poor as the preferred scale is international (and international markets). Security First, on the other hand, is possibly the worst-case global scenario in most aspects. Even if the government is presented as the dominant stakeholder, which could be viewed as slightly better than the private sector, in the Security First scenario the government shares benefits poorly. As for the regional level (Amazonian level), corruption and participative democracy are not taken into account. Using other criteria, the scenario that could match this lose-lose pathway would be the "Once Green Hell" Scenario, in which social and environmental policies are poor, the dominant stakeholder is the private sector and the dominant scale is national.

There is also a lose-lose pathway from the regional to the global scale. This pathway involves a poor approach to markets (not integrating sustainability, not open to other markets and poorly diversified), a poor integration of public policies (of scales and focus areas), low aid and a low approach to innovation. In essence, lose-lose scenarios from regional to global scales involve very poor cooperation across borders, between focus areas (e.g. environment, society, economy). It involves the "Security First" scenario at the global level, as well as the "Inching along the precipice" and the "Once Green Hell" scenarios at regional level. As we can see, there is a considerably weak overlap between the (1) local-national and the (2) regional-global driving forces of change. It seems to underline the fact that if local governance issues are not solved, even the best future scenarios at higher scales might not have any effect locally in Guyana, which might lead to a win-lose situation. However, considering that the overlap between scales is so weak, it is possible that even if worst-case scenarios at higher scales develop, they may not significantly affect local scales.

#### 4.3 Conclusions on cross-scalar analysis

Our analyses show that there is a clear disarticulation between the local-national scales on the one side, whose focus is primarily on governance and transparency issues, and the regional-global scales on the other side, focusing more on policies, attitudes and approaches to different key areas (e.g. environment, society, markets, technology). It seems that what is revealed in this analysis is the contrast between policy and practice. To bridge the gap, mechanisms focusing on governance issues at local-national scales have to be developed at regional/global scales.

## 5. Discussion

In the following sections, we aim to analyse the scenarios using Spangenberg (2006)'s systems approach of evaluating both the objective 'real world' models and the value-based 'mental' models behind different scenarios. In looking at the 'real world' models (Section 5.1), we will be testing the scenarios against the current situation or what Bossel (1998) calls the 'riverbeds of likelihood'. These are the many properties of human and natural systems, determined by the laws and principles of physics, genetics, biology, evolution, and so on, current and recent economic and social trends and theories, but also by historical facts contained within the psychology and memory of billions of people, which together act to significantly restrict the range of possible futures. Section 5.1.1 summarises the current social-ecological situation, with a focus on the Amazon and Guiana Shield region. Using this context, an analysis of the scenarios then follows in order to explore the relevance of the different scenarios (Section 5.1.2). We then try and unravel the values and mental models of the groups proposing the scenarios (Section 5.2) focusing on how different scenarios emphasise ultimate and/or proximate drivers (see Section 1.4). In Section 5.3, we explore the compatibility of different scenarios at different scales to see whether these disparate scenarios combine to build a coherent picture, or whether there is a mismatch between scales. Finally, in Section 5.4, we reflect on our methodological approaches, including the need to identify measurable indicators from within the scenarios, and in Section 5.5 provide some conclusions.

### 5.1 Testing the scenarios against the current situation

#### 5.1.1 The current situation

Globally, drivers of unsustainable development continue. Posited on the significant amount of data available, examples of irreversible trends are the unabated increase in greenhouse gas emissions, combined with measurements of global temperature change, ocean acidification, sea level rise etc (see for example, IPCC, 2000; MA, 2005). At the same time, there are an increasing number of publications on global biodiversity loss (e.g. Pereira et al., 2010) and earth observations (satellite and radar imagery) showing ecosystem degradation, conversion of natural ecosystems and large scale infrastructural developments (e.g. Butchart et al., 2010; Rands et al., 2010; IUCN, Red List<sup>28</sup>). Demand on natural resources has doubled since 1966 and we are currently using the equivalent of 1.5 planets to support our activities (WWF, 2012). Population growth and economic development are seen as ubiquitous drivers of environmental change with particular facets, such as energy, transport, urbanization and globalization, exerting the most pressure (UNEP, 2012)

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<sup>28</sup> [http://www.iucn.org/about/work/programmes/species/our\\_work/the\\_iucn\\_red\\_list/](http://www.iucn.org/about/work/programmes/species/our_work/the_iucn_red_list/)

Yet, the numbers of initiatives to reduce environmental impact are increasing. For example, despite the continued massive use of fossil fuels, the global energy market is showing signs of a gradual shift towards more sustainable non-fossil resources (IEA, 2012). A global energy reform will have major impacts on land use and economies which can either be positive or negative, depending on the side-effects of energy production (e.g. bio-ethanol production leading to the conversion of large land areas). Concurrently, a number of measures are being proposed to avert on-going effects of climate change, land conversion and pollution, partly based on new technologies such as carbon capture and storage (CCS) and partly on changing practices, such as a ban on detrimental pesticides (see for example the recently proposed ban on neonicotinoids by the European Commission<sup>29</sup>), adopting principles of 'sustainable intensification' (e.g. FAO, 2010; Pretty et al., 2011; Godfrey et al., 2011) and/or through Payments for Ecosystem Services (PES) schemes such as REDD+ (e.g. Ghazoul et al., 2010).

In the Amazon, humans have been playing a key role in shaping the landscape over millennia (Cleary, 2001). However, today, the region is facing rapid and large-scale challenges including land degradation, and the loss of forest cover and biodiversity (O'Toole, 2013). A recent study by the International Development Bank states that global warming may cost the region up to \$100bn by the year 2050 due to declines in agricultural yields, the disappearance of glaciers, floods, droughts, and other associated problems (IBD, 2012). In the Guiana Shield, unsustainable practices of mining<sup>30</sup> and land conversion are widespread (e.g. Maughan 2011), as is the rising and sustained threat of organised crime and/or corrupt groups in co-opting whole regions and communities in supporting the narcotics drugs trade, migration, ill-planned infrastructure projects, and the unregulated expansion of the agricultural frontier<sup>31</sup>. Many of the countries that make up the Guiana Shield fall in the 'medium-high' categories of human development and income (UNDP, 2011), with Brazil in particular becoming a global economic player. Nevertheless, poverty is endemic and indigenous peoples are amongst the poorest and marginalised communities of the region (Hall and Patrinos, 2006, 2010).

