

A NEW PARADIGM
OF **SUSTAINABILITY**

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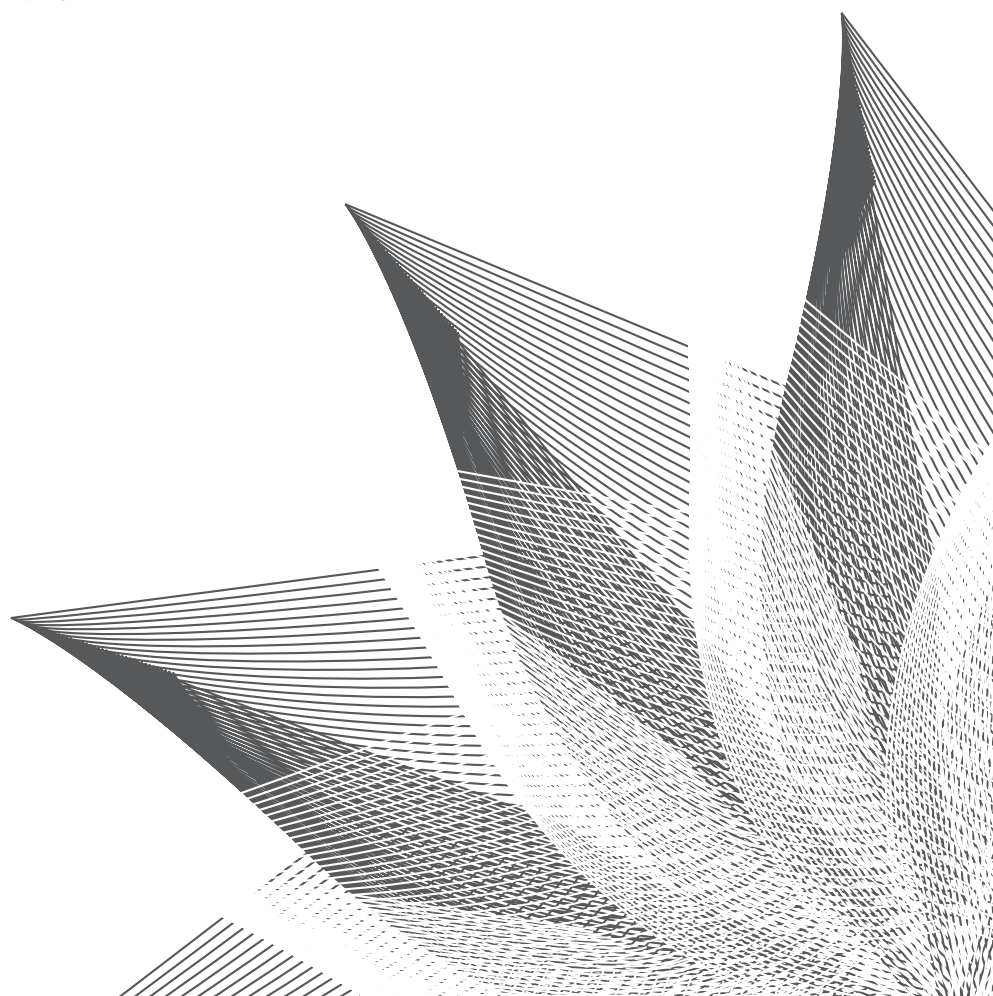
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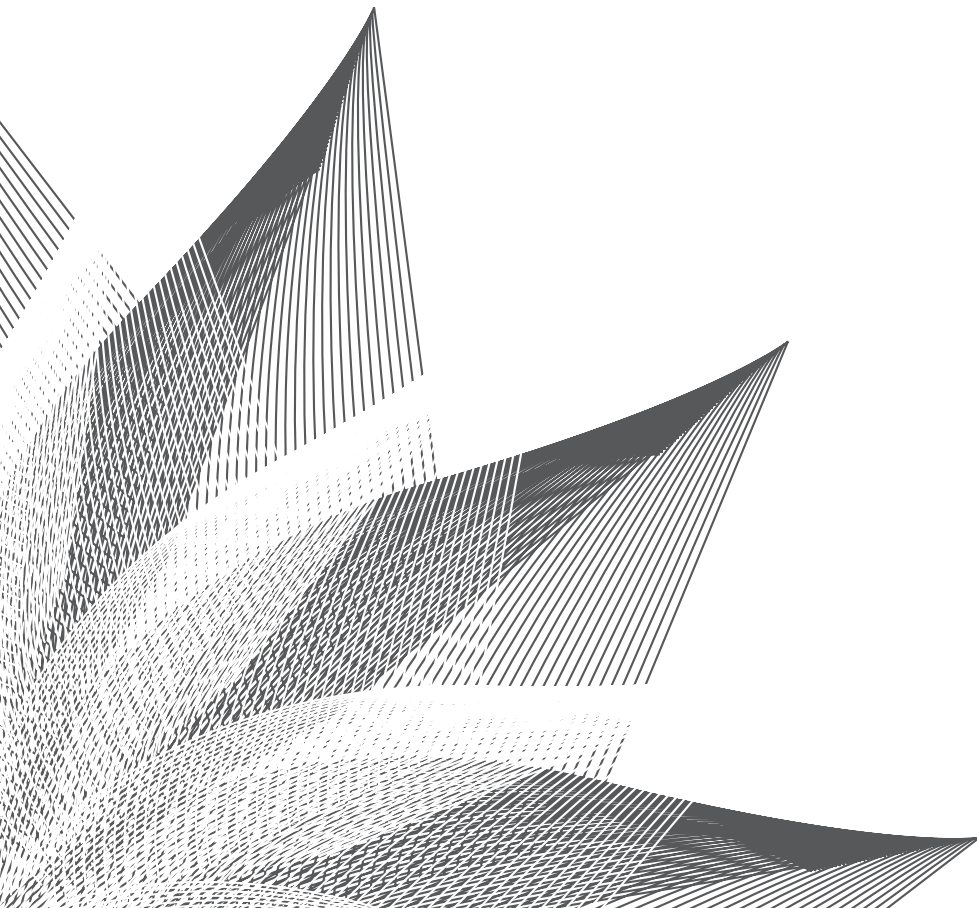
WEI DAN



A NEW PARADIGM OF SUSTAIN ABILITY

THEORY AND PRAXIS
OF INTEGRATED LANDSCAPE
MANAGEMENT

INGUELORE SCHEUNEMANN
AND LUIZ OOSTERBEEK (EDS.)



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EDITION

IBIO

ENGLISH AND REVISION TEXT

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PRODUCTION AND EDITORIAL COORDINATION

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CIP-BRASIL. CATALOGAÇÃO-NA-FONTE
SINDICATO NACIONAL DOS EDITORES DE LIVROS, RJ
N843

A new paradigm of sustainability : theory and praxis of integrated landscape management / Ingelore Scheunemann e Luiz Oosterbeek (orgs.) ; [tradução da versão em inglês Sybelle Margery Marie e Jongh Doria Martins]. - Rio de Janeiro : IBIO, 2012.
280p. : il.

Inclui bibliografia
ISBN 978-85-60840-11-3

1. Sustentabilidade. 2. Desenvolvimento sustentável. 3. Política ambiental. 4. Gestão ambiental. I. Scheunemann, Ingelore. II. Oosterbeek, Luiz III. Instituto Bio-Atlântica.

12-3528. CDD: 363.7
CDU: 502.131.1

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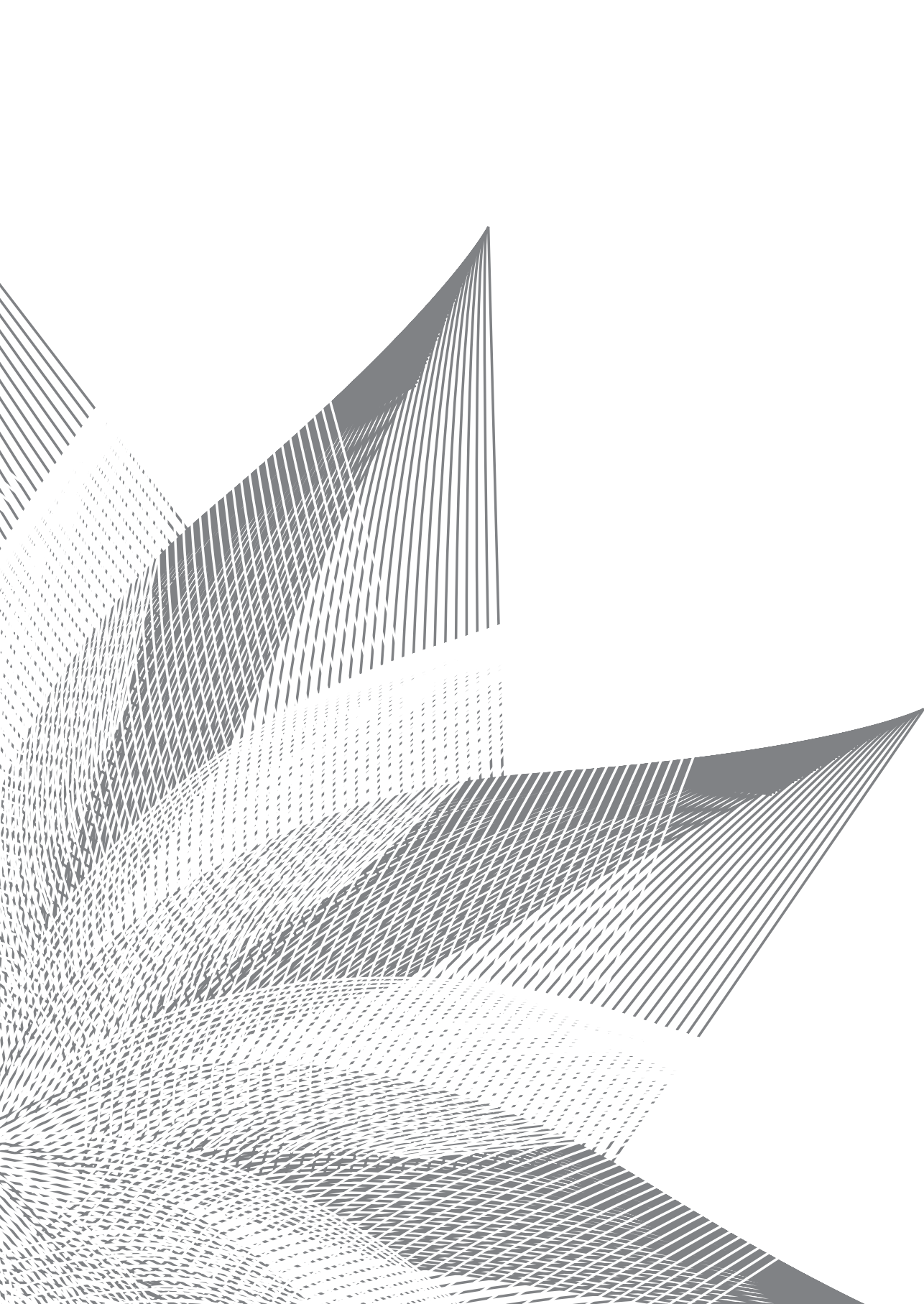
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PREFACE

ROBSON ANDRADE

In 2012, Rio de Janeiro receives one more global conference to address sustainable development. The Rio-92 (or Eco-92), held 20 years after the Stockholm Conference, consolidated the concept of Sustainable Development and originated the Agenda 21 and three major treaties whose developments decisively influenced national policies and international relations: the United Nations Convention-Framework on Climate Change, the Convention on Biological Diversity, and, from the negotiations that took place in Rio, celebrated the term alluding to the United Nations Convention to Combat Desertification. Agenda 21 is a powerful instrument to reinterpret the concept of progress, promoting quality, not just the measure of growth.

The 40 years separating the Rio+20 from Stockholm show that there are important challenges to effectively reconcile the models of development with environmental limits of the planet, that is, to find ways to reconcile economic systems with ecological systems. Overcoming this challenge should also consider that the present moment requires that government and society create conditions for including a significant contingent of the population in emerging and developing countries in the consumer market. The revitalization of emerging and developing economies has had a key role in overcoming the current crisis. However, it is important the emer-

gence of new patterns of production and consumption based on the principles and imperatives of sustainability so that this dynamic does not incur in another crisis, the environmental.

Over the past 20 years, Brazil and the world witnessed important transformations. The Brazilian economy overcame hyperinflation, adopted deep regulatory reforms, liberalized trade and investment regime, and in the first decade of 21st century, achieved the resumption of economic growth, with improved standards of income distribution and poverty reduction. Active programs to combat poverty and generate income and employment contributed to the Country ending in the first decade of the new century with clear improvements in social indicators.

Worldwide, the '90s were marked by the convergence of national regulatory regimes around a model of economic liberalism, which encouraged cooperation initiatives and international negotiations. From the mid-90s and the next decade, the world experienced a period of strong economic growth, with the intensification of trade and investments.

This economic environment led to the emergence of large developing countries, particularly China, whose demand for products intensive in natural resources promoted the rise in international commodity prices and contributed to the growth of countries like Brazil. Changes in the second half of the decade, due to the effects of expansionary monetary and fiscal policies in developed countries, fueled by the weakness of regulation of international financial markets, produced an unprecedented international economic crisis since the 30s of last century.

The economic and social policies adopted by Brazil in the last decade allowed the country to face the international crisis on more favorable terms. But the Brazilian industry was not immune to the crisis and the impact of the boom in commodity exports on the exchange rate - the strong value of the Brazilian currency, coupled with the slowdown of international demand, has imposed heavy pressure on the competitiveness of industrial products in the domestic and foreign markets.

The situation is unfavorable for the efforts on international cooperation and negotiation, even in finding a productive sector more aligned and committed to its thematic axis. The articulation process of the industrial sector for the Rio+20 Conference - coordinated by the National Industry Confederation (CNI), which involved the S system and 16 industry associations - shows that the Brazilian industry has

advanced significantly in the efficient use of resources in production and in the models of governance that are more transparent and open to dialogue with governments and society. This dynamic is not different in most developed and emerging countries. In addition, the Brazilian industry develops under the aegis of strict environmental and social legislation, given the standards of demands similar to those of countries that are at the forefront of the subject.

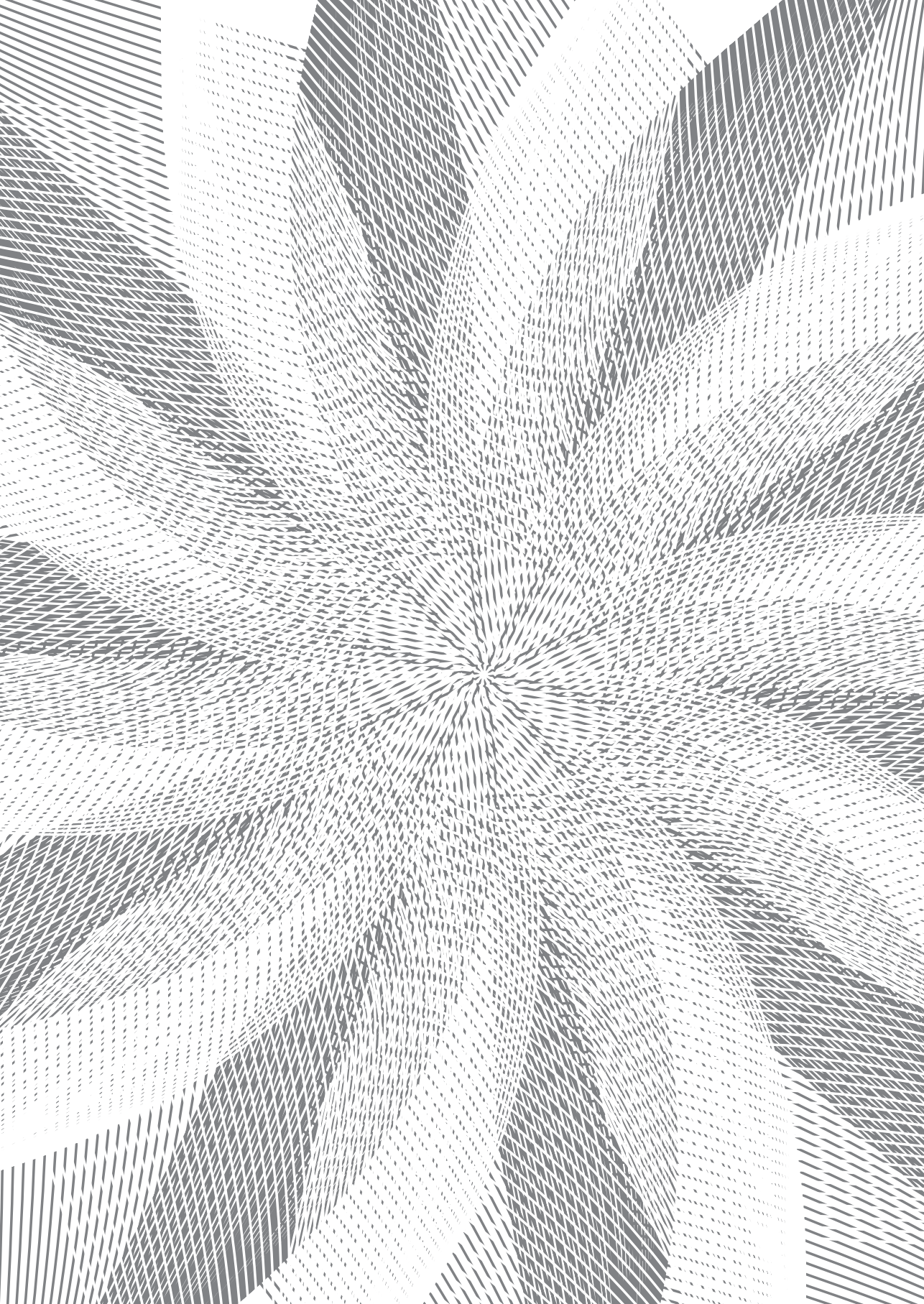
The Brazilian industrial sector sees the Rio+20 Conference as a great opportunity to show the achievements and successful experiences. The adoption of cleaner technologies, environmental management systems and certification standards such as ISO 14001, and further, the development of structured programs on social responsibility are realities of the Brazilian industry. The recent period has also been marked by the consolidation of corporate governance models aimed at strengthening relations with civil society and public authorities.