Crucial conditions for the success of averting developments that bring harm to social-ecological systems are political will, international pressure, functioning procedures of stakeholder consultation, and rights and capacity of local communities (Verwer, 2013). Political will translates into signing international conventions, producing national programmes and legislation and enhancing governance and law enforcement where necessary (Otsuki, 2012; Larson and Petkova, 2011). A number of international conventions on environmental issues and on the conservation of

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<sup>29</sup> <http://www.rsc.org/chemistryworld/2013/02/neonicotinoid-pesticides-eu-ban-bees>

<sup>30</sup> See for example: <http://www.atbc2008.org/miscellaneous/goldrush.htm>

<sup>31</sup> See <http://www.guianashield.org/>

natural resources, such as the Convention on Biological Diversity (CBD), CITES, UN Framework Convention on Climate Change (UNCCC), UN Convention to Combat Desertification (CCD) and the RAMSAR Convention on Wetlands have been signed and ratified by (most of) the Guiana Shield nations. International pressure can refer to both legally binding and non-legally binding agreements on the global or regional level.

However, procedures of stakeholder consultation which refer to transparency and equal partnerships, and involve the rights and capacity of local communities, are still problematic (Colchester and La Rose, 2010; Okereke and Dooley, 2010). Many indigenous groups in the Guiana Shield do not own their land and resources (Colchester et al., 2001), and of those that do, subsurface rights are still negotiable and potentially revoked, as shown in a recent case in Guyana<sup>32</sup>. This is in the broader context of relatively inadequate political systems, as reflected by governance indicators such as high corruption, low freedom of speech and low regulatory control (Transparency International, 2012; World Bank, 2011). Globalisation has also played out in the region, bringing Western values and acting as a homogenising force that can undermine unique indigenous cultures<sup>33</sup>.

#### 5.1.2 Relevance of scenarios to the real world

Reviewing the global and regional scenarios, the main challenges policymakers are facing in the effort to change behaviour derives from the compromise that lies at the heart of sustainable development: how to balance rapid growth that promises a way out of poverty with environmental protection. Shifts in policies may be brought about through various ways, amongst which are pressure from the international community, international legislation, market forces, strong lobby, discovery of resources (oil, gas, minerals) and natural hazards (Verwer and Glastra, 2012). Nevertheless, it is governance that is an overarching driver of these factors, and its high uncertainty in the future means that it is mentioned in many of the scenarios. A number of scenarios assume good governance systems to be put in place (e.g. Emergent Amazonia - GEO Amazonia, Sustainability First - GEO4 and Transition to Sustainability - GEO3 Latin America), whereas others predict bad governance (FROG! - WBCSD and Mad Max - Costanza). In terms of deforestation, SIM Amazonia has explored the potential effects of effective government regulation to limit deforestation.

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<sup>32</sup> See controversial court case favouring miners and violating indigenous peoples rights: <http://www.forestpeoples.org/topics/extractive-industries/news/2013/02/indigenous-peoples-rights-violated-and-traditional-lands-g>

<sup>33</sup> See <http://globalautonomy.ca/global1/topic.jsp?topic=Indigenous%20Peoples>

Similarly, governance is acknowledged as a key driver in many of the COBRA national and local scenarios mentioned in Section 3. Although, we see some positive trends in Guiana Shield governance issues, such as the rule of law, other areas including effective regulatory control, transparency and corruption (a focus of many of COBRA's scenarios) show either little change or an actual decrease over the last fifteen years (World Bank, 2011). An area little mentioned in the scenarios is the potential for greater violent, and potentially armed, conflict from indigenous groups disgruntled by poor governance. Only the National Intelligence Council Latin America scenarios (see Section 2.1.2.2) consider this in any depth. Interestingly, these scenarios see the potential for indigenous movements, which to date have sought change through democratic means, to consider more drastic mechanisms for seeking a fair share of political power and wealth. We potentially see the seeds of this in small isolated pockets around the Guiana Shield, such as the recent proclamations for opposing the government by the Amerindian Peoples Liberation Front (APLF) in Guyana<sup>34</sup>.

Global awareness of the role of healthy ecosystems for a sustainable economy has been increasing over the last decades (see initiatives such as corporate social responsibility (CSR) and international forums to promote a green economy like the Centre for Environmental Leadership in Business (CELB)). Scenarios like FROG! (WBCSD), Markets First (GEO4) and Mad Max (Costanza), in which traditional market thinking focusing on short term profits prevails above long term sustainability, indicate that resource scarcity will lead to serious problems. Initiatives of valuing ecosystem services and internalising them in the global economy have been explicitly mentioned in some of the scenarios (Relegated Sustainability - GEO3 Latin America, Light and Shadow - GEO Amazonia). Light and Shadow assumes that such economic incentives will not appear to be successful. The role of the private sector is a key theme in these scenarios, and currently reflected in policy discussions - over the last decades Latin America has established an active network of business councils for sustainable development, such as Mexico's Comisión de Estudios del Sector Privado para el Desarrollo Sustentable (CESPEDES) and Consejo Empresario para el Desarrollo Sostenible (CEADS) in Argentina. Potentially, foreign corporations could play a positive role nurturing sustainability through the transfer of technology, ideas, practices, and investment in the region's growing green economy. However, there is much scepticism about private enterprise interest in nature and any potential benefits to society and the environment as a whole (e.g. McAfee, 2012; Murat Arsel and Büscher, 2012).

In the Guiana Shield, a choice that could be of large impact in the future may be Guyana's Low Carbon Development Strategy, provided that good governance and cooperating markets are in place. The coexistence of the LCDS with high potential extractive industries in the region, such as mining<sup>35</sup>, logging and agriculture, will

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<sup>34</sup> See <https://www.facebook.com/aplfcampaign?ref=ts&fref=ts>

<sup>35</sup> Forest Peoples Programme and Rainforest Foundation US. Guyana court ruling violates indigenous peoples' rights. Press Release 28 January 2013 (weblink: <http://www.forestpeoples.org/topics/rights-land-natural-resources/news/2013/01/press-release-guyana-court-ruling-violates-indigen>)



however form a great future challenge. At the same time that the Guiana Shield has high potential for gaining support from REDD+ and has shown developments in the process (REDD Readiness Plans, Guyana REDD Initiative Fund), some recent audits show some doubts with regard to the process (Rainforest Alliance, 2012) and have shown that deforestation increased since the beginning of the Guyana-Norway REDD+ Agreement (DNV 2012). Such developments on national/regional scales are dealt with in the higher level scenarios (Global, regional and national) but to a lesser extent in the local level North Rupununi COBRA scenarios. This is particularly significant considering local communities are most likely to play a key role as 'stewards', of natural resources such as forests, in many of these schemes. Both at the national and local levels, the presence or absence of mining, especially, oil was estimated to be of significant impact on future social, economic and environmental development of the region. This probably reflects the current high demand for minerals, particular gold and bauxite, and the active drilling for petroleum both inland and offshore (Joe Singh personal communication, cited in Jafferally et al., 2012).

Short term developments in technology may be well predicted. However, the extent to which we will rely on technology to solve global environmental problems is a key issue in scenarios. Based on current rapid technical progress, many scenarios exist in which technology forms the solution to many environmental problems. However, long term predictions on technological developments are highly uncertain. Many of the scenarios reviewed in Section 2 mention technological progress or high-tech economies as a future pathway: Technogarden (Millennium Ecosystem Assessment), High Tech Economy-Technology Pushes off the Limits (Millennium Project), IPCC A1, Star trek (Costanza), Jazz (WBCSD) and in the regional Light and Shadow scenario (GEO Amazonia). In contrast, in the COBRA national scenarios, technological innovation is only mentioned as a key driver in the scenario constructed by environmental scientists, and it does not feature at the local scale.

The Millennium Ecosystem Assessment makes a distinction between globally connected societies versus regionalized worlds on the one hand, and reactive versus proactive ecosystem management on the other. The globalised pathway is seen as well in the IPCC B1 scenario set and in Costanza's Big Government, both of which put a focus on global solutions to environmental problems. The regionalised pathway is evident for example in the IPCC A2 and B2 scenario sets and in Costanza's Ecotopia. Focusing on the Amazon region, environmental narratives have changed considerably over time: in the 1970s and 1980s they were about how best to open up the region for exploitation, but by the 1990s they were about deforestation and protection (Mistry et al., 2009; O'Toole, 2013). In recent discussions, the acknowledgement of the role of local and indigenous people in natural resource management has become more and more apparent (e.g. Berkes et al., 2003; Blom et al., 2003), yet interestingly, none of the regional scenarios described in Section 2 incorporate local communities as dominant stakeholders in environmental management.

One of the greatest challenges in scenario development is formulating them in such a way so as to allow direct comparison with real world events. In many cases, this involves the introduction of measurable indicators. The scenario sets analysed in Section 2 contain both qualitative (narrative) scenarios and quantitative (modelling) scenarios. The IPCC scenarios provide both narratives as well as elaborate quantitative analyses. Scenarios by Costanza (2000) and the Very Long Range Scenarios in the Millennium Project are merely storylines without modelling exercise. Swart et al. (2004) states that as complexity increases and the time horizon of interest lengthens, the power of prediction diminishes. Therefore, “quantitative forecasting is legitimate to the degree the state of the system under consideration can be specified, the dynamics governing change are understood and known to be persistent, and mathematical algorithms can be created that map these relationships with sufficient accuracy for simulation” (p.140). Quantification of storylines is done in global and regional Amazon or Latin America scenarios. However, it may also be done on the national and local scale by developing indicators for different drivers of change. Most of the scenarios developed by the national and local actors could yield useful information when quantified.

## 5.2. The values behind scenario development

Having compared scenarios to the current ‘riverbeds of likelihood’, we now turn to analysing the values and mental models which determine the creation of scenarios. The drivers that shape scenarios can be separated into two categories: ‘proximate’ drivers and ‘ultimate’ drivers (Raskin et al., 1998) (see Section 1.4). Proximate drivers are responsive to short-term intervention, and include population size and growth, economic volume and patterns, technological choice, governance (e.g. focus on policies) and environmental quality. Ultimate drivers, on the other hand, concentrate on the root causes that shape society and the human experience, and include values, desires and aspirations, structure of power, knowledge and understanding, human needs and long-term ecological processes. Looking at the fundamental drivers determining the scenarios at different scales in our study, we see that at the international level (Section 2.1.2.1), the focus is squarely on proximate drivers where globalisation/market liberalisation, governance, ecosystem management and technology, for example, are viewed as the critical uncertainties. A similar pattern is found in the regional scenarios (Section 2.1.2.2), where although GEO Latin America, SIM Amazonia and the Millennium Project Latin America Scenarios focus on issues of equity and well-being in their narratives, the main determinants of the scenarios rests on large-scale governance through the implementation of public policies. In fact, at both scales, only the scenarios developed by Costanza (see Figure 4 and Table 8) explicitly address any ultimate drivers, namely power structures and values in the form of ‘level of cooperation’ (community versus individualism) and long-term ecological process in the form of low/limited versus high/unlimited resource availability.

Yet, Costanza's scenarios are the only ones that were not developed by an 'expert' group; they were developed solely by him and based on systems thinkers Harmut Bossel and Donella Meadows. The systems approach taken by Costanza, Bossel and Meadows allows the identification of complex cause-and-effect relationships, thereby enabling a big picture view of the situation that explicitly includes ultimate drivers. We are not advocating unilateral scenario development, but one of the criticisms of many of the global and regional scenarios could be the make-up of the scenario-building group. As van Vuuren et al. (2012) in their assessment of global environmental scenarios point out, although most scenario processes are highly participatory and rigorous in nature, there needs to be greater involvement from a broader range of 'expertise' that includes psychology, sociology and anthropology. This would strengthen the scope of the scenarios by giving a more equal footing to a diverse range of worldviews. This is exemplified when looking at the responses of the expert group enlisted to select scenarios for each scale (Section 2.2.2). The group, although small and united through a common international and regional (Guiana Shield) focus, present a varied range of perspectives which highlight the importance of values, either through individualism versus communitarism and/or, governance. This slightly stronger focus on ultimate drivers is probably reflected by the fact that although the group could be classified as 'international environment/development professionals', they come from different natural and social sciences, and academic and practitioner backgrounds (see Table 18). This is supported by the results from the national level scenario workshop in Guyana, where participants developed scenarios closely aligned to their worldviews; environmental scientists - renewable energy development and man-made disasters, government bodies - implementation of policies and governmental frameworks, government ministries - oil production and agricultural diversification, and indigenous representatives – societal values and oil production. The key is the opportunity for the different worldviews to be conveyed and discussed, as was at the national workshop, thereby allowing different interests and perspectives to be shared for mutual learning.