This is a moment to reflect on the effectiveness of the commitments drawn in previous conferences. A critical view on the concept of sustainable development must emerge to evoke further discussion, and, perhaps even clashes. Commitments around the theory of sustainable development were made collectively. A number of multilateral meetings hosted discussions on sustainability. Advances were made, but important structural and operational challenges have not yet been overcome.

The reflection proposed by the BioAtlântica Institute and its main European partner, the Polytechnic Institute of Tomar-IPT, shows a way, an alternative to overcome the bottlenecks that interfered in the achievement of sustainable development. The Integrated Landscape Management (ILM) includes culture as a form of union between the environmental, social and economic issues. By incorporating the logistics, which leads to treatment the territory under a new light, as the site itself where development is processed or not, ILM recognizes it as a complex system.

The CNI walks toward the Integrated Landscape Management when offering to Brazil the study Competitive Brazil, which is being done by geopolitical regions, where the possibility of development is addressed not only from the economic perspective, the analysis of productive chains, but considers the logistics and the interrelationship between the different territories, with their characteristics. Our partner in this initiative, EBX adopted the concepts and methodology of Integrated Landscape Management as part of its model.

The CNI and EBX come together to support the initiative of IBio and IPT to call exponents of thought and action on the important issue of sustainable development around the world to give their contributions in the composition of the book *"A New Paradigm of Sustainability: Theory and Praxis of Integrated Landscape Management"*. It constitutes a contribution to the advances that are intended by Rio+20 in the direction of sustainable economic development.



INTRODUCTION

ILM: A PATH TO SUSTAINABLE DEVELOPMENT

EIKE BATISTA

To generate and multiply wealth with innovation, human capitalism, sustainable attitude and integrated vision of surrounding social, environmental, economic and cultural factors: This is the great challenge of the entrepreneurs of our time.

In the EBX Group, we support over 160 social and environmental actions. We sponsor initiatives in education and culture, health, sports and environment. We act with the awareness of knowing who is responsible for the sequence and consequence of the endeavors. So, we go beyond.

Besides the traditional forms of wealth returns to society, we adopt a format that values the individual and takes notes of the territory in which we operate, from a new perspective. In this context, we embrace the Integrated Landscape Management (ILM).

It is a methodology that includes and values the natural vocation of the region. It works from a systemic and integrated approach, valuing diversity and human being.

For the ILM, the culture is not just one more element for sustainable development. But the fourth element that makes up the fundamental basis of support for territorial development, together with the social, environmental and economic aspects.

There is a greater meaning in this model: understand and stimulate the potential of each local agent, enhance cultural diversity. In this context, the ILM involves government, enterprises, civil society organizations, educational institutions and regional leaders to build sustainable solutions for development.

Thus, we formed an integrated entrepreneurial social network, which sees human capital as the main agent of territorial transformation.

We adopted the ILM in the Açú Super port project, the highest investment in port infrastructure in Latin America, which is being built in São João da Barra, in the State of Rio de Janeiro.

We invested in programs to strengthen fishery in the region, such as the Fishing Warehouse, which will ensure the infrastructure and necessary support to the activity. For the farmers of São João da Barra we developed an agricultural area for the diffusion of production technologies. In partnership with the community and local institutions and from neighboring counties, we conducted about 50 social and environmental initiatives in the region, which will reach close to 300,000 residents by 2025.

It is so, that the private sector often is left to do what the local, State, or Federal government has less efficiency to perform. To promote dialogue, perform integrative actions, which highlight the cultural diversity and encourage participatory management. And, once again, respect and encourage local skills helps to maintain the self-sustainability of the region!

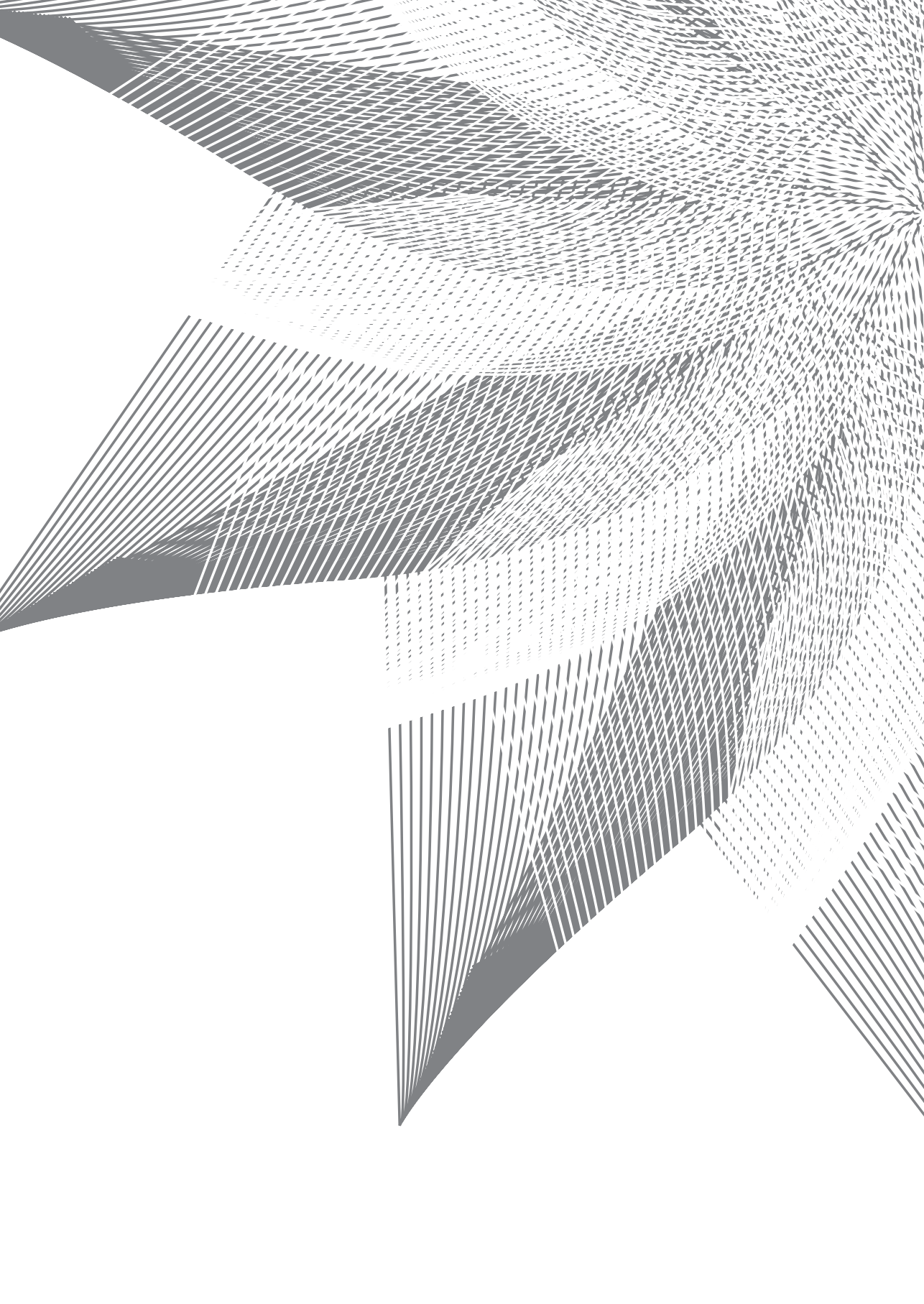
In Açú, for example, we created what we call "memory spaces", with, already, 20 units, and the "Knowledge Center", which also works as a space for dialogue with society.

The center includes a library on the region, and it is where the community meets to consider and propose projects that can be run by them, by institutions or adopted by the company. We are also creating a museum to rescue the local history and culture.

Still in the region of São João da Barra, we allocated 4 000 hectares to create a Private Reserve of Natural Heritage (PRNP). Other initiatives are the nursery for native species of this biome in the region, monitoring of the nesting of sea turtles and the installment of the Ecological Corridor of Muriqui, in an area of 400,000 hectares - equivalent to almost three times the city of Sao Paulo.

Large projects need to be conceived and grown integrated to territory management. An enterprise can no longer plan their ventures viewing within their walls, without hearing society, without considering economic, social, cultural characteristics and, above all, the vocations of the region in which it invests.

It is necessary to expand boundaries, to look ahead, to break down walls. For this, we believe in the model of the ILM and in the formation of a creative social network, entrepreneurial, participative and transformational!



PRESENTATION

SUSTAINABILITY IN THE AGE OF THE RISORGIMENTO

ERLING LORENTZEN

The search for sustainability has entered a new era. Over the walls of the Academy, the fact extrapolated the closed discussions among experts, advanced beyond corporate boundaries or lanes of public administration and became an issue common to all. There is no sustainable company, government or country without a sustainable and responsible society committed to basic principles for the perpetuation of natural resources, human and, by extension, economic.

Brazil has a key role in this process of rupture and subsequent evolution of knowledge about sustainability. The country is the birthplace of a new scientific concept, which is transforming our understanding of sustainable development.

The development in question is the work of renowned Brazilian specialists in conjunction with researchers in Europe. We can cite as key characters for the development of this study Professor Ingelore Scheunemann, of the Institute Bio-Atlântica (IBio), and Institute of Territorial Certification, and Luiz Oosterbeck, an eminent researcher and member of the Polytechnic Institute of Tomar, Portugal, and committees of the European Commission, UNESCO and the UN. Both lead a valiant group of researchers gathered around the IBio, which has been notable as the focus of discussions for the design of this model, having as main compromise the generation of economic development, equality and social welfare.

The ILM (Integrated Landscape Management) represents an improvement compared to the original concept of sustainable development. Initially, the sustainability model took into account the economic, environmental and social aspects. For many years, this vision was instrumental in establishing tripartite references and guide actions in both public and private spheres, but today it is an outdated model, unable to meet the needs of all stakeholders and those compromised to sustainable economic growth – enterprises, governments and society in general.

The Integrated Landscape Management incorporates a key variable: the culture. As Eliezer Batista well defined in his article, the cultural issue is replaced by a transversal effect on other factors. It sews up the economic, social and environmental ends, giving an integrated understanding of something so far seen as compartmentalized, from a detached perspective. The Integrated Management aims to use culture as a factor of intertwinement.

The ILM allows the analysis as a whole in a given economic project, based on systemic-holistic understanding of all factors and actors relevant to the territory in question. This new model assumes that reality is always integrated and all vertices of any development with social and environmental impact should interact with each other. The addition of the culture to the economic / environmental / social triptych maximizes the use of new knowledge to obtain logistics solutions for a more efficient structural benefit to the community.

This is one of the great merits of this work. The reports of the prestigious sustainability experts gathered in this book will enable a better understanding of this new concept and its consequences extremely beneficial to society. Should it be for its scientific value, for its ability to redirect and further discussions on sustainable development, this is a work that deserves to be shared among all audiences. Also because the ILM will certainly have a transformative effect on the development of economic projects and will completely change the relationship between business, government and community.

One of the most relevant effects of the advent of Integrated Management is the formation of an entrepreneurial network composed by civil society organizations, community leaders, landowners, and corporations, federal, state and municipal governments.

The main line of the ILM marries perfectly with the IBio efforts to promote regional planning, within the intricate equation of harmonizing factors often seen as conflicting: environmental conservation, population growth and economic development. In its genesis, the Integrated Management is able to enhance the understanding that the territory is composed of resources, largely non-renewable and limited, requiring a systemic administration of its use.

The proper use of the economic, social and natural potentialities in a region depends crucially on this unique vision, amalgamated. For this you need to find the focal point for the aspirations of the different characters that interact in the same area within the modern perception of sustainability. As he points out Martin San Fernando Ortega, from the University of Lima, the Integrated Landscape Management allows the mapping of communities among which there is a confluence of interests and desires of more homogeneous groups of the population, and then establishes processes for the construction of a shared vision of the future based on common needs.

Also according to San Martin, one of the challenges is to define the "territory", which often transcends geopolitical boundaries. This concept refers, in fact, to the social and economic units built over time, creating a bond between people and their respective geographical areas.

This is just one of the great changes brought by the Integrated Landscape Management. The geographic boundaries give way to the geo-economics borders. The territory is not a cartographic line, an imaginary trait, but rather an axis around which to unite the economic potential of a given area, which allows the preparation of regional and even nationwide strategies.

Another important difference of the ILM in relation to the original concept of sustainable development is the extent of their actions. Sustainability goes beyond the gates of the companies and spreads on a much larger radius of action. The new model includes the conjugation of the economic, social, environmental interests throughout the region around the economic project, giving an integrated vision that guides its concept. It is precisely the cultural variable, in which the human resources are inserted, that allows the tying of the several factors, external and internal, needed for the execution of a project truly sustainable.

Increasingly therefore, companies and public managers have to identify with greater precision the various supply chains and cultural planning and investment opportunities which will allow integrated regional development, whether in the name of a local project or even a project of national scope.

Large corporations, governments and society in general are facing a challenging crossroads, reflected in several dilemmas: how to combine economic growth, sustainability and the different needs of social inclusion? What is the point of symbiosis between the private and public interests? Is it possible to promote sustainable development without a more active involvement of central governments? What is the "best spot" of sustainability so that it does not become an obstacle to economic growth, job generation and social mobility, especially in emerging countries?

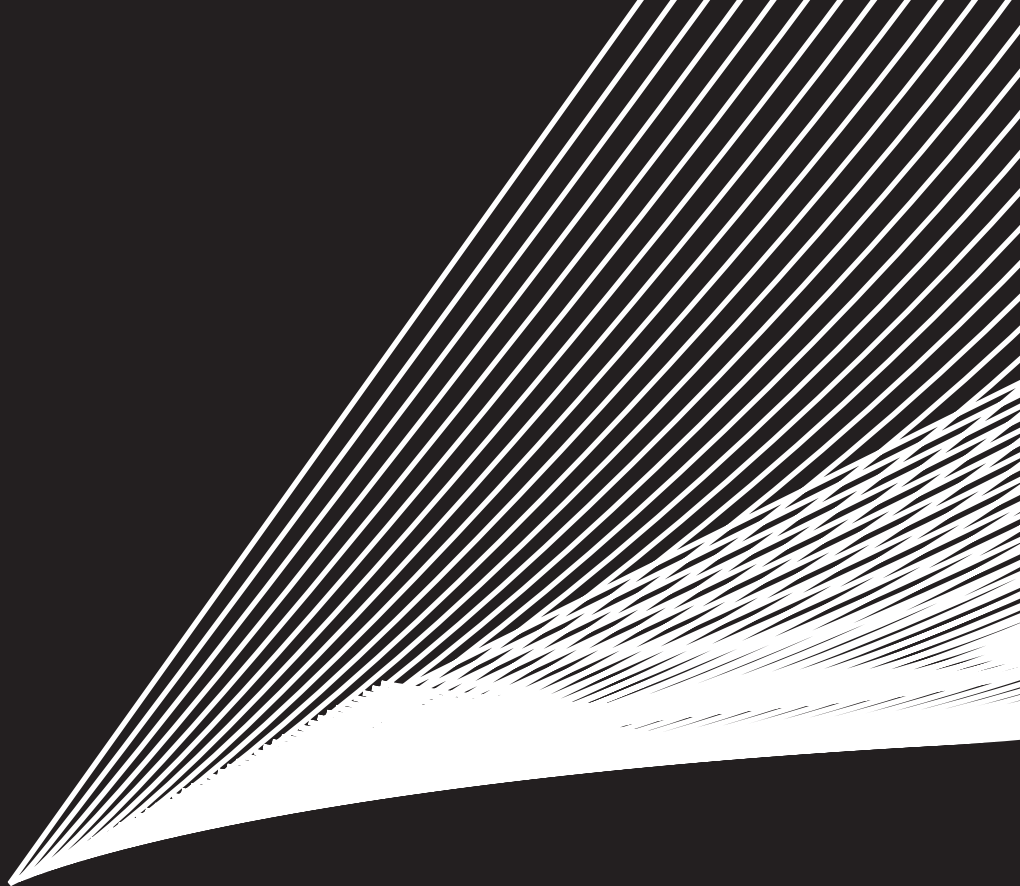
The balance between the economic, environmental and social interests depends on a rapid response to these questions. Likewise, we need to take all the discussions about sustainable development to higher levels of objectivity. There is no more time for ethereal theories that do not support the crossing to practice. We must build sustainability as a tangible and palpable asset.

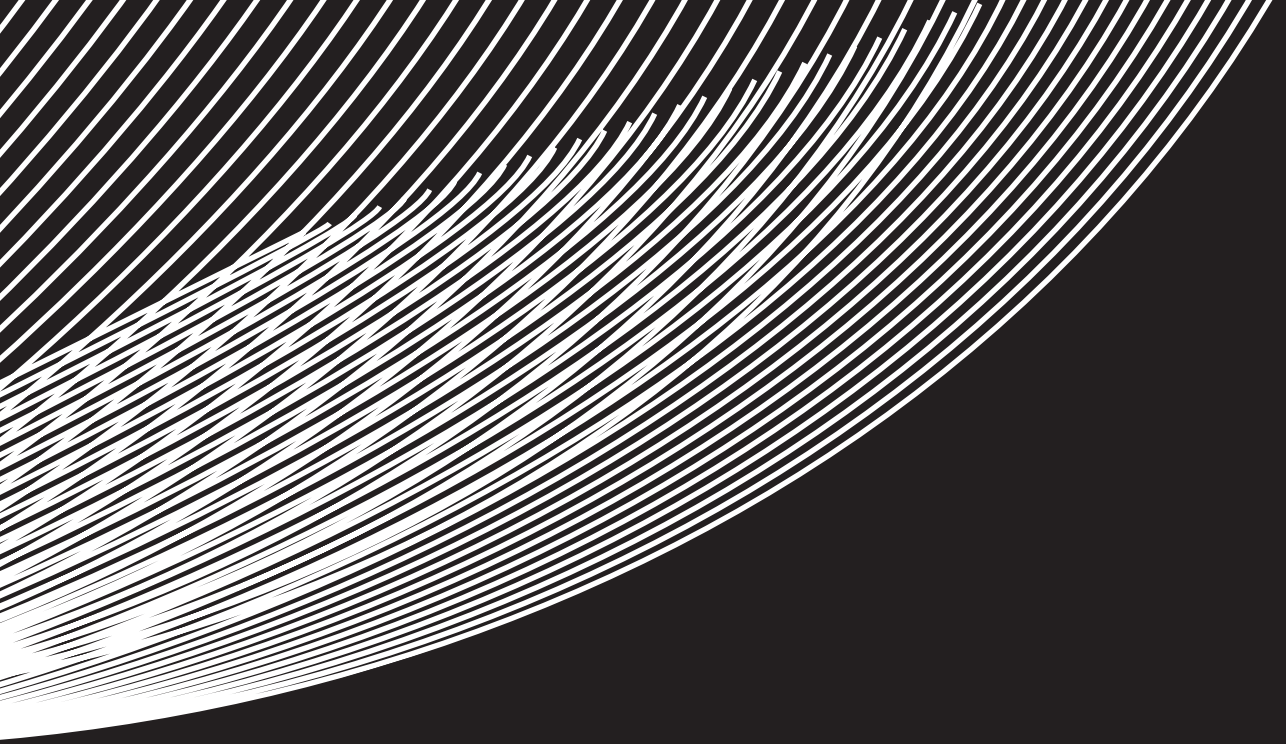
At this point, Brazil confirms to be in the prow of the studies in favor of the evolution of the concept of sustainability. In addition to the Integrated Landscape Management, the country is the source from which flows a model capable of measuring sustainable development within strict technical criteria. This is the Territorial Certification.

This methodology allows the monitoring of projects and the intersection of all the variables, generating a detailed analysis of developments in economic, social and environmental. That is, sustainability has now its metric system, capable of measuring the success of actions taken and to assess quantitatively and qualitatively, the results achieved.

As it can be seen, we are in an extremely challenging time, but also stimulating. No more time and room for hesitation or farfetched in emptiness. The idea of sustainable development is experiencing a period of evolution towards the practice of Integrated Landscape Management. The sustainability experiences a reinterpretation based on a more current and capable of bearing the interests and needs of diverse audiences viscerally involved and interested in this process.

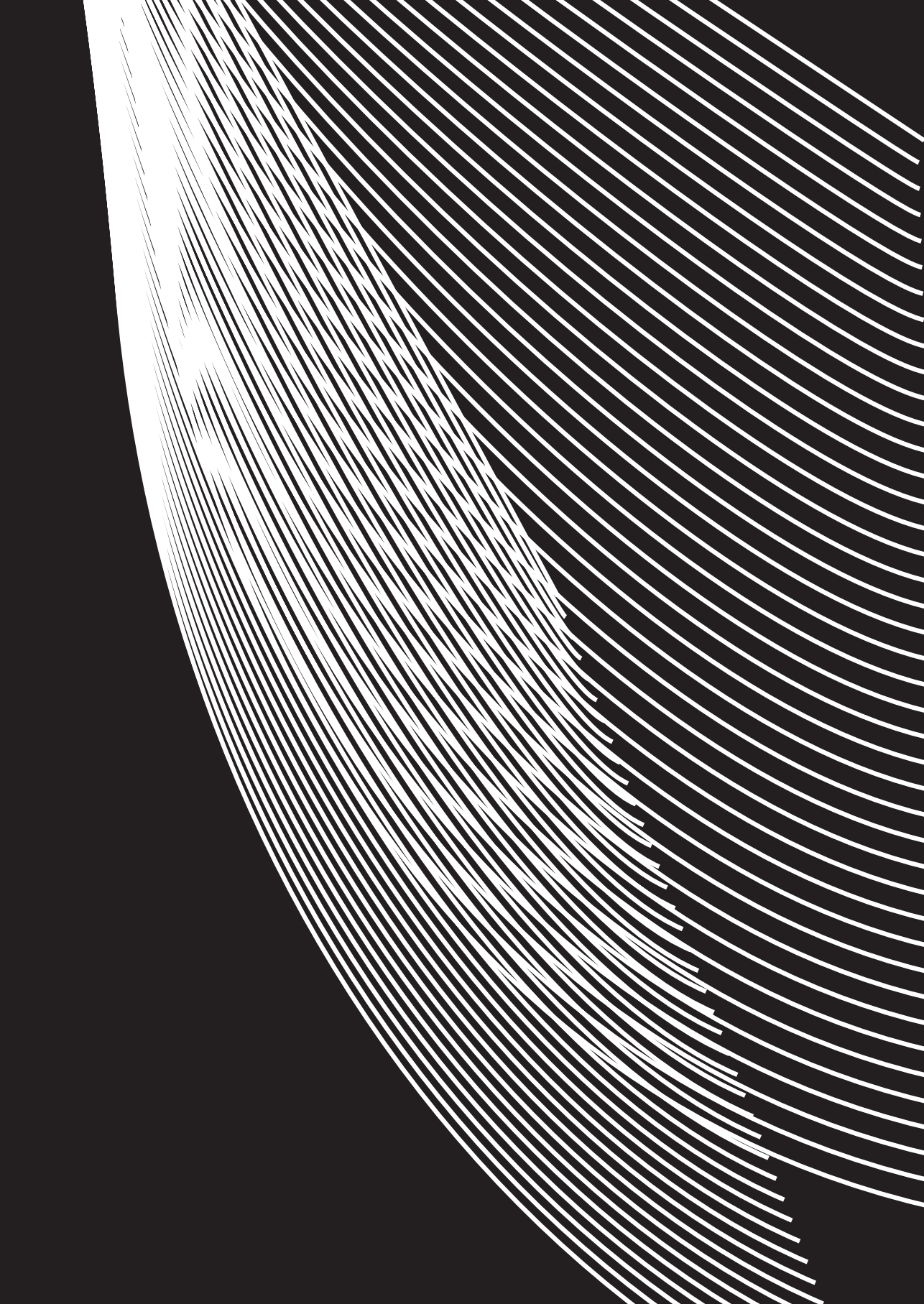
"Revisiting sustainable development" has as one of its aims to analyze these changes and contribute to an objective discussion on the theme. Moreover: this book is true, above all, by its propositional character and the intention to respond to the dilemmas surrounding the binomial economic growth / sustainability in the third millennium. The pages of this book form a gallery framed by some of the greatest thinkers and scholars of the matter, characters who dedicate their present to the mission of devising a more fruitful future for humanity. The following words are as perennial as the world we want.





PART I

From integration to certification



OUR COMMON FUTURE...

25 YEARS LATER:

10 QUESTIONS AND ANSWERS MOVING FROM ANXIETY INTO THE PRAXIS OF LANDSCAPE MANAGEMENT

LUIZ OOSTERBEEK

*Essential is to know how to see
To know how to see without thinking,
To know how to see when one sees,
And not even think when one sees,
Nor see when one thinks.
But that (poor of us, all dressed up in soul!),
That requires a profound study,
Learning to unlearn
Alberto Caeiro*

WHO AND WHAT ARE WE?

Culture is our nature.

Facing a largely unfriendly environment, our ancestors developed specific adaptation skills that enabled them to populate Africa first, Eurasia almost two millions of years ago, Oceania (across the sea) some 60.000 years ago, and the Americas possibly a bit later. This amazing dispersal and flexibility to adapt to completely different environments was not primarily based in physical strength, fast locomotion

or great number of individuals. Some millions of years before, the ancestors of our ancestors, before becoming primates, “chose” the path of neoteny, i.e., an evolution mechanism characterised by lower numbers of descendents and longer extra-uterine maturation process (Gould, 1977). As a result, we became learners, primates that never cease to grow in knowledge. And, following the primates’s path, our way of being became mainly extra-somatic, educated. Culture became our way of being natural.

Human societies, organised in tribes, had no lasting recording systems to preserve their knowledge advances. Their survival depended on oral transmission, and this was a main task for all humans: learning by heart a series of prescriptive tales, that would possible mix technical ways of doing and social behaviour rules, from which mushrooms not to eat (knowledge as a foundation for behaviour) up to why betrayal is negative for survival (ethics as source of social cohesion). Many of these tales would be sung out, in order to facilitate memorisation.

These prehistoric societies, as all oral societies in the past and in the present, were very conservative: despite the adaptation flexibility of our species, change would mean, most of the times, death. Innovation was a major risk, and external challenges were crucial for any major modification of traditional attitudes. Whenever this was required, humans built extensions of their bodies, objects and structures that amplified their capacities: technical innovation became our main evolutionary strategy.

Some eleven thousand years ago, the climate was changing all across the globe. In the northern hemisphere, one may imagine how bison, auroch and mamouth hunters became puzzled when the tales that they were learned to sing, and that taught them how to cope in a severe cold environment, proved to be useless. Debates certainly emerged, engaging different perspectives and resulting strategies. Some groups migrated north, trying to keep their traditional way of life, and some managed to do so for a few millennia, in increasingly restrict spaces. Others started to hunt new game, as the small and fast species that took the place of the great herbivores, like rabbits or wolves, improving the techniques of using bow and arrow. Others still became seafood eaters, occupying estuaries and building impressive shell middens. Many of these survived quite successfully, although they were still very few. But some decided to start putting down trees in order to clear fields for

crops: these opened a new era of population growth, greater interaction, economic intensification, cycles of expansion and hunger and increased innovation.

They started globalisation and we are their descendents.

IS GLOBAL ENVIRONMENTAL STRESS AT THE EDGE?

Yes, and this is largely independent from human actions.

The most important positive result of the 1992 Earth Summit has been a widespread awareness of the global nature of the environmental stress that the planet is experiencing, as a consequence of the great acceleration. Legislation and new attitudes of citizens and companies are a result. Environment agencies, ministries and NGOs have been successful to promote such awareness, even if rigorous knowledge is often shaded by the confusion between environment and climate, or by an anthropocentric overestimation of the implications of human actions in the planet.

Pollution, combined with global warming and inadequate distribution mechanisms, generated a major stress over potable water resources. While some coastal territories face the threat of water rise, it is surface water that diminishes, with a direct major impact in the most impoverished populations. Water management needs were, in the past, both the main driver pushing for technological innovation and generating conflicts (from ancient Mesopotamia to the Jesuitic and Guarani), and despite the growing attention paid to other mineral resources, one should not forget that basic needs were always determinant in setting humans in the move.

Associated to water scarcity, the degradation of several ecological resources, from rain forest to mangroves, entails a decrease in biodiversity, i.e., on basic resources for the sustainability of humans. The restricting of the spectre of resources available for humans diminishes human strategies possibilities, or human societies' resilience, thus favouring other competitors (bacteria, etc.).

The stress on primary (water) and secondary (bioma) resources is aggravated by long lasting discarded residues, namely resulting from industrial activities, the urban concentration and the equity model that is based in the access of growing numbers of people to disposable goods, often non-recyclable.

Environmental stress is also a consequence of global changes and trends, in the current stage of the Holocene, and human actions have little influence in this, even if humans have to adapt to it.

Growing awareness of the global environmental and climatic stress is a fact, but despite all local efforts, no global strategy or solution has been implemented, and all tangible progresses are mostly local (see M. Machnig, this volume).

IS GLOBAL SOCIAL DISRUPTION A GROWING PHENOMENON?

Yes and its end is not foreseeable.

Whereas environment is perceived within a global scale, the same does not occur at the social level. The past twenty five years were not as successful in spreading awareness on the global nature of society, but as the 1987 report implied from the beginning, sustainability implies a systemic understanding also of the invisible web linking all human groups. Global society is a direct result of global economy, i.e., of an economy based on the exchange of commodities, products and human resources across the planet. Although globalisation is a process that can be traced back to modern humans dispersal, over 40.000 years ago, the basis of current global economy were set in the 16th century, and most major conflicts since then gained a growing global scale: wars to control the transoceanic routes in the 17th century, revolutions with global ideals in the 18th century, regional conflicts with global effects in the 19th century, world wars and a peace of global tensions in the last century.

While population keeps growing numerically for a while, in fact it is already diminishing, given the negative balance of the birth rate in all continents except Africa, this leading to ageing with all its implications, namely the outnumbering of the labour force by old people and the future incapability to secure the continuation of the species (rule number one not to be broken by any living species). This de facto trend is consolidated by contemporary ethics, focused in individual rights over collective needs, a characteristic observed in past turmoil processes, as in ancient Rome from the 2nd century AD.

At the dawn of the 3rd millennium, the major pillar of such peace of tension in the past decades is currently threatened: middle class in the northern hemisphere

faces decay, the demise of supposed acquired rights and unemployment, losing faith in participatory democratic regimes, while emerging middle class in the southern hemisphere is told never to get the status the former has had. Technology, this crucial resource for evolution, poses a new dilemma: it tends today to enable producing more and cheaper, but with less manpower, thus leading to growing unemployment and impoverishment, as to the loss of expectations of youngsters and the demoralisation of elders. Major powers fail to control the planet's safety, as they were capable of a few years ago, while pirates sail across the Indian ocean freely, for the first time in five centuries, and social disruptions potentiate the desegregation of states and the return to a tribal governance in various parts of the globe, not only in less developed countries but also within major megalopolis where often not even the police is capable of entering.

In the years to come, while established frontiers will be questioned, the global nature of the social disruptions, calling for a global response, will become growingly clear.

DOES GLOBAL ECONOMY ENTAIL SOCIAL AND ENVIRONMENTAL UNBALANCE?

Economy is performed within environment through social structures.

Society's troubles are a result of the inadequacy of still existing social structures (local, national and regional) and the nature of the economic system (global). The absence of global social structures (global governance) also imposes growing difficulties to the economic sector, often distorted into virtual (financial) growth. Global economy is often perceived as a danger, even as a mainly negative process, just like manufacturers perceived steam production, or likely hunter-gatherers perceived first farmers. But in fact, global economy should be understood as a process when human economy finally overcomes the human driven planet divides and meets the global nature of environment.

Global change has implications in all spheres, including on what should or not be considered progressive or conservative, as contributing for an alignment of economics and society with the environment or not.

As the poet said, in the quotation that introduces this chapter, one needs to unlearn, to put aside prejudices. Thinking ahead and with no prejudice enabled

shifting paradigm towards a green economy, in which considering Co₂ as a main resource in the future plays a key role (see chapters by Zepf et al. and by Massué, this volume).

Whichever economic model will prevail in the future, it is certain it will relate human needs to commodities through technology. This is why while political structures are either too fragile (as the UN) or of regional or national scale (thus resisting to global governance) to build a global alternative, some major companies that base their wealth in global economic productivity (and not mere financial speculation), alongside global world wide networks of local units connected through global communication (NGOs, networks of consumers,...) do have the possibility to play an unforeseen role in the shaping of the planet's future.

They will undoubtedly have a major responsibility in Rio+20.

IS IT POSSIBLE TO LIST ALL DISRUPTIVE FACTORS?

The list is endless, but they can be rationally clustered.

There are mainly economic factors, related to the growing needs for energy within a system based on long distance trade. The difficulties will be solvable through improved technology (energy consumption re-design through renewable energies or other means, for instance) and new urban models (currently too concentrated and tending towards a non-flexible unique model), but meanwhile generate environmental stress, namely disarticulating agriculture across the planet, which is a direct cause of social disruptions such as in Darfour. As a result, production growth rooted in human needs was partially replaced, in global economy, by financial speculative rewarding, leading to a major crisis of the international currency system. This is a major matter of concern, namely taking into consideration previous major depressions of 1873 (often forgotten) and of 1929. In both cases, the crisis generated expressed through a financial malfunctioning lasted for over two decades, lead to wars and could only be overcome after a major re-design of political frontiers (aligning social structures with economic processes) with a major attention to social equity (the welfare state with Bismarck first and the New Deal of Roosevelt later).