Discussion of the COBRA scenarios developed by community representatives in the North Rupununi revealed that in spite of greater cohesion of scenarios around issues of values, desires and aspirations, power structures, human needs, and knowledge and understanding, specific participant interests still came to the fore. The scenarios developed by the men were centred on oil production and governance. Their concerns lay in how the local communities would benefit from oil discovery and whether institutional frameworks would be in place for equitable benefit-sharing. The women, on the other hand, were more uncertain about community cohesion in the future and how a lack of good leadership might lead them into paths towards unsustainability. This was reinforced by the youth whose scenarios focused on issues of leadership and community (young people) breakdown through the lens of recreation. Interestingly, similar findings are shown by Rawluk and Godber (2011) working with Ukupseni indigenous group in Panama. Here, although the community as a whole shared future concerns over cultural continuity, education, land and water use and the local economy, different groups had a different focus. Older men visions were linked with 'trading with the known', an outward, reactive scenario that focused on high external trade. Older women, on the other hand, had proactive, inwards 'local

sustenance' visions, highlighting traditional knowledge and organised cooperative use of resources. Young people also highlighted organised cooperative use of resources, but were more proactively outwards looking, open to change and adaptation.

It is more than likely that indigenous communities in the Guiana Shield (and beyond) share similar concerns for the future. However, we see that in many contexts, women and youth, normally the most marginalised members of the community, have convergent visions quite different from men. Yet, it is men who are generally in positions of power. Nevertheless, our results from the indigenous representatives at the national level do show that ultimate drivers around societal behaviour are at the forefront of their concerns and could play a part in influencing decision making.

### 5.3 Linking scenarios across scales

Linking scenarios across scales is necessary in order to understand how processes at different scales may directly depend on each other (e.g. climate change as a global phenomenon), to place lower scale developments within a global context, to understand which global factors or driving forces are external to a local or regional system (in order to set boundary conditions for developing timely response options), and to bring together stakeholders, researchers and decision-makers from different geographical settings, to create a greater and shared knowledge about particular issues (Lebel et al., 2005; Zurek and Henrichs, 2007). Since we were interested in the management of social-ecological systems, our approach used loosely linked scenarios (i.e. developed independently) which are typically better able to maintain credibility and relevance to users by retaining a greater degree of specificity (as seen above), and help reflect and communicate different points of view across scales allowing convergence of issues and viewpoints to emerge (Biggs et al., 2007).

Indeed, a significant result of our cross-scalar analysis is that there are extremely few synergies between the local and global scales i.e. there does not seem to be a common vision between the 'smallest' and 'biggest' scales of analysis. Although we might have expected this, considering the independent processes of scenario building and the context specificity of the local scenarios, we thought that there would be greater similarities in the underlying scenario drivers. Much of this incompatibility might be explained by the discussion above on proximate versus ultimate drivers, and their relative importance at different scales. At the global and regional scales the focus seems to be much stronger on policies and how these can influence society and the environment, with public-private partnerships as facilitators. The GEO4 Scenarios, for example, play out the situation between economic development and the environment, and government and the market, as policy priorities. At the core of the GEO Amazonia scenarios, is the role of public policies, particularly in the realm of sustainable development and marketisation. In contrast, at lower scales, the focus is on practices; issues around the actual operationalisation and implementation of effective development and environmental management. These include education and

capacity-building, mechanisms for safeguarding natural resources, with communities joining government and private enterprises in decision-making.

For the local communities, considering that the overlap between scales is so weak, it is possible that even if worst-case scenarios at higher scales develop, they may not be significantly affected. On the other hand, the few win-win situations identified closely link the local to the national scale. These linked scenarios are underlined by issues of governance, and highlight the importance and influence of effective and equitable power structures at national level on local level sustainable futures. This leads us to reason that the national scale is a key mediator between the local and regional/global scales, as can be seen in the case of REDD+ processes and implementation. This is reiterated by de Oliveira et al. (2013), who point out that in relation to national REDD+ agencies, the concerns are less about gaps in institutional or technical capacity and more about gaps in legitimacy and governance principles such as transparency, quality control assurance, and fiduciary accountability. Interesting in this mix, is the relevance and/or lack of regional scenarios. There are very few synergies between the local and national scenarios and the wider Amazon scenarios. In a region of high political and environmental relevance to the global community, trajectories of the future are very different to any visions of national stakeholders and local communities. For example, the Guiana Shield Facility (GSF) is a multi-donor funding facility for the long-term financing of national and regional activities to conserve ecosystems, protect biodiversity, and to sustain human livelihoods within the Guiana Shield eco-region<sup>36</sup>. As part of this remit, GSF aims to support regional institutional, administrative and policy frameworks. Our scenario analysis indicates that differing visions for the future in the region may have important implications for the cohesion of the region in terms of social-ecological policy integration.

One of the aims of this analysis was to understand through what processes win-win scenarios could develop, in order to gear the current community practices towards best-case scenarios. In that respect, we have seen that national governance plays a key role for the trickling down of 'best' approaches from international level to their implementation at the local level. However, we have also seen that 'best' approaches from the local level could remain at a local-national level, without any beneficial influence at higher scales. So, in order to promote the development of win-win scenarios, what should politicians and practitioners focus on? The cross-scalar analyses show that certain themes do constitute strong threads that link scales to one another; values, participative democracy, corruption, social policies, environmental policies and dominant stakeholders. It thus seems to argue that the development of participatory processes for policy development and implementation, involving stakeholders at all scales, could potentially be a key pathway for the 'trickling up' of community values, a value which remains strong at the local level but is in great jeopardy under the top-down decisions made at the national level. Indeed, looking at the COBRA men's scenarios around the discovery of oil in the North

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<sup>36</sup> See [www.guianashield.org](http://www.guianashield.org)

Rupununi, they show that local values and practices could radically change according to how the national government manages its extractive activities in the area. Community values would be diverted towards individualist values. Since 'community values' is a very strong ultimate driver of change, very sensitive to proximate drivers (economy, governance), the safest pathway to maintain them and to promote them towards higher scales, and thus to gear towards win-win scenarios, would be through a high participative democracy. With regards to the oil scenario in the North Rupununi, one of the indigenous researchers said:

*"If oil was found and developed in the area it could be good or bad, we have thought of positive and negative outcomes, because it depends on many uncertain factors. For now, it would be better if oil wasn't found, we like things the way they are now. We like things to go slowly and surely, so maybe in many years oil could be found and developed, when we're more ready".*

These reflections show the importance of participatory approaches to these kinds of developments, which could be very much applicable to REDD+ and other PES scheme implementation. A local understanding and involvement in the processes is the key to win-win scenarios, avoiding conflicts and the loss of values.