A second set of factors relate to social organisation, from demographic trends (ageing) to growing mobility (from tourism as major economic activity to refugees as major social catastrophic process), both questioning old cultural identities and opening room for the end of some cultural groups as well as for the emergence of new ones, whose profiles and scope are yet to grasp. These social re-design is also influenced by the new long distance exchange and interaction networks, including the digital networks, which so far proved to be efficient in dismantling structures but not as much in generating new ones. While some states fail their basic responsibilities (Somalia, but also Iraq, Afghanistan, Lybia,...) and even the most powerful ones fail to provide stability in their core (from massive violence, to terrorism or major riots), none seem to be replaced by anything but a void of power. The divide of nations is no longer clear, since despite the still economic prevalence of northern hemisphere countries, these face growing social problems and a decay of the middle class, while emerging countries are diminishing poverty and a fast pace. It is the generalised weakening of governments that sets the dominant trend, alongside growing power of private corporations and amidst global governance default. Parallel economy grows, and weapons and drug networks, all sorts of mafias and pirates, also benefit from this brittle territory.

Of course environmental factors are among those most widely acknowledged. Global warming as a result of natural oscillations within the Holocene is often undermined by a public opinion with little memory of prior oscillations (as the “Little Ice Age” that ended at the dawn of industrialisation) and too eager to imagine humankind always at the centre of the any changes in the universe. Yet, it remains important to understand that extreme events are becoming more regular, and that humans need to adapt to it, including diminishing their own contribution to the process. CO₂ stands at the core of these debates that also consider the environmental risks associated to the retrieval of critical raw materials, often to be found in still poorly understood regions, as in deep subsoil structures.

It is in the cultural sphere, though, that most of these factors of disruption concentrate, since any successful battle against them requires a prior, culturally enlightened, understanding. The diminishing of language diversity is but one of the loss of resilience of a species that roots its adaptability in being diverse (see A. Samassekou, this volume). This process entails a symmetrical one: the exacerba-

tion of xenophobia from threatened identities that build new tangible and virtual barriers to mobility, boost conflicts and use all sorts of ideological or religious fundamentalisms and populism to promote segmented interests. For decades, Unesco promoted an educational programme that isolated the various sciences, neglected fundamental knowledge to the benefit of applied solutions namely in emerging countries and promoted pedagogy per se as a strategy. Despite having enabled the education of massive numbers of people, this programme also accentuated alienation, through segregating what was once kept as a whole, even if at a low level of complexity. Thinking about the future, investing in future generations, learning different skills and adapting to change throughout life, were still dominant a hundred years ago, but are they today?

To reinforce human capital through promoting an education for critical thinking based on detailed knowledge and not mere opinions, to train memory and skills, to illustrate how dilemmas are the key challenges for humankind, are among the top priorities if one wishes to change for the better.

HAVE GLOBAL DILEMMAS MET A GLOBAL RESPONSE?

Not yet. There is no global government, not even governance.

Humankind faces difficulties, and these are perceived as major problems. Yet, the scale of the tasks ahead is one of overcoming not mere problems (for which solutions are available or to be found) but true dilemmas.

Intensification is needed, but how to choose between exploiting new fossil resources and preserve deep earth stability? Grains can be used to produce alternative bio-fuel, but how to prevent, then, that their use as a combustible may lead to growing starvation in various regions? Population is ageing, diminishing its renovation capacity and its resilience, but how to cope with this without pushing the planet resources to unbearable pressure? The financial crisis implies cutting costs in research, but should this be focused in fundamental research (with no immediate results, but a pre-requisite for long term innovation) or in problem solving approach (thus diminishing social tensions and anxieties, but compromising long term improvements)?

Whereas in some regions attention was focused in environmental preservation but with unsustainable economic strategies leading to social disruptions, other regions focused on social stress often allowing for over environmental degradation, and others again tried to preserve both the environment and social equity but without securing economic growth. Mangrove destruction by starved communities in Africa, air pollution in China, social turmoil in the Mediterranean or the Euro crisis are all part of the same global process, since each affects the other.

To face these constraints, collaboration among different governments is required, but it is not sufficient. When sustainability was conceived as a strategy based on the three bottom line, it was never intended to segregate society, economy and environment, but to underline their systemic interaction. Yet, the praxis of the last two decades did not foster this approach, partially because the institutional model of creating offices and ministries for environment was too often segregated from economy and social care policies, partially due to the growing divide within the academia among the various disciplines. The same mechanism that allowed for the major advances (specialization) also led to a disintegrated approach to each of the considered sub-spheres.

In contemporary world, there no single power, or cluster of governments, that is capable of finding alone a positive path to follow, and it is not possible to conceive a common ideological agenda, since the short and midterm interests are too conflictive. “The interests of the world’s great powers don’t square up”, as R. Foroohar wrote in Time (April 25, 2011, p. 18). This is due not only to tangible contradictory interests, but also to different understandings of the nature of the system and of its components, since society, economy or environment are analytical categories that are understood differently by different cultures.

Global dilemmas do require immediate action, though.

IS GLOBAL RESPONSE POSSIBLE IN THE NEAR FUTURE?

Due to cultural and cognitive reasons, an inter-generational agenda is required.

Within global economy local and regional powers have a decreasing authority, as a consequence of not being able to provide global solutions for many basic needs (wa-

ter supply, peace, jobs, etc.). For this reason, a distinctive character of the 21st century society is participation, either through conventional democratic mechanisms or other forms of negotiation between the executive powers and the individuals. This is a novelty in comparison to the last two centuries, but occurred in the past in number of occasions, whenever social structures weren't capable to master economy (citizenship for the roman colonies, literary education in pre-modern China or the Magna Carta in medieval England resulted from similar participatory processes). This implies that major decisions require a widespread agreement, based on convincement and understanding. In those past occasions, different interests collaborated in order to get benefits in a mid to long-term. But are contemporary citizens conscious of the dilemmas to face, or focused in short-term problems?

It is useful to acknowledge that weakening of governments and increasing social participation without global awareness also occurred in the past, in those cases the crisis being overcome through social fission and economic dispersal (e.g. during the dawn of the middle ages in Europe or the Manchu dynasty in China) or through external conquering (Alexander dominating Greece and creating Hellenic world). This second option is now closed, since no existing society escapes global crisis, which leaves two ways out: world governance or economic decay, social fission and environmental short-term degradation.

Understanding is a complex process that transforms sensitive impressions into cognitive notions, organised in space and time through causal sequences. Senses are misleading, since they allow for a basic notion of space alone. It is by observing changes in space, mobility, that humans approach time, and even so they tended to perceive it as an external, transcendental, process: this is why cyclic time dominated old visions of the world. It was through developing devices that changed processes, i.e., through technology, that humans understood time as an irreversible sequence and cause as a natural, tangible, phenomena. Techniques, making things, is a crucial component of the development of our cognitive capacities. In growingly urban societies, the ready-made products of our times, themselves produced with a limited human intervention, slowly downgraded human rational critical capabilities. Alienation, the enemy of human intelligence, won territories, and the computing era aggravated the dangers already foreseen by Charlie Chaplin in "Modern Times". As N. Carr stresses, technology changes cognition, as when maps dissemi-

nated a rational understanding of space, when clocks changed time, when writing with spaces created written reading or when press focused attention. Today, the internet weakens memory, disperses attention, prevents deep detailed thinking.

One contradictory feature of our global society is that the most technologically advanced communities have the greatest levels of alienation (whereas more skilled communities often have lower technological capacities, lower life expectancy and lesser resources). Education against alienation, valorisation of training in techniques and recovering of memory, are urgent tasks. But in order to move in such direction it is crucial to find a common ground. This will hardly be a global agenda, a mere awareness or an intangible concern.

There is therefore an urgent need to design a strategy based on the cognitive skills still widespread, and these cluster around the notion of space, which is also the setting for economic activities and for social interaction. People often fail in foreseeing the future, as they are misled when trying to identify specific causes for the perceived crisis affecting them, but they have an awareness of where they are, of their basic production and consuming needs and of global connectivity, i.e., they perceive the territory (although different communities and different people perceive it differently).

CAN LANDSCAPE MANAGEMENT LEAD TO GLOBAL RESPONSES?

Yes, because perceptions of the territory are different, but the territory is just one.

The territory today is the planet, or even beyond. It includes various sub-territories within which human groups design their logistical strategies. Such logistics aim at linking human needs with resources, based on the perceptions of the territory. Economics is the framework of logistics, in the sense it articulates human agents, resources, mechanisms of transportation and communication and other techniques within growing territories. Society is the organising structure of economics and environment is the context that encompasses all. And cultures are the way each community articulates its socio-economic logistics.

It is not possible to guess what the world economics and governance will be in two centuries, but it is sure that humans will still have needs, will still design strat-

egies to cope with those needs on the basis of acceding to resources located in the territory. They will be acting based on their perceptions, meaning they will act not as much on the territory itself, but on its perceived landscapes. Upper Palaeolithic hunters' landscape didn't consider gold as a resource, oil was not a major commodity for nomads in the Arabian desert three centuries ago, and geosciences advances incorporated a number of new resources into some of the most advanced perceived landscapes in the most recent years (see E. de Mulder, this volume).

Therefore, a strategy focused in integrating territorial management will necessarily engage individuals and their groups (stakeholders) in processes they can perceive. Such strategy must then foster training against alienation and socially participated foresight, thus introducing the dimensions of time and causality into social reasoning. Global targets, as the Millennium goals, remain fundamental, but they do not mobilise the attitudes of the society as a whole, as territorially focused targets do. Yet, when discussing territorial, pragmatic, issues, the global scale will become increasingly visible, not only in the environmental sphere but also in all other.

The awareness of direct territorial difficulties led to major landscape management improvements in the last decades, from financial and planning driven approaches, into participatory and holistic ones. A new step is required: to recognise that contradiction (of interests, of agendas) is not only impossible to avoid (through meagre consensus, that often are negative to all parties) but a positive feature: it is at the heart of human adaptation, of its flexibility.

Whereas environment is global, economy is getting global and society structures need to become global, cultures will remain diverse, ensuring humans lasting adaptability. Cultures are changing all the time, but not to create one global culture. In this process, the appropriation of the past through heritage is more than a source for mythical founding of identities, it also secures the transmission of past technological knowledge, since past objects and structures convey humans' trajectory to master techniques, from anti-seismic physics building techniques to elaborate wine chemistry.

Focusing on the territory implies, thus, a multidisciplinary approach, since it involves scientific knowledge (natural and hard sciences, as well as social sciences and humanities), pragmatic needs (from eating to dwelling, as the proposal of an

International Year of Global Understanding stresses – see B. Werlen, this volume), logistical strategies (sustainable social organisation and economic processes compatible with global human-environment equilibrium).

COULD GLOBAL CULTURE OVERCOME THE SOCIAL AND ECONOMIC DIVIDES?

No, since cultures are constructs defined through contradiction.

Territories are perceived by cultures in their three main Interlinked dimensions: environment (physiographic interpretation of the world, based on natural and exact sciences), economy (logistic indicators, reporting needs, resources and relations, based on social sciences) and society (socio-economic indicators, reporting humans groups dynamics through space and time, based primarily on humanities).

The perception of these three dimensions was global and integrated in the 19th century, but it was broken by increasing technological complexity and the virtualisation of production processes and distribution networks. To meet this gap, science popularisation became a matter of concern in the last decades, using magazines radio and TV programmes, thematic parks, museums and other resources, to provide what a hundred years ago could be achieved through the universal exhibitions. From Scientific American to Cosmos, science dissemination became very important, at the same pace people were becoming less and less aware of the global and integrated nature of each scientific detail. Back in 1915 the front page of Chicago Tribune could be dominated by scientific advances in X-ray technology; would this be possible today?

This model is in crisis today, since it was designed for science and technology didactics to understand the environment, when despite a minor awareness of the later was still balanced by a strong widespread cognitive control of economic and social processes.

Current alienation requires new instruments. When understanding economy, focus must be made on techniques and applied knowledge, in order to foster the understanding of the relations linking raw materials, knowledge, transformation and products (to learn in school how to build a table or grow a flower is today an often irreplaceable priority). Understanding society implies valuing flexibility,

human networking and creativity within and beyond arts (since it is crucial for scientific and technological advances). Greater difficulties have to be faced when understanding environment, since there is a widespread awareness of the changes, but this is often superficial and anthropocentric (thus leading to paralysis). Experimentation is a useful didactic device, but it is not sufficient.

The key response is empowerment of people, fighting alienation, and this will lead to greater cultural diversity, since groups and individuals will react differently to any external pressures or induced educational projects. Within economy this can be done through educational programmes articulating territorial value chains with traditional knowledge. In the social dimension this can be done through reinforcing creativity and diversity. In the environmental side, observing natural processes (as most educational projects promote) is limited, since alienation persists until a cognitive mastering processes is achieved (selective trash collection is a powerful example, since its growing success also results from the fact that within it environment is a compound of economic, social, cultural and other natural processes).

It is always through contradiction and competition that humans, and human knowledge, evolve. It will not be different when globalisation is concerned, and territories offer the best common ground to achieve this.

BUT, IS INTEGRATED LANDSCAPE MANAGEMENT AN EFFICIENT GLOBAL RESPONSE?

Yes, since a set of instruments and procedures exist and are proving their efficiency.

As Dr. Eliezer Batista (2011, p.91) mentioned, “The new paradigm [Integrated Landscape Management] also contemplates the project's surroundings. Innovation and cross-culture have come to tie the economic, social and environmental variables together. According to the original sustainability concept, they were met, but weren't necessarily related”.

Integrated Landscape Management contributes to territorial, global, management, focusing on the fact that people act based on perceived landscapes. While Europeans often blame the growing energy consumption of the emerging countries for stress on environmental resources, the later underline the need to pre-

vent social disruption due to great social inequity. There is no major disagreement among them on the theoretical considerations, but they are perceiving different landscapes. When western and eastern countries mistrust each other for not agreeing into a common deadlines agenda, it is not only because of different interests, but because of different notions of time.

Global governance is required, and at this stage it needs to be built bottom-up, from specific territories (where conflicts and contradictions are explicit, allowing for detailed negotiation having an immediate impact on peoples' lives) into wider global ones. Any local management strategy for sustainability will require changing the scale of an intervention, clarifying the processes.

In order to implement an integrated landscape management strategy, four major sets of instruments are required, and these are being applied in several scenarios in Brazil and beyond, namely in the very important context of the industrial complex of Açu super harbour, in the state of Rio de Janeiro.

First a programme of training at various levels, from technical basic training to research degrees, is required. The global aim is to lead people to understand other people's needs, interests and agendas, within an holistic approach. The departure point is the consideration that all humans design logistic strategies, based on the perception of their own needs and available resources; in this sense all humans are alike, but their contexts differ, and this generates different technological adaptations, most of the times complementary but sometimes contradictory. This is the base of different cultures. Training and education reinforces human capital, the most valuable resource, which enables foresight.

A second set of tools is the territorial matrix. The disintegration of society, with the crisis of all traditional socialization structures, including families, has diminished social resilience. Human groups and identities are continuously re-combining themselves, but continuity is secured through basic territorial units; these are also questioned once mobility becomes a major component of peoples' behaviour and non utilitarian collective structures are undermined. Two major types of structures are required. At a central level, knowledge resources centres, linking universities, authorities, corporations and NGOs, are needed to merge analytical capacities with decisional procedures. At a local level, memorial structures may retrieve traditional knowledge and foster economic exchange rooted in cultural identities.

This territorial matrix is flexible enough to adapt to major socio-economic changes, and may be led to launch projects that move from inter-institutional relations into proper joint interventions, involving all major stakeholders.

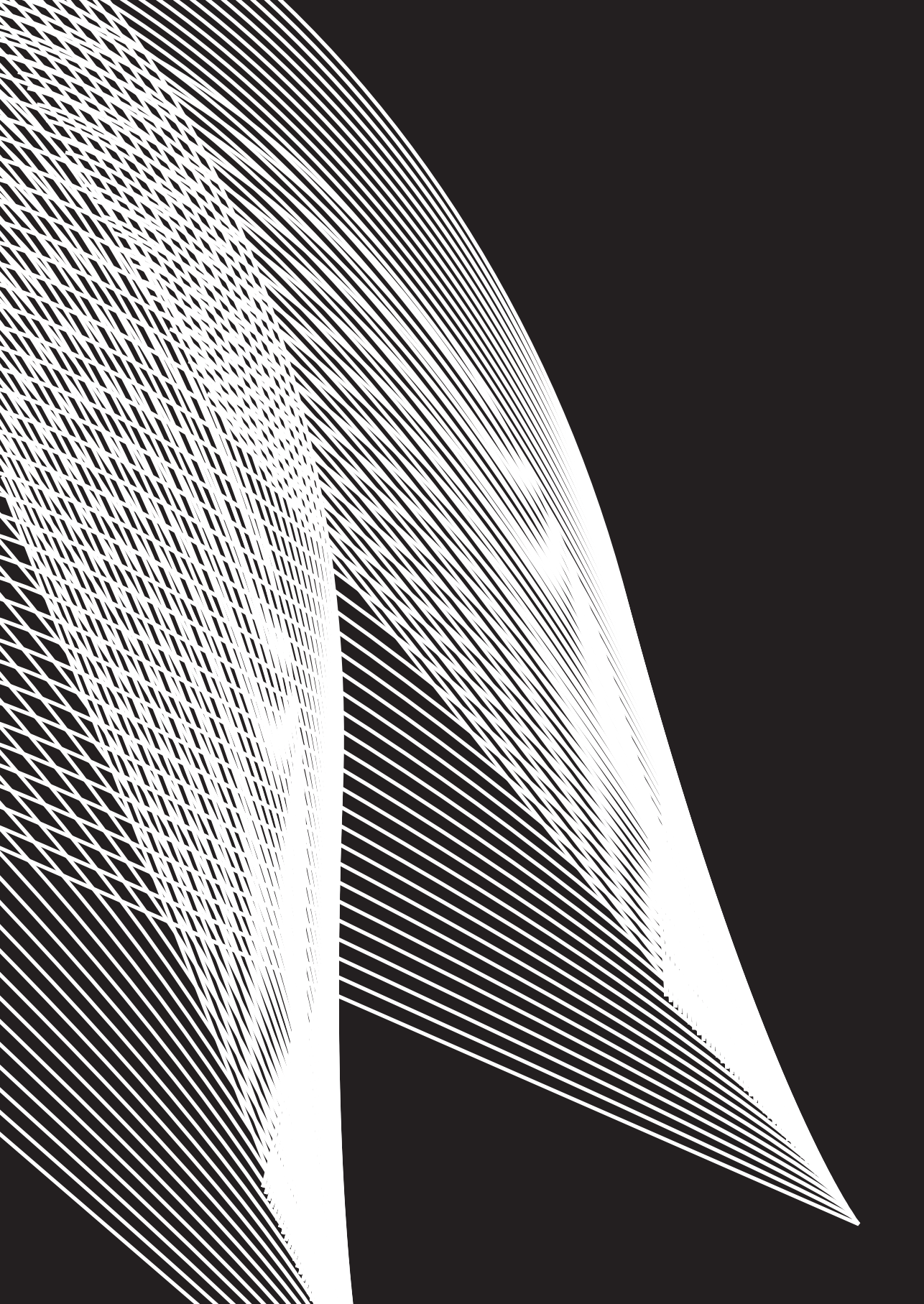
The territorial matrix allows for a reasonable balance between self-representation and esteem, on one hand, and flexibility on the other. Through the territorial matrix, disciplinary and other barriers are softened, and negotiation to build common agendas becomes possible. This paves the way to launch territorial consortia to implement strategic projects, for the benefit of the various stakeholders, and this generates, ultimately, the basis for multi-partners permanent articulation, i.e., for governance. Governance emerges, hence, rooted on human capital, on a territorial matrix of empowered communities and on selected strategic projects.

The territorial matrix, supported by a continuous training and education strategy and reinforced by strategic projects, will have no major arguments against, but will have to deal with the need to convey accurate messages, avoiding misinterpretation. This leads to the fourth pillar of ILM approach: communication. All along the ILM implementation, communication serves as the backbone of all activity, aimed not only at the dissemination of projects and results, but primarily to the generation of common grounds of understanding, leading to global governance (see R. Gudauskas, this volume).

These four sets of instruments have to be implemented all together, and their degree of success may be monitored within a global monitoring of the territories advancements and difficulties. This, in turn, is secured through another novel tool: territorial certification (see I. Scheunemann, this volume). ILM and TC, acting separate but converging towards a common goal, enable a new approach to the management of territories, focused on global quality and leading to global sustainability.

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RE-VISITING SUSTAINABLE DEVELOPMENT: THE PRAXIS OF INTEGRATED LANDSCAPE MANAGEMENT

INGUELORE SCHEUNEMANN

“The behavior of the complex systems that are under stress is governed by natural sciences and the practical solutions to redress the abuse of these systems will need support from innovation across a wide range of technological areas. But natural sciences and technology are not enough to achieve sustainable development. To create sustainable development will require an unprecedented integration of research and practice across disciplines and new modes of scientific and political discourse including socio-economic sciences and humanities.”

European Union, 2009

FROM INTEGRATION TOWARDS TERRITORIAL CERTIFICATION

The background: sustainable development scenario and new challenges and tendencies

Scientific efforts and technological progress are still far from reaching satisfactory results concerning mitigation of poverty affecting millions of people, hunger, access to appropriate drinking water, sanitation, with consequence of sicknesses provoked by water and air pollution, and undernourishment, among others. It is useless to discuss environmental protection where people are starving, living under poor health and educational conditions and with little possibility for income generation.

In the last decades, awareness of different sectors of society worldwide, about the relation of nature preservation and respect for ecosystem is sensibly growing, specially guided to the delicate issue of global climate changes and the highly “carbonized” economic models. Greater concern to alleviate poverty, increase HDI, decrease of environmental damages by man intervention, by the academic, scientific, economic and political representatives have been shown, and progresses have been noted by the recent translation of conceptual ideas into actions.

In this sense, efforts worth mentioning are consequences of the “Brundtland Report” (mid eighties), and the Rio Earth Summit in 1992. These events triggered the inclusion of sustainable development strategy into policy making, legislation and programmes. Impact assessment and problem solving in the area of sustainable development, specially focused on energy generation innovation, “clean industries”, energy problems, conservation, and climate change, became main concern of several packages. Furthermore, in the research field, sustainable development has been subject to scientific, technological and socio-economic studies. Sustainability became a main ingredient for new models of development that marry economic, social and environmental objectives.

Long-term energy scenarios show that current life styles in industrialized countries are not sustainable on a worldwide scale. Existing technologies, alone cannot bring about the needed solutions for sustainable development. On an integrated basis they have to be accompanied by policy measures and behavioral changes.

The international conventions and environment protection laws were issued as a response to the social, economic and environmental scenario as means to hold back further damages to natural resources also in concern for life quality of future generations.

These challenges constantly drew the attention to a list of priorities in the socio-economic sciences and humanities. Discussions and research brought about themes in economics, employment, behavior and territorial dynamics that could induce changes. The awareness connected society as a whole: academics, researchers, industry, policy makers, and common citizens.

At the end of 1990s it became clear that catastrophic environmental impact was caused by large enterprises and gradual derived activities and consumption patterns from individual citizens. The latter inspired legislation and penalties

concerning individual activities that clashed, to a certain extent, with individual rights.

On the other hand public policies and penalties for environmental crimes did not promote response that would assure social equity and sustainable environment, that being, the creation of new processes and instruments to substitute the inefficient existing ones (i.e. adequate education and formation and community capacity building).

However, if these laws were not put into practice, situation could become worse. Nevertheless, it did not bring improvements to existing problems, neither proposal were made referring to adequate models for sustainable development. It is consensual that depredation was not stopped or reversed even after the Rio Conference in 1992.

Strategies two decades ago were based on abstract concepts, mainly economy, environment and society, with no regard to essential aspects and most of the time contradicting cultural and social reality. This tendency is clear in the instruments derived from the Agenda 21 suggested to organize society and territory as means to achieve sustainable development.

Another tendency in the last decade is the discussion on the concept of globalization vis a vis local development. Arguments are based on the problem of social exclusion aggravated by globalization. On this respect, local development became an instrument of inclusion and sustainability, and is seen as an alternative to present models that induces to the accumulation of wealth, and carries a negative impact on the environment.

The main objective of any approach to sustainable development should include the promotion of quality of life of local people by generating jobs and income and main actions should contemplate improvement of infrastructure, production and qualification of human resources. For this to take place, new forms of governance are being analyzed, new geopolitical approaches are being considered, resources conflicts are being minimized, man relation to land use is changing as economic impact is being measured. The relationship between development and community values is dynamic and may involve conflicting values. It should be managed in a sustainable way for present and future generations.

The environmental impact of production and consumption and the social character of sustainability (worker conditions, industry location, involvement of local communities and municipalities) are seamlessly linked. To make economic activity more sustainable, it is necessary to improve knowledge and raise awareness of the possibilities. Case studies and learning from good practice are useful tools for this purpose.

A transition stage to alternative models indicate that the corporate sector has a key role to play in the search for an industrial model capable of delivering a “greener”, no-carbon economy. Improvement on life quality and sustainable economic growth requires energetic efficiency, the use of renewable energy sources, preservation of environmental resources, and territorial management in an integrated manner. Still, cooperation among science, economics, and workforce cannot be overlooked as main step for a better-distributed welfare, a greater dissemination of knowledge and culture, and the formation of citizens that are engaged in the process of development.

It became clear that citizens should be an active part of any model to be proposed, becoming protagonist as much as different sectors involved. Cultural diversity, that is, the differences are essential tools for social reality transformation. Local development cannot succeed unilaterally, based on one or other economic model. The sustainability must rely on a multisector approach, and respecting diversity that is encountered.

THE NEW RELATION OF SCIENCE AND SUSTAINABLE DEVELOPMENT

Issues like climate change, natural disasters, the storing of toxic waste, the outcomes of the progress in biotechnology, nanotechnology, human genome project and other scientific progresses bring about many controversial aspects. Increasing awareness of society and governments arises the questioning as to which role science should play on the application of scientific knowledge regarding management of natural resources, biotechnology, bio-safety, and others. Situation calls for a greater participation of scientific experts, therefore needing a closer cooperation among policy makers and scientists.

In the last decades this awareness has triggered policies and measures from the side of governments and intergovernmental organizations aiming at improving sustainability. Yet, the translation of scientific discovery into practical policies for sustainable development many time does not bring the adequate solutions to local problem, by, sometimes, not matching with political, social and economic factors that also come into play. Science should come in to play in consonance with other existent factors and demands, such as, sustainability, development and community interests.

The idea to shift diagnosis from "lack of integration" to "the need to shift modes of integration" was envisaged. This idea is being discussed in several fora, starting in 2009 at the directorate for Sustainable Development at the European Commission.

It is relevant to mention that the goals of sustainable development have long been pursued from unique or diverse bases as ecology and economics, physics and political science, for example. A sustainable science research should transcend the traditional scientific concerns of foundational disciplines, and focus instead, on understanding the complex dynamics that arise from interactions between human and environmental systems. To embrace the whole range of the global systems requires cooperation between scientific, social and economic disciplines, public and private sectors, academia and government. The focus transcends disciplinary boundaries involving understanding of the dynamics of systems existing in society, environment and different areas of scientific research.

The science of sustainability has emerged as an innovative, complex, field of research and education. It became eminent that the science-politics interface needed to be reframed to include the triangular interaction between scientific experts, policy-makers and citizens. The urge for experts trained in interdisciplinary and integrative approaches towards sustainable development is a fact. Those experts should be prepared to assess and deal with the complexity of the issues involving sustainable science from a system's perspective. Those also needed to do cross work between different disciplines and domains, and to make interface of science, policy and society.

The vision of a sustainable science is to build a scientific network that will allow an integrated cross-disciplinary work between social, economic and environ-

mental sciences. This three pillars approach has to give rise to an approach addressing directly the integration of these pillars, integrating notions such as thresholds, limits, resilience, and transitions, among other aspects. It should be one of the key objectives of research (in sustainability science, but not only) to bring about the concepts allowing this to be done.

Awareness in the academic sector around the world has led several universities to structure sustainable science formation programmes, in recent years. With a growing body of research, substantial understanding on interactions between disciplines has been gained, e.g. through work in environmental science that includes aspects like human action on the environment and environmental impacts on humans, work in social and economic development studies that seeks to account on environmental impacts, among others. These studies demand the inclusion of several disciplines like agriculture, ecology, biochemistry, sociology, management, biology, etc.

Basically, a sustainable science, as a new academic discipline, provides a platform that enables existing disciplines to address challenges not considered before on a global or local level from an integrated problem solving approach and it can be characterized as a field of science defined by the problems it addresses rather than by the disciplines it employs. In the scope of this science, scholars and stakeholders are expected to interact and the results should reflect the needs of society and its different actors.

Yet, among other factors, many aspects should mobilize further discussion under the scope of the new science, such as: limits or boundaries when including a variety of participation and regarding the integration of existing independent activities of research, observation, assessment, in order to integrate all into manageable systems; what should be the role of actors, (i.e. experts, policy makers, community members) towards the positive intervention of sustainable sciences as assessment for integrated sustainable development (foreseeing integrated territorial management, environmental governance) on global and local basis.

NEW FORMS OF GOVERNANCE AND ILM

Under the globalization phenomena, economic and social crisis in specific regions of the world bring rapid influences and changes to most regions, and this tendency will grow even more in the future. Yet, many regional policy makers are overlooking this fact. Moreover, institutions and or enterprises that could trigger integrated efforts towards sustainable development are still not prepared to face the new challenges.

In order to allow the incorporation of new values and new forms of decision making, changes in governance is being pursued in different regions of the world. New forms of governance are being defined in enterprises, municipalities and regions and in many ways they follow the perspective “think global but do it local”. Elements like water and land management are among the ones considered to exemplify new forms of governance as traditional ways of production has weakened the role of common property management.

The need for new governance arises when common resources implies in dealing with many stakeholders, due to decision making process complexity that regards local authorities, private sector and community members that should be responsible to catalyze the creation of sustainable development conditions. Public-private and community partnerships should be welcome to secure the sustainable economic development of a region, working together to improve economic and the local environment efficiency by using integrated technologies.

New models and forms of governance should provide new needs for ecosystem services for a wider range of beneficiaries. This will require a participative process to research needs and mechanisms and to identify future policies. In the case of urban planning and sustainable cities the engagement of citizens in local governance and decision-making processes through the use of collaborative techniques is essential. City governance linking all levels of urban society has to be established if sustainable development is to be achieved. Governance should play a critical role in ensuring social equity and resource sustainability.

Local development is related to the affirmative of territorial identity, which implies in the recognition of singularities that differentiate one locality to another. It means that local development should become the result of efforts that consider

identification, recognition and of local values and assets and to profit from comparative and competitive advantages from the territory in question.

It is also clear that State intervention alone is not enough to carry on development strategies. In order for development to take place; partnership amongst Government, Society and Market should be enhanced, as well as, participative planning and shared management of projects with community members. Participation should also include entrepreneurs in a proactive manner.

Furthermore, interdependence between different regions is growing through trade, human mobility, scientific and cultural exchange, human security concerns, disease, and ecosystems functions of major biomes, ocean and atmospheric exchange. From this perspective, governance and sustainability should not only frame environmental, social, cultural and economic dimensions but it faces the need to reconcile conflicting actors and antagonistic stakeholders. Holistic approaches to territorial cohesion are needed. Promoting sustainability in different localities must be seen as a 'quality step', balancing good land use, territorial planning, development policy, design and life style. This implies more effective involvement of citizens in decision-making and new modes of governance to inform and involve all citizens. In turn, improved governance of resources in the rural and urban environment should be seamless with improved social equity. Socio-economic sciences and humanities provide a bridge between natural science and its equitable application to the real concerns of people.

The idea is that a stretch of territory can become the promoting cell of social and economic development in a balanced way. For this to happen the choice of the stretch of territory that will be object of institutional intervention should be made carefully and closely analyzed in order to favor the implementation of adequate, methodology so that this territory can become a reference and promoter of sustainable development. The planning has to be coordinated horizontally, that is, geographically, and vertically, referring to the production structure, in an integrated manner to attain the full long benefits of sustainability in development

As intervention happens locally it has to consider the existent social structure, environment, infrastructure, preservation practices (natural and cultural patrimony), economy and production factors, employment and income generation, as basis for the implementation of a model that will increase life quality of the com-

munities involved and which are integrated and mutually reinforcing in a context where social and cultural diversity and differences should be used as resource to generate changes and local development.

Based on their low HDI some regions are the main concern of the Brazilian government, and should be the focus of development of sustainable and integrated projects aiming local employment generation and income. The main objective is to promote the improvement of quality of life of local people by generating jobs and income. The main actions expected concern infrastructure (logistics), qualification and production.

In order for government actions and private investments to improve positive impact in a sustainable manner, it should orchestrate stakeholders, local communities and authorities. All aspect should be considered in an integrated strategy that should aim to a balance intervention and funding of socio economic activities at the localities involved. The ILM, (Integrated Landscape Management), stresses that strategic planning with a multisector and multidisciplinary view should take into consideration all interests and conflicts, before designing development plans, taking special consideration on the preservation of natural, historical and cultural patrimony, improvement of life quality of local inhabitants, the adequate policies and choice of social-cultural-economic activities.

In recent interview to the periodical Insight-Bioma over the new paradigms of sustainability, Dr. Elizer Batista, former president of Vale company, expressed that “The original idea of sustainability-based on the triple bottom line (economy, environment and social) – became obsolete.” And he considered further, “that the frontier of yesterday is only history fragments over which archeologist will address them in the future. Respecting one o the axioms of science – the idea that it is always necessary to go beyond – the concept of sustainability advanced. The new paradigm of sustainable development incorporates a variable that is not contemplated in the original concept: that is, culture. This variable has a transverse effect over all other factors. The synthesis of all contribution is what we call Integrated Landscape Management.”

Integrated Landscape Management is a stakeholder-oriented and participatory process that attempts to influence the direction of a transition towards a more sustainable regional development and improvement on the quality of life. It has a pre-

requisite a long-term vision, then, experiments in niches to prepare bigger interventions and to build new coalitions between actors. Government can facilitate process, but does not dictate as a lonely actor and manage all risk factors.