#### 5.4 Reflections on the methodological approaches

Our participatory action research approach, outlined in Appendix 1, has allowed us to engage with a wide variety of perspectives and experiment with a range of ideas and approaches, the most feasible of which will be included in an accessible format through the Community Practitioner Handbook<sup>37</sup>. Looking back at the national and local scenario workshops, and the scenarios developed from these events, we can identify areas in which the processes could have affected scenario outcomes. At the national scale, we identified the potential participants of the scenario workshop by considering all of the relevant stakeholder groups that could represent the interests of sustainable development and natural resource management. At the local level, again, we aimed to achieve a good mix of the community make-up (men, women, old, young) while at the same time drawing on some participants that had attended a previous scenario workshop. These groups we felt were a coherent mix of people, of mixed gender and policy/practice backgrounds. By dividing the participants into specific interest groups, participants were given the opportunity to employ scientific, experience based and local knowledge during the process, and put forward their specific interests. This is reflected in the focus of the scenarios which illustrates the diversity of positions/interests/aspects. Nevertheless, the composition of the workshop participants can strongly affect the scenario process in terms of knowledge and voice (e.g. Bohunovsky et al., 2011; Kaltenborn et al., 2012), and needs to be carefully considered.

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<sup>37</sup> The Community Practitioner Handbook will be a toolkit for implementing the approaches and techniques of the COBRA Project aimed at community practitioner.

In addition, there was an element of many participants (the majority having been drawn from non-academic sectors) wanting to take the 'inside-out' perspective, rather than the 'outside-in' perspective (Ogilvy, 2011). In other words, they had a more action-oriented way of approaching the scenario process, thinking more about the end point and what they can do to their world, rather than a more academic preference of elaborate talk over action. In respect to this point, Ogilvy (2011) suggests that participant ownership over scenarios can come about through the development of lists of early indicators for each scenario; as participants try to imagine the first signs of a scenario, they inevitably find themselves occupying the world described by that scenario. This may be a way of motivating communities and others to incorporate visioning processes within their decision making. Nevertheless, just taking part in a scenario process can provide participants with improved thinking about futures and understanding processes of change and adaptation, encourage pro-active engagement and legitimacy, build confidence and responsibility, and improve interactions and alliances (Ravera et al., 2011). Indeed, Jafferally et al. (2012) found that many of the participants of the local workshop in the North Rupununi who were part of village councils found the techniques potentially useful for planning their community's future activities, as illustrated by the following quote by Norbert Salty of the Kwatmang Village Council:

*"This was interesting for me working with the men's group. The work that we have done was like an assessment of some of our development and what has been going on now and could in the future. We can use some of these tools in our communities. I find these tools adaptive. In our area oil is being looked for. What would happen if oil is found in the next year or thirty years from now? Where would our communities be? Would we have a good negotiating position? I have learnt a lot from the three groups that presented today. I would like to thank the staff for giving these tools to us and I will impart this knowledge to my community."*

## 5.5 Conclusion

Our analysis of international, regional, national and local scenario sets has provided some useful insights that are relevant to decisions being made today. We see the juxtaposition between national and higher scales focus on schemes such as PES and REDD+ as potential pathways to a 'green economy' and the lack of this vision in any of the local communities' scenarios. We also see good governance cited as prerequisite for any form of effective social-ecological management, yet past trends and the current political situation in the Guiana Shield does not provide optimism for positive future outcomes. Local communities as key stakeholders, and the potential of grassroots movements to make significant changes, do not feature in any of the scenarios except those created at the local scale. This is in light of the fact that the Guiana Shield and wider Latin America has a long history of grassroots movements, and the recent worldwide phenomena of the Arab Spring.

Raskin et al. (2002) point out that mainstream environment/development policies focus almost exclusively on proximate drivers such as economic patterns, technology, demographics and institutions, whereas the more stable ultimate drivers, subject to gradual cultural and political processes, will define the boundaries for change and the future. But who will be the agents of this change? Raskin et al. (2002) point to the critical role of civil society organisations for fostering debate and progressive change in the global, regional and local arenas, and engaged citizens for advocating a new suite of values that emphasises quality of life, human solidarity and environmental sustainability. They also highlight youth culture; young people representing a demographic cohort whose values and behaviours will influence the culture of the future. In this regard, indigenous communities with their awareness of the importance of ultimate drivers in determining their social-ecological systems, have a significant role to play in shaping values at higher scales. Yet, as illustrated by the scenarios developed by young people of the North Rupununi, if the link to understanding and proactively engaging with ultimate drivers is severed, there is a danger that youth will not engage with the 'structural' issues determining the community/regional/national/international destiny, and therefore will not be active players, but rather, passive pawns in the future evolving toward consumerism, individualism and even nihilism.

### 5.5 The next phase

The aim of this phase of the research was to identify a range of possible future scenarios with regards to the social-ecological systems at the international, regional, national and local community levels, and to compile and prioritise a range of win-win, win-lose and lose-lose options for local communities from among the different scenarios. Using the information detailed in this report, and that outlined in the report on cross-scalar actions and compatibilities<sup>38</sup>, we now aim to compare the current situation for local communities to potential futures in order to identify ideal actions initiated at community level which will avoid moving the current situation towards conflictual/worst-case scenarios, but instead maximises the chances of achieving positive synergistic outcomes. These ideal actions, termed 'community-owned best practices', will be studied in-depth within Work package 4, and then shared with other indigenous communities across the Guiana Shield in Work package 5<sup>39</sup>.

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<sup>38</sup> See Report on the cross-scalar interactions and compatibilities governing sustainable development and ecosystem service management of the Guiana Shield, available at <http://projectcobra.org/report-on-cross-scalar-actions-and-compatibilities>

<sup>39</sup> See briefing on the Structure and Activities of the COBRA Project, available at <http://projectcobra.org/structure-and-activities-of-the-cobra-project>



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**Appendix 1. The Participatory Action Research (PAR) process: how the WP3 activities unfolded at different scales.**

The aim of WP3 was to: identify a range of possible future scenarios with regards to the repartition and use of ecosystem services at the international and regional Guiana Shield (Brazil, Colombia, Venezuela, Guyana, Suriname, French Guiana) levels; identify a range of possible future scenarios with regards to the repartition and use of ecosystem services at the local community level; and, compile and prioritise an agreed range of win-win, win-lose and lose-lose options for local communities from among the different scenarios.

To initiate WP3 activities, work package leader Jay Mistry (RHUL) developed a preliminary plan of action by drafting a breakdown of tasks/activities based on what had been written in the proposal. These were then shared and evaluated with work package task co-leaders Laurens Gomes and Rob Glastra (IUCN NL). During a Skype meeting in early February between Jay Mistry and Laurens Gomes, a refined plan of action was developed, assigning specific tasks to different partners. Table 26 outlines the progress of the WP3 activities as partners worked through stages of the research.

*Table 26. Key action stages of WP3, where JM is Jay Mistry (RHUL), RG is Rob Glastra (IUCN NL), LG is Laurens Gomes (IUCN NL), CV is Caspar Verwer (IUCN NL), CT is Celine Tschirhart (RHUL), IB is Isabella Bovolo (IIC), VR is Vasco van Roosmalen (ECAM)*

<b>Dates</b>	<b>International/regional level scenarios</b>	<b>National/local level scenarios</b>
January 2012	JM drafts WP3 strategy and shares with LG and RG	
February 2012	JM and LG meet to devise strategy for the work and allocate specific tasks.	
	RG presented initial analysis of Millennium Ecosystem Assessment Scenarios as a basis for discussion amongst partners about scenarios use and relevance.	
	JM, LG and RG meet at Brussels partner meeting to discuss WP3 tasks in detail and revision in allocation of tasks following departure of LG from IUCN NL.	
March 2012	JM undertook review of current academic literature on scenario analysis and use of Delphi technique.  RG and JM undertook review and analysis of global published scenario sets	
April 2012	RG and JM undertook review and analysis of regional published scenario sets, including inputs from IB and VR. Completed first draft of report summarising global and regional published scenarios.	JM drafts outline for national and local scenario workshops in Guyana. Feedback received from IIC and NRDDDB COBRA staff.
May 2012	RG and JM devised questionnaire to distribute to consortium and advisory group members.	IIC and NRDDDB COBRA staff facilitate scenario workshops in Georgetown and North Rupununi, supported by JM and RG.
June 2012	RG and JM completed and published (on Basecamp) international and regional scenario analysis final report. Questionnaire distributed to consortium and advisory group members.	Community researchers work on developing films and photostories to share and screen to the wider community for feedback.  IIC COBRA staff produce draft of national and local scenario workshop reports.
July 2012	Analysis of questionnaire responses by JM and CV	Community researchers visit villages to screen results to the

		wider community for feedback. JM and RG provide feedback to drafts of national and local scenario workshop reports.
August 2012	WP3 work and findings to date presented by JM and RG to consortium at Project Management Board meeting in Guyana.	Community researchers begin work on consolidating feedback from community engagement and screenings into films and photostories.
September to October 2012	CT compares questionnaire results with reviewed global and regional scenarios, to help select one scenario set from each level for cross-scalar analysis.	IIC COBRA staff produce second draft of national and local scenario workshop reports.  Community researchers visit villages to screen results to the wider community for feedback and then consolidate results.  Community videos and photostories completed and submitted to EC and project website.
November to December 2012	CT and JM undertake cross-scalar analysis of scenarios, first through a qualitative coding approach and then through a quantitative factorial analysis.  IIC COBRA staff complete and post national and local scenario workshop reports on project website.	
January 2012	JM, CT, CV and RG work in iterative steps to draft and re-work the cross-scalar scenarios report.	
February 2012	Cross-scalar scenarios report completed and submitted to EC and project website.	

In the next section, we will concentrate on three key phases of WP3:

1. The international, regional and national scenarios review – this formed the basis of WP3 and from which all other activities followed;
2. Community engagement experiences in Guyana – this involved cycles of participatory action research with local communities;
3. The cross-scalar analysis – since there are few studies that attempt to link up scenarios of different scales, this part of the research was very much ‘action research’.

All researchers, both at community and academic levels, kept diaries that recorded activities and reflections on practice. These are extremely rich sources of information which will help inform other project deliverables including the practitioner's manual, case studies and journal articles. Here, we provide summaries and reflections, excerpts of diaries and from email correspondences from different phases of the research to illustrate some of the achievements and challenges of working collaboratively COBRA researchers and various stakeholders (communities and national/international stakeholders) on the different phases.

### International, regional and national scenarios review and development

At the international, regional and national level analysis of future scenarios, the first few months involved a clarification of the working process. Headed by Jay Mistry (RHUL) and Rob Glastra (IUCN NL), a desk-based survey of global and regional scenario sets was first undertaken. At the same time, a discussion arose on how the results of the survey could be summarised and communicated. It was decided that identifying the key drivers behind the construction of each scenario (i.e. those determining the main axes of scenario building) would allow a comparison between the scenarios and then enable a cross-check with the opinions of an 'expert' group. However, this was not an easy process as highlighted in the following email correspondence:

*"I must admit that I find it difficult to always identify the two or three key drivers (cf. your frequent comments in the previous draft) that determine the uncertainties and assumptions within each set of scenarios. I notice that many sets discuss a variety of drivers and variables, and not always highlight the two or three "key" ones. Therefore, I am not always certain about the drivers I marked in table 2. This may be due to my lack of understanding of scenario basics, or maybe a set of scenarios does not always have to have two 'key drivers' "* (Rob Glastra, 11<sup>th</sup> June 2012).

Uncertainties in the drivers were therefore surfaced and discussed at length by Jay Mistry (RHUL), Rob Glastra (IUCN NL) and Celine Tschirhart (RHUL), and where possible, any published literature identifying scenario drivers was consulted. The review of the scenarios and their associated key drivers allowed us to then to reflect on what the next step of the research should be. The results of the review showed that there were a wide range of drivers of scenarios both at the global and regional levels, and some form of narrowing down from the pool was necessary. In addition, within most of the regional scenario sets, Brazil, particularly the Amazon region, was either explicitly or implicitly part of the narrations and storylines, whereas Guyana did not feature at all. This led to the agreement that we would use some form of the Delphi Technique, as we had previously planned to do in the project proposal, to come to a decision on which scenarios to take forward for the cross-scalar analysis, and that we would hold a national level scenario workshop in Guyana.