TERRITORIAL CERTIFICATION WILL BRING A FORMAL MECHANISM TO ENSURE GOVERNANCE AND PROMOTE SUSTAINABLE LOCAL DEVELOPMENT

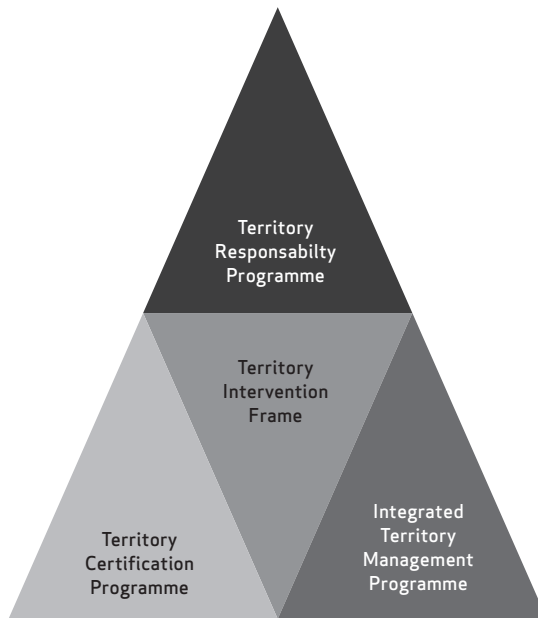
Territorial Certification is an instrument that measures, evaluates and communicates the territory performance in three-year cycles. Territorial Certification provides the minimal parameters to be observed by territorial intervention processes. In that sense, it works complementarily to Integrated Territorial Management, by two ways: first, helping the former to establish the goals for plans, projects and policies; lately, functioning as a territorial baseline to compare and analyze the effectiveness of implemented actions.

In Brazil, the recently created Territorial Certification Institute – ICT holds as mission to guide and measure territory performance in an integrated and participative manner, empowering citizens, promoting sustainable development and stimulating territorial competitiveness. According to Dr. Eliezer Batista “Integrated Landscape Management should not be an end by itself. The background idea is to promote the certification of whole territory covered by certain project all over the state, a country.”

The core business of ICT is to certify and normalize territory and its constitution elements with basis on reference patterns and performance metrics appraisal. This includes cities and other geographic scales such as micro and macro regions, economic and institutional spaces, that being production chains, infrastructure nets and public services.

Territorial certification together with Integrated Territorial Management should generate the model of governance that will enable synchronized territorial intervention with a multidisciplinary approach, as an alternative to limitations and constraint involving state or municipal government intervention, when called to solve territorial problems and the existing dilemmas. These constraints could be technical or/and financial.

Under the perspective of territorial certification by ICT, territorial intervention should take place through a framework that integrates three fundamental instruments: normalization/regulation, measurement and management. The Institute proposes the Territory Responsibility Programme for normalization, the Territory Certification Programme for measurement, and Integrated Landscape Management Programme for management model to be implemented by BioAtlantic Institute in Rio de Janeiro and by Polytechnic Tomar Institute and Institute Terra e Memória, both in Portugal, as illustrated as follows in figure 1.



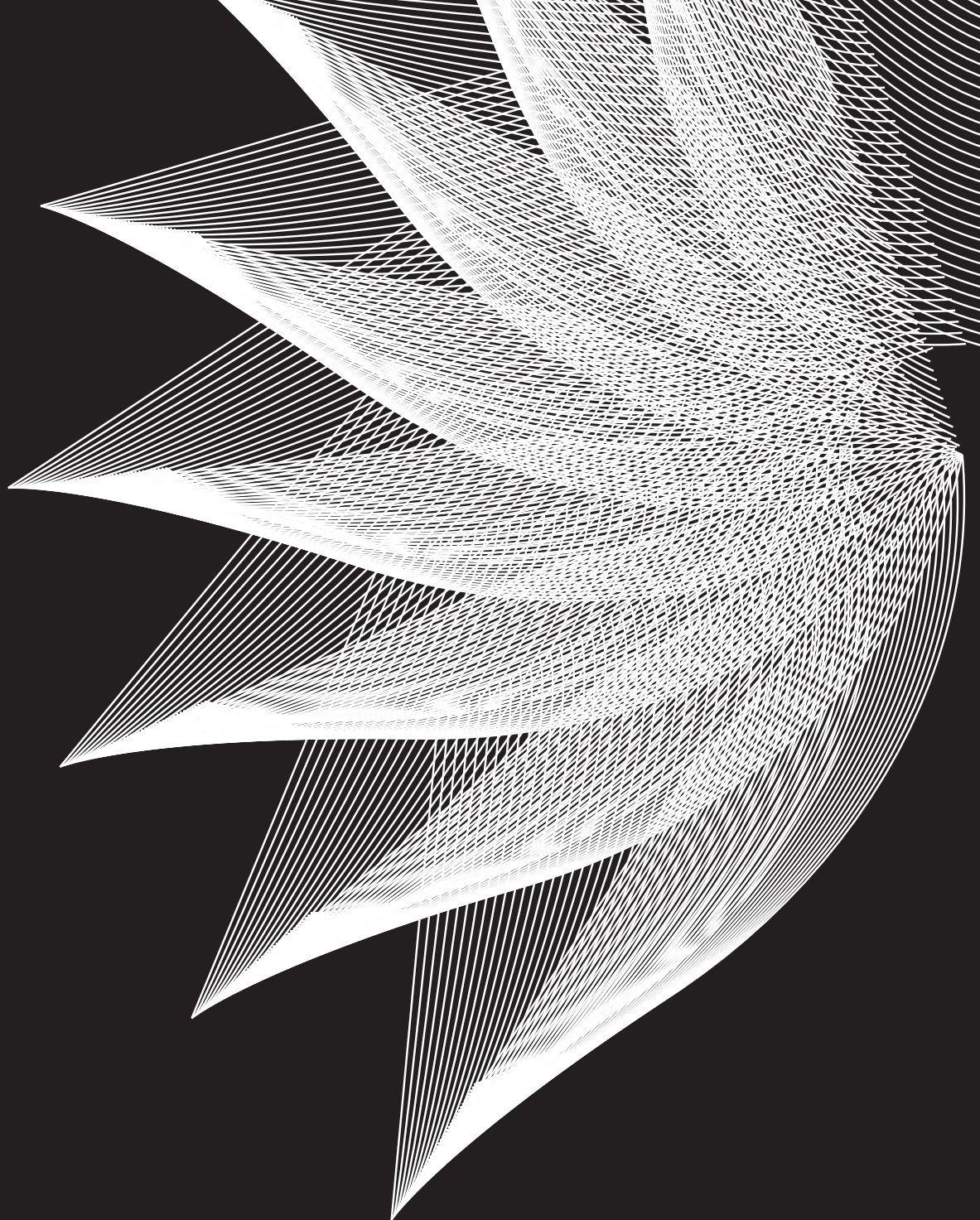
Benefits of the programmes as indicated on the ICT proposal is as such:

- The construction of a common agenda for the territory
- Integration of public policies and of administrative bodies
- Complete overview of territory, sustainable development and competitiveness
- Compatibility with existing responsibility patterns, norms and systems
- Cost reduction (entrepreneurs assumes surrounding areas)

Example of this model, involving integrated participation of government, private enterprises and civil society, working together, has been implemented in Brazil, in the region of Ipatinga, in the State of Minas Gerais, is being developed in the Açú complex, in the region of São João da Barra, Rio de Janeiro, and project is already being designed for implementation in the State of Para in the Paragominas region.

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A NEW EYE ON THE TERRITORY

LUCIANO COUTINHO

SÉRGIO WEGUELIN

Ever since “Our Common Future” Report, published by the World Commission on Environment and Development, and the United Nations Conference on Environment and Development (Eco 92) urged us to pave on a more definitive path towards sustainable development, many organizations (and individuals) have started developing a more holistic approach towards their relationship with the surrounding environment. A common denominator was a more decisive integration of the concept of sustainability based on three bottom lines (economic, environmental and social impacts). Some went beyond this and started considering other variables in their approach. Here at the Brazilian Development Bank (BNDES), for example, we added innovation and regional (or territorial) development (Brazil is a large and diverse territory) to our bottom-line concerns. As the 2012 Earth Summit approaches and new insights on how to address emerging challenges arise, it seems that a new element should be introduced to the bottom-line approach to enhance its effectiveness: territorial dis-integration and analysis coupled with an ensuing managed re-integration of the analyzed (and better understood) parts. This process is in keeping with the Integrated Landscape Management approach discussed in this publication.

When it is mentioned, as often occurs, that there might be limits to the planet's resources, what this actually means is that there might be constraints on our presence here (the planet will survive without us) if regular socio-economic activity (business as usual) is pursued. The new territorial approach towards sustainable development to be cultivated focuses on a broader perspective and a more integrated analysis of causalities affecting life on the planet. Considering that human activity interacts with the planet in specific areas (territories); that the non-linear characteristics of the environment begin to prevail – which means that imbalances in one area might propagate and trigger other imbalances in the entire system –; and that the environment is increasingly conditioning human activity, the ability to comprehend and deal with what occurs in specific localities becomes vitally important. This fundamental interaction between man and his environment (or his territory) was very well depicted by the Italian philosopher Lucio Colletti when he mentioned that *“just as man, the effect is also the cause of his cause, so the latter is also the effect of its own effect”*. In other words, man affects nature and is, in turn, affected by it. The territorial disintegration-integration process aims at digging into this relationship and at striving for a balance in the human-nature interaction. The richness of this new approach, which uses culture as the driving force in the reintegration process, lies in pushing us into new and as yet insufficiently mapped terrain: human territory.

In practice, whatever territory we might be dealing with, it can be dis-integrated into the n-dimensions that represent the factors and processes, both natural and social, that exist and occur within its boundaries: water, carbon, biodiversity, quality of soil and air, food production, natural resources, education, health, urbanization etc. Different territorial features may include: water basins, political groupings, biomes, cultural identities etc. The analysis of this n-dimensional space within specific spatial aspects can produce high-quality information that, when reintegrated under a holistic approach that takes into consideration the specificities of the components that make up each territory, will bring about a more valuable total. In the end, and with the proper policies and interventions in place, we should expect that the sum of the parts of our territory will be worth more than the original whole.

The technique – or the praxis – of integrated landscape management, which presupposes an understanding of the physical and social interrelations that occur within a territory, will produce more value not only for the territory itself, but also for the surrounding environment. The use of local/global culture as the driving force that reaches across the analyzed dimensions paves the way for the creation of a common, “survival-prone” strategy for humankind. Here, we might mention the fact that the need to develop an alternative growth model on the part of contemporary capitalism requires a change in the way we perceive our reality as a forerunner in establishing economic analysis that leads to changes in the rules and the institutional arrangements that govern the existing – and unsustainable – processes. The integrated landscape management approach, with its holistic treatment of all the activity that occurs within a territory, represents a step forward in this direction.

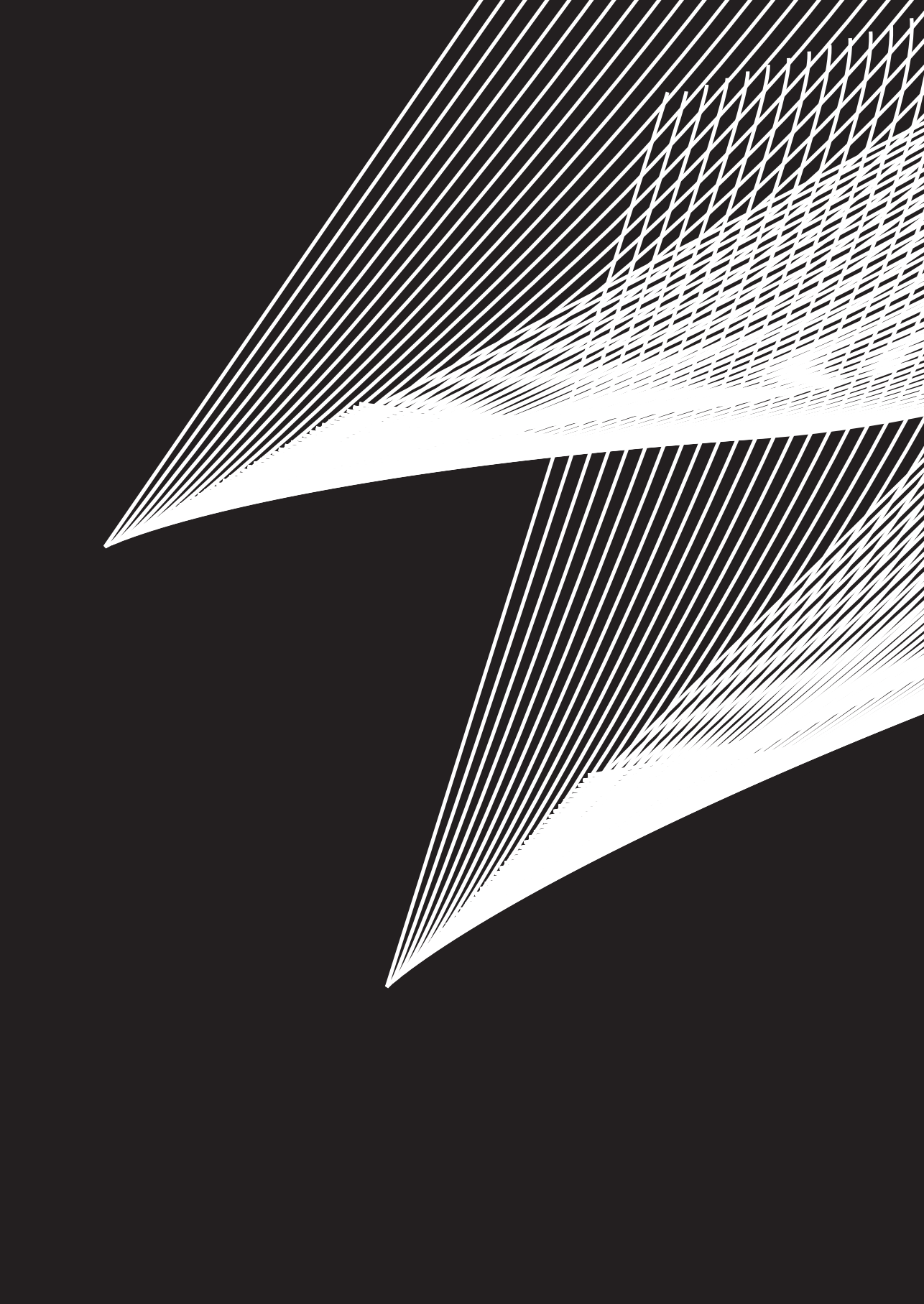
It must be pointed out that, when we perceive the existence of limits to our presence on the planet, we understand that we cannot go on this way and that we must bring about changes in behavior, technologies and methodologies (accounting, for example). However, these changes are difficult to promote or, in many cases, difficult to accept. Although we have made great advances towards grasping the factors that govern our interference in the planet (science has come a long way in measuring and analyzing this interference), we are still gaining the momentum to move ahead in a more substantial way. We know all the rules, and we have built an impressive set of political commitments so the present and future generations can pursue an adequate livelihood, but our operational agenda is still moving at a slow, listless, pace.

The good news, though, is that we seem to be getting to the heart of the matter: we have forged the understanding and the will to produce the required behavioral changes that will guarantee our future generations’ harmonious presence on the planet. The fact that Integrated Landscape Management employs culture as a key element for analysis, planning and intervention, and that it takes into full scope our diverse socio-economic environment, allows us to imagine that we are finally headed for truly sustainable development.

The proposed concept, therefore, is quite similar to what the BNDES has been implementing. It is with great satisfaction that we see other initiatives moving in the same direction – dialogue with several agents, planning, and concern for so-

cial and environmental impacts, besides the economic effects – in such a way as to guarantee that projects, especially the large-scale models, offer the population an increase in well-being.

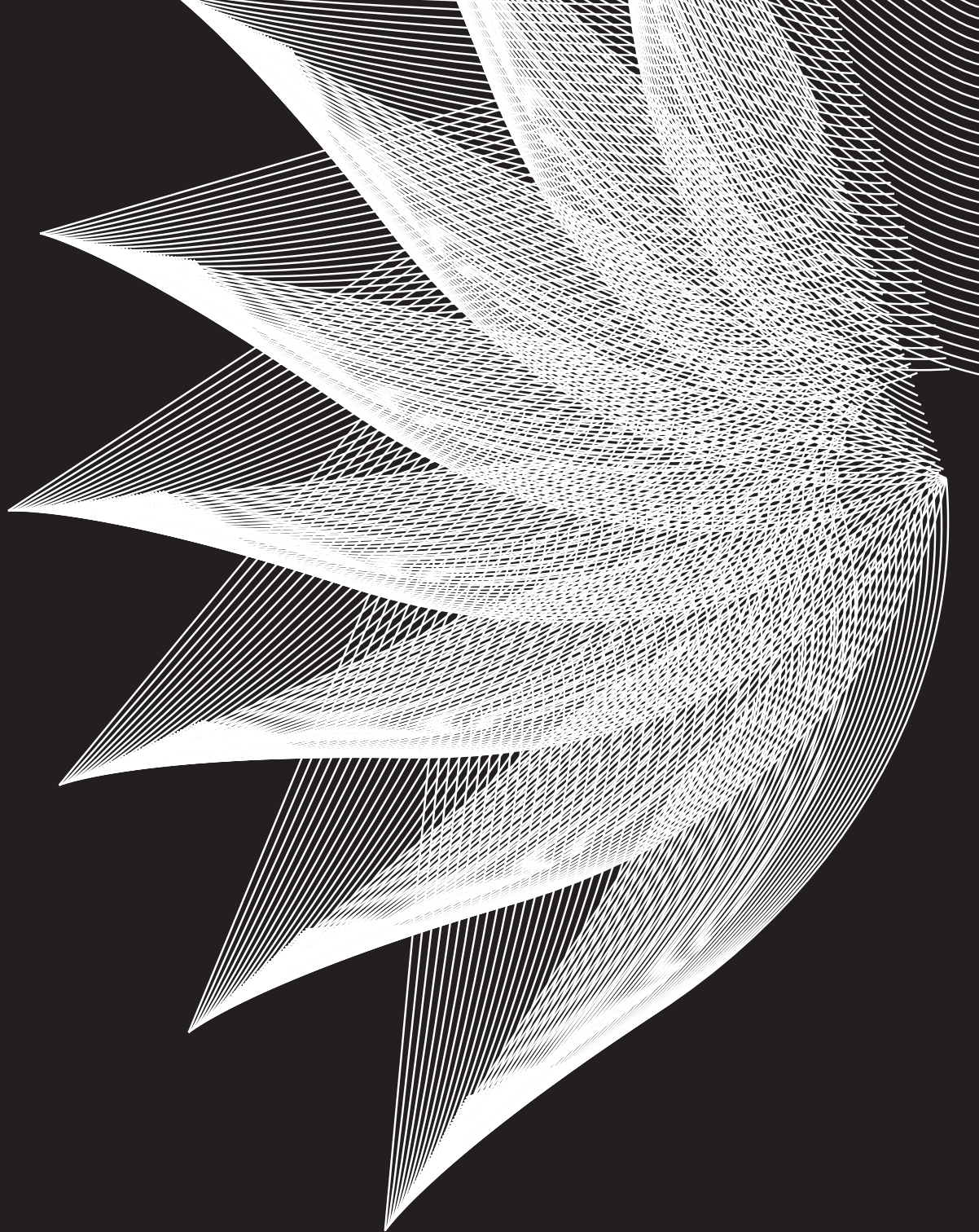
Implementing Integrated Landscape Management is a rather complex task as it involves detailed analysis of the many “layers”, or socio-environmental dimensions, that comprise the activity within a geographical area (in accordance with political, economic or environmental rationale, for example) and its re-integration into a new framework that encompasses the balance in the relationship between man and nature. It is a tough job, but the potential for success is high. And the way forward has already begun to reveal itself in the articles that follow in this thought-provoking publication.





PART II

Science and technology for sustainability



EARTH & MAN – RE-VISITING SUSTAINABLE DEVELOPMENT

EDUARDO F. J. DE MULDER

ABSTRACT

Five decades in Earth scientific research unravelled the Earth's anatomy, determined when major events on Earth took place and learned roughly how our planet works. Checking such knowledge against global human development trends for the next 5 decades generate more reliable prediction models of potential impact of human development on the geo-environment. Communicating new Earth scientific knowledge to a wider audience, including politicians, as done during the International Year of Planet Earth (2007-2009), is essential for societies on their way to sustainable development. Cultural differences between societies should be acknowledged as these have been largely ignored on sustainable development actions since the Earth Summit in 1992.

INTRODUCTION

The three pillars of sustainable development (economic, environmental and socio-political) have not been sufficiently diagnostic to arrive at the level of sustainable development as envisaged in the Earth Summit in Rio de Janeiro 1992. Apparently, politicians have been too optimistic aiming at world-wide consensus and global

measures while ignoring cultural differences among societies. Nevertheless, remarkable progress was made in socio-economic and in environmental issues during the past few decades. However, we are still far away from having addressed the Agenda 21 and UN Millennium Development Goals ambitions.

Socio-economic development may only be labelled 'sustainable' if basic human needs would be in balance with the Earth's bearing capacity. Much is known about human needs but very little yet about capacities and limitations of the Earth to absorb environmental pressures. Some highlights in geoscientific research are given below followed by a brief review of relevant human development trends. Next, future human needs will be checked against their anticipated impact on the geo-environment and on their demands for physical space. Attempts to communicate geo-environmental issues with a wider public are exemplified by the International Year of Planet Earth (2007-2009).

SELECTED RECENT DEVELOPMENTS IN THE GEOSCIENCES

1. Introduction

Our predecessors considered the Earth as an integral part of their natural environment, a position still acknowledged in certain cultures. Until the onset of agriculture and human settlements, 10,000 years ago, people strongly relied on the Earth. Settlements transformed into cities and urban people gradually lost their perception of the Earth as the producer of their basic needs. The underground became associated with the realm of darkness, danger, death and decay. Such perceptions were facilitated by an almost complete lack of knowledge about the Earth. Although our planet became subject of serious research since Hutton, some 230 years ago, it was not before the late 1950s that the Earth sciences began to attract the interest of the general public. Subsequently, geoscientific knowledge grew rapidly to a level that we now know broadly how the Earth works.

2. *The Earth' anatomy*

Geological mapping unravelled the composition of the Earth crust in the early 19th century (Winchester, 2001). Initially, its main purpose was to identify occurrences of natural resources vital to national economies and social development. Geological mapping was practised by geologists employed by national geological surveys which began emerging during the 19th century. Needs for international coordination in and standardization of geological mapping resulted in the Committee on Geological Maps of the World in 1881, and stimulated production of global geological maps on a wide variety of themes. Until the 1980s most nations had systematic geological mapping programmes in place involving tens of thousands of geologists. With the rise of computer technology analogue data were replaced by digital data and stored in exponentially expanding databases. Rapid progress in hard- and software capacities prompted geological surveys to convert their systematic geological mapping programmes into map production on-demand.

ICT also stimulated digital cross-border mapping as aimed for by the OneGeology project (www.onegeology.org), one of the flagship projects of the International Year of Planet Earth (Chapter 5). It provides a platform for sharing and continuously updating dynamic and inter-operational digital geological data sets resulting in all kinds of digital geological maps (de Mulder & Jackson, 2007). By December 2011, OneGeology served 165 organisations in 117 countries. It has the potential to provide a subsurface dimension to geo-search engines as Google Earth.

From the early 1980's, major breakthroughs in geological surveying technology occurred. 3D seismic exploration methods replaced traditional 2D techniques providing much higher resolution in observations to depths of several kilometres. About simultaneously, seismic tomography methods emerged uncovering large-scale structures in the deep Earth. This method, derived from medical scanning techniques, displays up to 2000 km deep images of the Earth's interior and identifies anomalies in seismic velocities caused by chemical and thermal variations related to density fluctuations. These, in turn, drive convection flow currents in the Earth mantle. This technique displays how crustal plates develop and disintegrate in subduction zones (Tanimoto & Lay, 2000) and identifies hotspots and plumes in the deep Earth.

3 *Resolution in time*

Before 1850, scientists believed that the Earth was only a few million years old. Emerging insights in radioactive decay processes, some 50 years later, lead to age estimates of some hundreds of millions years. It was not until 1956 that radioactive clocks determined the true age of our planet at 4.55 billion years, a value close to that assessed today.

Rock dating underwent revolutionary progress since by significantly refined biostratigraphic records and new radioisotopic techniques requiring smaller samples but with much higher precision. Introducing astronomical dating in the 1980s generated a major breakthrough reducing uncertainties in dating geological events in the Cenozoic 20 times or more. Astronomical dating is based on identifying Earth's orbital characteristics in long, cyclic sediment series. Originally applied to the Late Quaternary only, Earth's orbital impacts were recognized in older sediments as well. In 2004, the astronomical time scale was calibrated from Present until the onset of the Neogene, 23 million years ago. Only eight years later, this time scale extended and covers most of the Cenozoic and significant parts of the Mesozoic (Gradstein et al, 2012). Likewise, inaccuracy levels of stage boundaries were reduced drastically. The same, but with different tools, holds for geological events in pre-Phanerozoic (> 541 My) times, in particular in the Neoproterozoic.

Resolution in geologic time improved also by collecting longer and more detailed sediment records. (Almost) continuous and datable records may provide ideal opportunities to identify environmental changes over long time intervals. Since the late 1960's, thousands of such long cores have been retrieved from ocean floors around the globe by dedicated drilling vessels (Fig. 1). Other, well-preserved long records were drilled in land-ice accumulations covering Antarctica and Greenland. Normally, such cores contain fossil air bubbles trapped in ice. These provide first-order data on atmospheric conditions during the past 0.8 million years (Wolff et al. 2010).



Figure 1 – The Chikyu (Japanese for Planet Earth) one of the two currently deployed vessels to explore and drill the ocean floors

4. Earth processes

Understanding the mechanisms driving large scale processes as plate tectonics in the late 1950's and early 1960's prompted a wide range of new geo-research activities. These included reconstruction of the fragmentation of Pangaea, the supercontinent that existed in the Late Palaeozoic and started spreading 200 My ago. Remains of older mountain ranges and occurrences of originally coherent crustal fragments now far apart confirmed that continental spreading and subsequent unification has been a cyclic process throughout the Earth' history. This points to the former existence of stil earlier supercontinents and large landmass clusters (Nield, 2007), including Rodinia: 1.1 – 0.76 billion years ago (Ga), and more recently, Columbia (or Nena) 1.8 – 1.5 Ga, Kenorland 2.7-2.1 Ga, Ur (3.0 Ga) and (the theoretical) Vaalbara (3.6 Ga). Such large-scale palaeogeographic reconstructions of continents and

ocean floors wandering in deep geologic time was possible mainly through new knowledge acquired on geochemical mantle – crust interactions and improved dating techniques.

As to micro-scale geological processes major discoveries were made recently as well, in particular at the grain-fluid interface level and concerning the active role of biota in such processes. In the saturated zone sediment particles interact with groundwater molecules including dissolved chemical compounds. As groundwater flows and its composition changes over time this process is never in complete balance. Moreover, micro-organisms (biota) in groundwater or attached to grains interact, for example, by fixing atmospheric nitrogen and by decomposing organic matter. The quantity and diversity of micro-organisms in the soil varies but is abundant and most of the land's biodiversity lives underground (Dent et al., 2005). Organic molecules degrade chemically and/or biologically. This thermodynamic process is controlled by biota availability and oxidation (redox) state of the subsurface. To flourish, micro-organisms need energy and carbon. Recent geoscientific research, spurred by health concerns for soil contamination, revealed that organic contaminants, like chlorinated hydrocarbons, may fuel biota with energy and carbon while degrading into less harmful products. Over time, any such contaminant will be approached by indigenous populations of micro-organisms and degrade. Under favourable redox conditions this natural attenuation process may develop relatively fast in case of chlorinated hydrocarbons and pesticides. This capacity of soils for biodegradation depends on their resilience in terms of biota availability and groundwater supply and discharge. This natural process might serve as a powerful tool in remediation policies. Frequent monitoring is required to check biodegradation status of the contaminants and their associated products. In coherence, hundreds of recent geoscientific research studies provided a much better insight in micro-scale geological processes and in the power of micro-organisms in the subsurface.

The past few decades witnessed unprecedented increase in knowledge about our planet. New satellite and seismic techniques facilitated scientists to map the Earth' surface rapidly and more precisely and to virtually observe the Earth' interior. These, together with the rapidly expanding collections of digital data and our strongly increased knowledge of large- and small-scale Earth processes justi-

fy statements that the Earth's anatomy is rather well-known now, that we know roughly how this planet works and quite precisely when major events have taken place in the Earth history. Such knowledge is indispensable to predict impact of human activities on the geo-environment.

HUMAN DEVELOPMENT TRENDS

This chapter describes five global trends in human development impacting the geo-environment and sustainable development of societies: population, urbanisation, living standard, environmental awareness and science & technology. The UN (2008a) predicts that 9.15 billion people (mid scenario) will live on this planet by 2050. From 2050 onwards, this number would remain approximately constant for the following next centuries until at least 2300 (UN, 2004). Until 2050, the Earth should prepare for a 30% human population growth and for societies to make room for accommodating its new inhabitants. The UN Population Division estimates that in 2050 there will be 2.9 billion more people living in urban centres than today (UN, 2008b), 0.7 billion more than the entire world population would be growing until 2050. That will boost the world urbanization to almost 70% in 2050 (50.6% in 2010). Continuing urbanisation will put major pressures on local geo-environmental conditions and in particular to urban space as cities cannot always continue growing horizontally. In combination, both trends will cause urban land prices to rise, particularly in the city centres (Fig. 2).

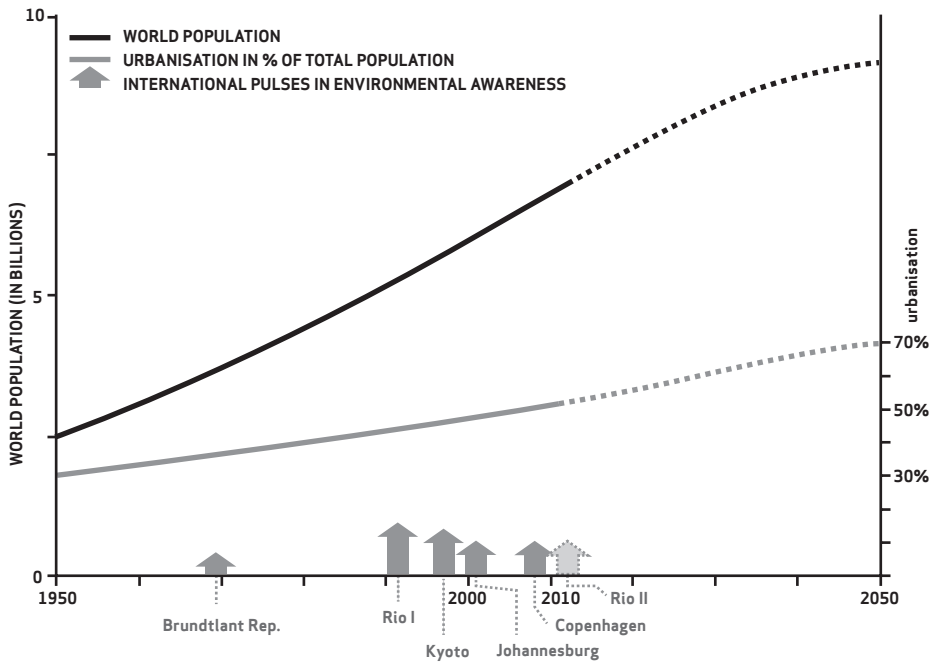


Figure 2 - Past development and future trends for global population, urbanization (UN population Division 2008) and pulses of environmental awareness

Since 1820, GDP per capita increased significantly for all parts of the world. From 1950 to 1995, average incomes in the industrial nations rose 218% and in the developing countries 201% (Lomborg, 2001). Simultaneously, life expectancy increased spectacularly while the proportion of people living in poverty roughly halved. Today, individuals eat more and better quality food and use more natural resources than ever before. As a rule, more prosperous people demand better and larger housing, while economic growth normally request for expanding industrial areas and economic zones. However, increased prosperity also resulted in very large volumes of domestic and industrial wastes stored mainly in sites surrounding cities. Industrial expansion, waste disposal, together with increased food and natural resource production has placed major pressures on the geo-environment and, in particular on physical space. Although the sharply increased commodity prices since 2002 had some impact on economic growth patterns, such global trends are not likely to revert significantly. This assumption is supported by the

fact that since 1970, the world's GDP per capita on average gradually increased: from 2.2% to slightly above 3% in 2008 (IMF). Moreover, global fertility rates went down from 4.92 in 1950/1955 to 2.67 in 2000/2005. The UN expects a further decline to 2.02 children per woman in 2045/2050, which would be below break-even level (UN, 2008b). Despite the impact of the current (2009-2012) global economic crisis on national and regional economies and GDP, there is no reason yet to believe the long-term economic development towards higher GDPs be blocked or reverted for the next four decades.

Converting public environmental awareness into political action has put additional pressures on physical space since the 1970's. At the global scale environmental awareness may be expressed in pulses of public attention attached to major environmental events (Fig. 2). Environmental protection measures resulted in conversion of large areas into natural parks or nature reserves sterilizing these for other types of development. Concurrently, substantial areas of arable land have degraded. Both land degradation and environmental protection added pressures to land development and availability of physical space for growing urban populations. As there are no indications that environmental awareness among the public and politicians will cease to be a relevant factor in policy making such pressures are expected to persist for at least a few more decades.

Technology may contribute significantly to sustainable development. The green revolution drastically improved food security in Asia and Latin America. Technological innovation spurred re-use of natural resources and reduction of mine tailings in the 1990s. Concurrently, significantly improved geological and geotechnical data handling and modelling techniques together with a new generation of tunnel boring machines made underground construction safer, cheaper and faster since the early 1990's. Technology also fuelled land reclamation and spear-headed environmentally safer waste disposal.

History shows that technological innovation driven by human ingenuity could cope with most environmental challenges. The question arises if we may cope with future needs and challenges too. And how will culturally diverse human societies adapt to such challenges?

EARTH SCIENCE FOR HUMAN DEVELOPMENT

Apart from satisfying scientific curiosity, recent progress in the Earth sciences may also serve present and future societies in a practical sense, for example in supporting them on their ways towards sustainable resource management.