Using the information from the global/regional scenario review, and examples of good practice from well established scenario building institutions, Jay Mistry and Rob Glastra worked on developing a simple questionnaire that could be distributed to an 'expert' group comprised of consortium and advisory group members. As reflected by Jay Mistry (30<sup>th</sup> May 2012):

*"I'm not sure we can do 'real-time' Delphi. First of all, we don't have such a big group of people, so we won't have a large sample to assess. Secondly, as you mention, it would involve considerable work, and I'm not sure it's worth it. I suggest we go for a two-round Delphi, where we first present the questionnaire with a deadline. The responses are analysed and then we give people another opportunity to comment on the findings and/or we devise further questions if necessary".*

In general, advisory group members were much better respondents to the questionnaire than consortium members, many of whom did not follow the instructions and/or delayed in responding. Some people found difficulties with the wording of the questions, others with making judgements about the relative importance of certain drivers over others. A few felt torn between ticking the boxes and making general remarks, and wanting to write long essays on each driver mentioned. Nevertheless, we did finally manage to compile all the questionnaires and analyse the results in order to identify the top drivers of change, which could be then compared to the published scenarios previously reviewed.

In terms of the national scenario workshop in Guyana, we reviewed the published literature on scenario building and devised a schedule of activities that would allow participants to build national level scenarios. Iwokrama compiled a list of academics, civil society members, government and private individuals that were then invited to the workshop. The following is an excerpt from the research diary of Jay Mistry on some reflections on the workshop:

*"People in general were receptive to the exercise. However, it was unclear how much they fully realised the potential uses of the outcomes, although the Ministry of Health representative did comment about how the scenarios could help look at the potential impacts of different interventions/policies on health outcomes. I was in the indigenous representatives group as a facilitator, and I found that although they had clear ideas on the uses of scenarios, it was difficult to get people to work through each stage of the scenario building process. They wanted to 'skip' to the end and build the stories of the 'futures' and required constant reminders of the process and explanations of every stage. Perhaps a visioning, rather than scenario building process would have been better?"*

Looking back on the experiences of the workshop, it seems that although all participants were deemed to be 'national level' participants, their capacities were very different, and that for some, such as the indigenous representatives, a visioning exercise to first discuss what the future might look like, and then deconstructing these to identify the drivers, may have been an easier exercise. In addition, getting participants to apply their own developed scenarios to their own concerns e.g. health, education etc., and/or getting participants to develop indicators to imagine the



first signs of a scenario, would be a fruitful exercise showing how scenarios could help them in their own work settings.

### Community engagement experiences in Guyana

WP3 activities at the local level started with planning for a scenario workshop. Jay Mistry introduced the idea of using a previous project's (Darwin Wetlands project<sup>40</sup>) scenario results from the region as a starting point. The rationale behind this was that local community members would be better able to envisage their futures if they could first see how some of their scenarios from the past had come true or not. Here is an email from Rob Glastra (2<sup>nd</sup> April 2012) commenting on the proposed approach:

*"This NRAMP report which you sent me on the Rupununi stakeholder forum in 2007 was very important. Here are some of my thoughts on this, which we could discuss on Skype. Of course, you know the local context much better than I do, so I am anxious to know what you think of them. I think that our workshop in May should really build on this, that is just fair to the communities. Their 2007 visioning was about a desired future and how to get there, scenarios is about plausible futures - I think that our challenge is to link the two in such a way that the communities have the feeling that they make a step forward and that at the same time our project stays on course. We could propose to IIC and NRDDDB:*

- *how useful do the communities perceive the 2007 workshop with today's eyes?*
- *how valid do the communities think that the 2007 visions are in 2012, and what (if any) elements have become reality? Has the vision since 2007 been used by communities or their leaders in any way, e.g. in development planning? (has there been an evaluation of the 2007 vision since then?).*
- *our workshop in May could validate the visions and/or then focus on scenarios based on assumptions behind those visions. In other words, look at the visions again after a scenario analysis that helps people think about what opportunities or obstacles exist and are expected in the future, and who can (or should) do what about these opportunities or obstacles".*

Iwokrama project staff also agreed on this approach, and planning and implementation of the workshop followed these ideas. The following is an excerpt from the group research diary of NRDDDB community researchers, Lakeram Haynes,

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<sup>40</sup> This is a reference to the Darwin Initiative funded Wetlands Project that took place between 2003 and 2008 in the North Rupununi. Formal title of the project was Sustainable management of the Rupununi: linking biodiversity, environment and people. UK Government (DEFRA) Project Reference Number: 162/12/019. More information can be found here: <http://darwin.defra.gov.uk/project/12019/>

Ryan Benjamin, Rebecca Xavier and Grace Albert, which summarises the two day local scenario workshop:

*“It all started.....when we came back from Georgetown after the Future Scenarios workshop that was carried out there with different stakeholders. In these workshops in Georgetown, we were participants as well as observers. This 2 days’ workshop was really interesting as it gave us access to different ideas and different views of the nation and also different views on how they see us. Rebecca was in the “indigenous” group, Ryan was with the “ministry” group, we were all spread out in different groups. Ryan says there was a lot of brainstorming and sharing about how they would like to see the future. And that in fact, the worst case scenarios might be the real ones for the country. We learned a lot, it highlighted what we should be looking at in the North Rupununi, because the effects will trickle down to the North Rupununi.*

*So we went back to the communities and carried out a similar workshop on the 15 and 16 of May. As most participants had participated in 2007 to the Darwin project, we started off with that, by asking which visions they had had back in 2007 had come true or not. And then we worked on the uncertainties. We thought it was interesting to have 3 different groups (men, women and youth), because it made it easier for them to share similar ideas and to get different perspectives out”.*

Over the two days, participants worked on developing local level scenarios in the three groups of women, men and youth, and this was documented using video and photos by the local team. Using the visual material collected during the workshop, videos and photostories on the scenarios were developed and then taken out during a community engagement visit to twelve communities of the North Rupununi. In two cycles of participatory action research, the community researchers reviewed the visual materials, edited them into films and photostories, and then returned to the villages to screen the drafts and gauge feedback. These comments and extra material arising from community screenings were then incorporated into the films and photostories to produce more representative versions.

The following is an extract from NRDDDB community researchers’ diary summarising the community visits and screenings:

*“Then we had to produce a movie to give feedback to the communities. Before doing so, we had to present the process and outcome of the workshop to communities, to integrate their ideas as well. Rebecca and Grace developed a video, Deirdre developed a poster and Lake developed a photostory. They divided themselves into 2 groups, one for the river and one for the others. The plan was to first show the video, then the photostory, and finally the poster as a way of engaging the communities with Future Scenarios. The poster at the end was to start discussion, and the discussions would be led by dividing the groups in 3 if possible: men, women and youth. But this plan didn’t always work. For example, people often show up late, which leaves less time. We usually wanted to have the workshops at 9 am but people were busy so we rescheduled at 4 pm, but as some workshops were long there were problems with light, too many mosquitoes, and sometimes also noise, as*

*we got a lot of rain, which blocked conversations. That was mostly the case for the river communities, so organisation changed, we had to be flexible. For the other communities, this plan worked out quite well. We visited 12 communities in all. Yupakari was the only one where we couldn't do anything, they were always busy, for instance with the heritage day. We visited the communities in July, and some of them in September. It took us 1 day per community, for workshops of 3 to 4 hours. In average there were 15-20 people showing up, often a mix, but more women showed up in Aranaputa, Fair View and Rupertee. More men showed up in Katoka, Kwatamang. Largest turn up was in Masara ("it got my heart pumping": Lake). Very poor turn up in Fair View (1 to 4 people). In the non-river communities, Ryan observes that there was often a dominant person leading discussions but that it was good, keeping discussion going. In the river communities, Lake notes that discussions were mostly led by men. There was a general understanding and most groups supported this step of the project. It made them think of how to plan something. Surama added some interesting ideas, with destruction of ecosystems. Rewa talked about a scenario about forestry, forestry alert and the impacts on the community, negative as well as positive. In Kwaimata, they focused on a very local issue which was the road, but the scenario approach made them think about what would the different possible ways of developing this road. Looking at it with this different approach was thought very interesting".*

Lessons learnt from the community consultation processes included having more personal interactions with villagers by meeting with them individually before group meetings. Community researchers thought that not only would this help in planning for group meetings (choosing appropriate times, venues etc), but more importantly, start building a relationship with people to show that they were interested in sharing and meeting with them. This would be a particularly important way to encourage the youth and women to participate.

### Cross-scalar analysis reflections

Once we had all the scenarios from the different levels written up in detail, the next stage was to look at where the compatibilities and conflicts between these scenarios lay. The cross-scalar analysis of the scenarios was undertaken by Celine Tschirhart and Jay Mistry over a number of weeks, and through extensive discussions. It began with Celine Tschirhart carefully reading over all the scenarios and identifying the drivers from the narratives. Some scenarios were easier than others; for example, the drivers determining the main axes were explicitly described in some scenarios, whereas in others drivers were underlying or coalesced into groups of drivers. The extraction of drivers was therefore made on published information and a subjective judgement on what were determining the scenarios. Once the drivers from all the scenarios were identified, these were coded and then used in a qualitative mapping process to make linkages. The following email correspondence from Celine Tschirhart (21<sup>st</sup> November 2012) summarises the activities:

*“Jay and I have been meeting on Wednesdays for the past 2 months to carry out the WP3 tasks. We have followed a similar approach to Andrea's<sup>41</sup> to carry out the cross-scalar analysis. The driving forces and trends were identified per scenario, at each scale. Then, in order to carry out the cross-scalar analysis, we decided to map them out, the way we did in Brussels. We identified key themes regardless of the scales to begin with, rearranged and re-classified them over 2 working sessions, until we thought the categories were relevant and corresponded to the scenarios. We then spread the category across scales, the North Rupununi being at the centre of the "map" and the higher scales around it. We have started identifying gaps and overlaps across scales, and next Wednesday we are carrying on with this step of WP3 !”*

The mapping of the drivers was a difficult but enlightening process; once one set of groupings was made, we stopped to discuss the results and through this realised that we had missed something and/or that drivers belonged in different groups. We then re-grouped and stood back to see what story the map was telling us next. This occurred over numerous sessions until we were satisfied with our groupings. We then discussed these with Andrea Berardi from the Open University which led to some final re-mapping of the drivers.

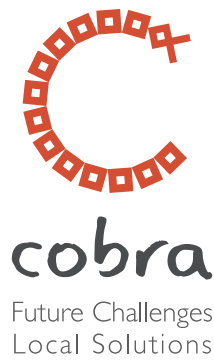
This analysis identified themes, but to verify the linkages between specific scenarios, we then needed to make linkages across the scales within the different themes. We first attempted to do this using the map of drivers, and using arrows and lines to make the connections apparent. Although this enabled us to begin making tentative cross-scalar interactions, it became clear through this exercise that we would need another method to produce more precise linkages between the local, regional and international scenarios. After some discussion between Celine Tschirhart and Jay Mistry about potential approaches, it was decided to complement our qualitative approach with quantitative analyses using a combination of Factorial Correspondence Analysis (FCA) and Hierarchical Ascendant Classification (HAC). The main reasons behind this choice were firstly the qualitative nature of the variables and the suitability of this particular analysis to deal with data of that type, and secondly that Celine Tschirhart already had good experience of the methods and its analysis. This led to the identification of win-win, win-lose and lose-lose cross scalar scenarios. The following paragraph reflects some of Céline Tschirhart's reflections on the use of this technique for identifying cross-scalar synergies and conflicts between scenarios:

*“I personally like using these statistical techniques for three reasons. Firstly, because it enables to build a typology of individuals (here scenarios) by taking into account a great number of variables, that often a human brain is finding hard to process. Secondly because it builds links between variables through a process that should be very objective. I say “should”, because one of the tricky steps in order to carry out the FCA was to code the scenarios. This process is highly qualitative and is prone to subjective classifications. Even though the risk is low, it is still one limitation of this technique we should all be aware of. Thirdly, I like using these methods because the*

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<sup>41</sup> Partner from the Open University

*results are visually mapped out on a graphic, which helps a lot for the interpretation. The results that have been reached by using these statistical analyses are clear, logical, interesting to interpret. The win-win, win-lose and lose-lose pathways were clearly identified. I thus think these methods open very interesting perspectives for cross-scalar analyses, whether it be for Future Scenarios or for other research themes. However, in order to analyse the results in an objective way and limit misinterpretations, the whole process leading to the creation of variables and coding should be extremely transparent”.*



The findings offered in this report are based on a comprehensive review of published international and regional future scenarios and case study materials developed through participatory scenario processes with national stakeholders and indigenous communities.

The report provides in-depth cross-scalar analysis of scenarios from international to local level to identify win-win, win-lose and lose-lose future options for indigenous communities of the Guiana Shield.