Once it was understood that distribution of natural resources in the Earth is controlled by geological factors generations of geoscientists were employed by the extraction industry in the mid 20th century. In the early 1970s, the Club of Rome (Meadows, 1972) predicted rapid depletion of many essential resources. An explosive rise of commodity prices was expected which would seriously hamper human prosperity. But, instead, prices dropped following historic downward trends (IMF 2008). Regardless sharply increased production and consumption the world's registered reserves of most commodities increased (Crowson, 1998). Current reserve-to-production ratios for oil are rather stable at 40 years (BP, 2010) and twice those in 1980. This paradoxical situation may be attributed mainly to new discoveries. Exploration geologists equipped with new tools including satellite images, 3D seismic surveying techniques and assisted by fast data handling and modelling methods, identified many new resources for a wide spectrum of relevant metals and minerals.

Although massive and continued extraction of non-renewable resources will result eventually in depletion of the best accessible volumes, this experience demonstrates that significant reserves of most such materials still occur and may well be identified with the proper tools and geological expertise on the condition that sufficient investments in and enrolment of substantial numbers of young professionals in geoscientific disciplines will occur (Chapter 6).

Apart from resource exploration, Earth scientific knowledge is also required for science-based land-use management decisions. For example, impacts of soil contamination to society may only be properly predicted with adequate knowledge of groundwater flow conditions and geochemical interactions between rock particles, biota, water and contaminants. Geological expertise is used for many more societal relevant issues, including nuclear and other toxic waste storage, combating criminality (forensic studies), energy saving, climate change research, CO₂ sequestration, infrastructure, etc. It supports sustainable decision-making and green economy for culturally diverse societies.

UNDERGROUND SPACE: THE LAST FRONTIER

Human development trends as discussed in Chapter 3 point to increased scarcity of land, in particular in urban centres. As lateral urban expansion will be no option any longer for many major cities due to physical constraints the only dimension left there will be vertical. High-rise buildings may continue to be the dominant construction type in the city centres for the next few decades. But as these have their own intrinsic infrastructural and economic limitations it is believed that the underground will become an increasingly interesting domain for solving space problems at surface in the near future (De Mulder et al, 2012). The subsurface offers an almost unlimited realm of potentials for development as only a very minor part of it is in use yet. Ongoing progress in excavation and geo-exploration techniques will further expand underground constructions, as in China today (Qian & Chen, 2007).

Still some major challenges hamper underground space development. These include psychological and mental barriers on staying underground and may be based on cultural differences (Nishida et al., 2007). Other challenges are the still limited knowledge of sediment and rock behaviour in the subsurface under specific conditions, public perception vis-à-vis that of local governments and the private sector as a driver for underground development, and, not least, legal aspects, policy and management of the subsurface (De Mulder et al, 2012).

Some of these challenges will be overcome in the future with new technologies, growing cultural acceptance and new attitudes in land-use management. This may happen first in places where the pressures on land are highest. By creating comfortable and light environments in underground spaces with adequate safety and security measures, psychological barriers may be overcome as demonstrated in several underground sites (Duffaut 2008). Technological development and spatial planning as well as psychological barriers may target development of the topmost 100 m below surface first. Deeper levels (100-1000 m) may offer comfortable working environments, good storage and energy saving options and might be at stake next.

Climatic factors and available capital may also drive underground development as demonstrated in the City of Montréal (Galipeau & Besner, 2003). Together with positive geological factors and energy (cost) saving aspects, the best conditions and

highest expectations for future underground development may be found in big cities in continental climatic zones in countries where sufficient investment capital and municipal leadership is available. Cities along the east coasts and in the interior parts of the North American continent, in northern and eastern Europe, in the Gulf States, in Japan, Korea and China would comply best with these conditions.

THE INTERNATIONAL YEAR OF PLANET EARTH

To benefit of the growing body of geoscientific knowledge for sustainable development, societies should be aware of its existence. This was checked in 2000 by the International Union of Geological Sciences (IUGS) and showed a major discrepancy. The Indian Ocean tsunami in 2004 and hurricane Katrina in 2005 successively confirmed the existence of that gap. Moreover, fewer future experts in the geosciences had been recruited at universities since the early 1980s although more geo-experts would be needed to identify new resources and to mitigate environmental challenges. These observations triggered ideas to encourage young people for a professional career in the geosciences through worldwide concerted action. UNESCO joined IUGS in its campaign for proclamation of an International Year of Planet Earth (IYPE) in 2001. IYPE, subtitled Earth Science for Society, aims to capture people's imagination with the exciting knowledge about our planet, and to see that knowledge used more effectively to make the Earth a safer, healthier and wealthier place for next generations.

Soon, 25 Associate Partners and 11 Founding Partners followed IUGS and UNESCO in this endeavour. To collect maximum public and political support, the United Nations system was approached. The Tanzanian delegation successfully launched the initiative in UNESCO's Executive Board in April 2005, followed by UNESCO's General Conference in October of that year. In December 2005, the UN General Assembly adopted a Resolution proclaiming 2008 to be the International Year of Planet Earth (UN General Assembly, 2005). The IYPE was registered as a not-for-profit Corporation in the USA and a Secretariat was established in Norway. As it was soon realized that a single year would not be sufficient to address its ambitions IYPE's life time was extended to a period from 2007 to mid 2010. Upon UN proc-

lamation support for the IYPE grew rapidly. By December 2009, 36 International Partners provided financial and other support and National and Regional Committees for national implementation were established in 80 nations and regions (Fig. 3).



Figure 3 – 79 National Committees for IYPE established (in dark) worldwide. One Regional Committee for IYPE was established for East and Southeast Asia

The main activities of the IYPE were coordinated through Science and Outreach Programmes. The Science Programme comprised 10 broad themes: health, climate, groundwater, ocean, soils, deep Earth, megacities, resources, hazards and life. Theme brochures were produced (www.yearofplanetearth.org). The Outreach Programme was mainly implemented at national levels. In addition, a global launch event was held at UNESCO headquarters in Paris, in February 2008, followed by an African launch in Arusha, Tanzania and a closing ceremony in November 2009, in Lisbon, Portugal. Many thousands of activities, often with an educational element, were monitored and registered across the globe.

The very significant worldwide attention given to the IYPE through its National and Regional Committees belong to its most prominent legacy items. These Committees brought together national, sometimes competing, entities into a single ambition. An evaluation in 2009 showed that this ambition had been accomplished to a significant extent. The creation of a Young Earth Science Initiative (YES), a

platform for geo-professionals under 35 years (www.networkyes.org) was another main result of the IYPE. At a political level numerous public statements were given by leading politicians pleading for implementation of the aims and ambitions of the International Year of Planet Earth. National launch events provided good opportunities for politicians and other VIPs to speak in support of the IYPE, often coupled with cultural performances. The ambition to bring together digital geo-data at a global level and to convert these into one single computer language (One-Geology) has been another major IYPE offspring (www.onegeology.org).

Many more legacy items developed during the IYPE Triennium including cross-country geological hiking tours (www.viageoalpina.org), simple but elegant geo-education methods (www.earthlearningidea.com), a series of scientific books on each of the ten IYPE themes, by Springer Verlag and an UNESCO initiative to monitor the state of Earth sciences education in Africa. A Final Report of the IYPE operation may be obtained through www.yearofplanetearth.org. Student entries in the Earth sciences grew significantly in at least 11 countries since 2007.

In sum, the International Year of Planet Earth has been particularly successful in its outreach and education programmes. UN proclamation has been crucial for the success of the IYPE, in particular for national implementation of the aims and ambitions through the 80 National and Regional Committees. These have also been the drivers for igniting follow-on initiatives upon termination of the IYPE, by mid 2010.

SUMMARY AND CONCLUSIONS

Socio-economic development may only be labelled 'sustainable' if basic human needs would be in balance with the Earth's bearing capacity. This paper reviewed some human development trends concerning their potential geo-environmental impact, in particular concerning demands for physical space. This becomes particularly relevant as knowledge of the Earth and on its bearing capacities is rapidly increasing. Examples of such remarkable progress were discussed. A more transparent Earth together with rather precise dating and timing of the major Earth's events and processes may feed prediction models with much better data resulting

in more reliable predictions, e.g. on positive or negative impacts of current and future societies on the geo-environment.

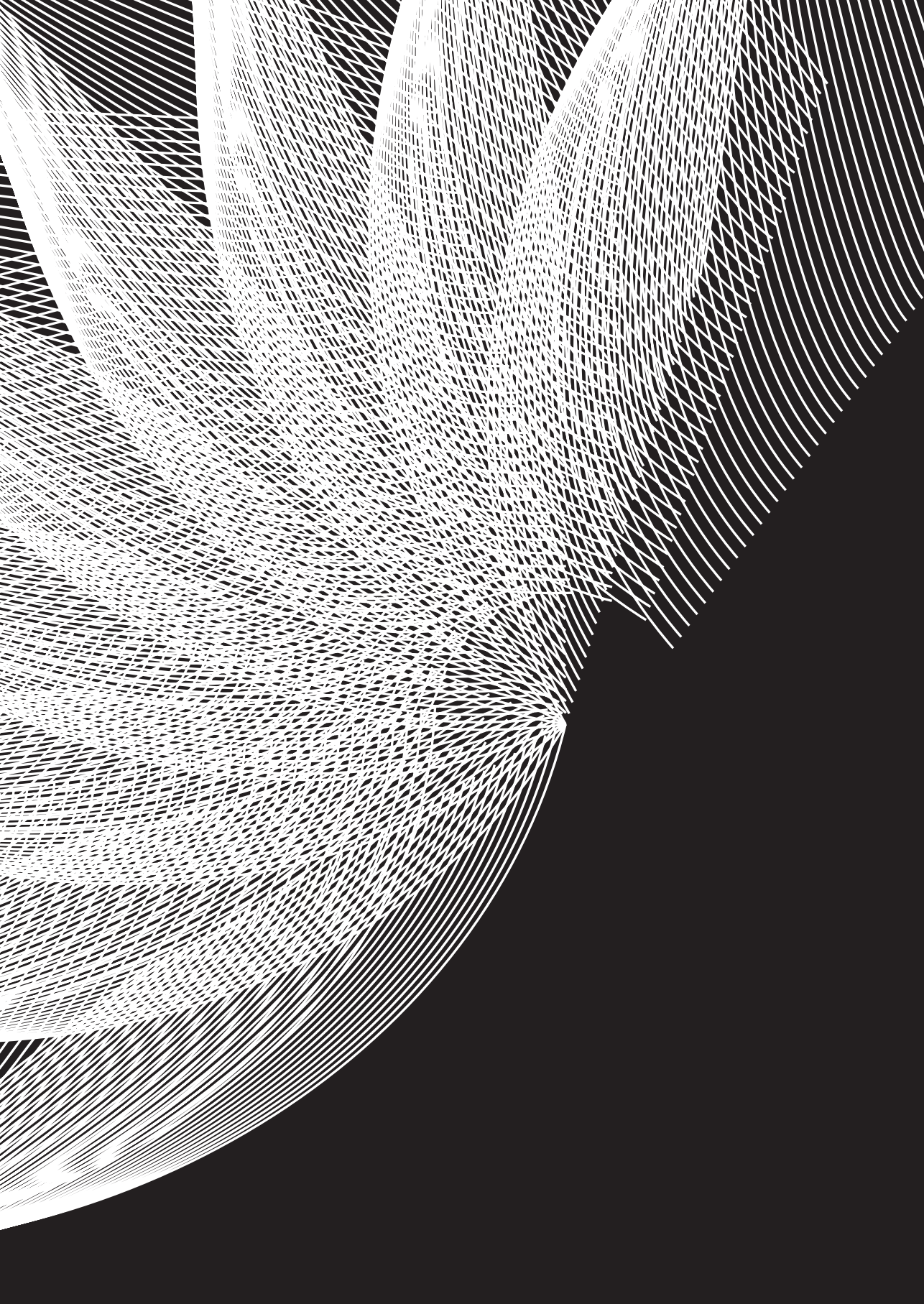
As to the bearing capacity of our planet reference might be made to the ecological footprint currently estimated between 1.3 and 1.5 Earths (FOOTPRINT 2011). Geo-environmental pressures are not expected to be released in the next one or two decades given the present lack of political ambition arrive at worldwide geo-environmental agreements. If current trends pursue (improved) quality of life may become a leading issue for next generations, at the same time demanding for more Earth resources per head but also for clean air, water and soils. This dual ambition may only be achieved through smart usage of Earth materials and more efficient technologies. Human ingenuity resulting in progressing science and technology together with stabilizing world populations by mid 21st century, may lead to healthier, environmentally and socio-economic more sustainable societies. The International Year of Planet Earth demonstrated that Earth scientists are ready to contribute to this global ambition.

Societies and cultures around the world behave differently. Some maintain close ties with Mother Earth while others seem to have been completely disconnected from their roots. It is therefore relevant to understand how different cultural societies around the globe impact their geo-environment. Solid research, both including the natural and social sciences, would be needed to uncover such different impacts. The International Year of Global Understanding, as spearheaded by the International Geographical Union, would provide a laudable opportunity in this direction.

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STRATEGIC RESOURCES FOR EMERGING TECHNOLOGIES

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BENJAMIN ACHZET

ARMIN RELLER

The title of this chapter assembles meaningful, grandiose words which can be seen as the solutions in favor of a better world. At the same time these words are already battered and maybe even have a portentous scent attached to them. So first a reflection about these words is being indicated.

INTRODUCTION AND DEFINITION OF THE WORDING

RESOURCE AND EMERGING TECHNOLOGY

Today, the attributes strategic, emerging as well as the words resources and new technologies are used in an inflationary manner. At the same time the meaning of these words does not seem to be exactly clear. Yet an overarching definition is indispensable for a thorough understanding of the issue.

The first difficulty lies in the word strategic. It is an expression commonly used by the military and that understanding of strategic suits well for today's more economic view: a consideration which is based on a longer timeframe around an overarching topic. The length of the timeframe and the width of the topic are however undefined. Maybe the counterpart tactical can help to scale the definition. Tactical is what has to be done now or in the very next future in a restricted and well defined, i.e. manageable, area. Next, the word resource has to be dealt with. Nowadays the expression resource is often directly linked to materialistic consid-

erations. Resources in this respect are thought of as commodities or rare metals and maybe money, funds or other financial values. A resource is however a lot more. The word resource is derived from the Latin word *resurgere* which means as much as to revive, to arise or to pour out of something. So there is no direct distinction to any materialistic thing. Moreover the etymological meaning allows and asks for a broader understanding. There is certainly a materialistic side incorporated like the commodity issue just mentioned, but also a non-materialistic side. This side incorporates immaterial features like knowledge or know how, time, education, processes, procedures and the like. These non-materialistic issues are potentials and should not at all be forgotten. They are of great importance, especially for countries lacking commodities like Germany, France etc. Obviously education builds the basis for knowledge. Together with experience, processes can be established on how to ideally solve a problem which in turn can be thought of as Know How.

Another facet should not be forgotten in this context: the colonialism, where technical Know How, often located in commodity poor countries, was combined with physical resources, i.e. raw materials, from entirely poor countries. This topic again gets into focus today. Certain behaviorisms suggest that a neo-colonialism is spreading all over the world, using especially African countries. Or that at least a neo-colonialism is impending. So the old global humanitarian problem may become a new one again.

Finally the list of emerging technologies is not a globally agreed one. Instead the issue is of discursive character. Before the focus is put on today's emerging technologies, a look back into history may help to get a better idea about the nature of new or emerging technologies.

THE NEXUS OF TECHNOLOGICAL EVOLUTION AND RESOURCE USE

A first insight in a new or first technology can be attained from the caves of Lascaux and some others in southern France where around the 19th century fascinating wall paintings have been discovered. This parietal art has been dated to the Palaeolithic at around 30.000 BC when the technique of painting with modest and ubiquitous raw materials was perfectly mastered. Mainly charcoal or iron and manganese

oxides were used to draw the figures which already show first signs of perspective. The paints were made up of pigments extracted from minerals which were found and mined in or near the caves. Research showed that the pigments were used either pure or mixed with talc to distend the valuable pigments (Lascaux, 2012).

A further decisive breakthrough is represented by the Neolithic Revolution, maybe not so much on the basis of the invention of new materials but on the knowledge about harvesting. A next step can be assigned to the general era of the Bronze Age, when a new materialistic technology evolved that allowed alloying of copper and tin to fabricate bronze. This technology required as a prerequisite of course the knowledge about the raw materials, their mining, refining and handling. In the same time another remarkable insight can be derived e.g. from the Nebra Sky Disk, a bronze disk of around 30 cm diameter, dated at around 1600 BC. It was found near the small village of Nebra, Saxony-Anhalt, Germany and shows stellar, lunar and solar relationships and thus an insight in knowledge about astronomy and the annual recurrence of the seasons. The Iron Age then again represents a general new technological era. At about the same time the Greek philosophy evolved contributing new ideas about community and polis. Then follows a nearly 1000 years lasting time until in the course of the Late Middle Ages the craftsmanship and construction of huge cathedrals can be seen as new technology. Towards the End of the Middle Ages then a new self-conception in the sciences sprawled questioning old concepts by observation and experiments using new instruments like telescopes. The global sciences eventually split to form the nature or philosophical sciences and the natural sciences. In the Occident ideas like the Enlightenment and the French Revolution gave new directions and self-confidence for further research. Scientists like Isaac Newton (1643-1727) then set up a new pace in the natural science.

A decisive breakthrough on the materialistic technical side was eventually initiated by Thomas Newcomen (1663-1729), a trader and preacher. He was born in Dartmouth, Devon near the Dartmoor where tin mining was an early industry. A big problem was the bad weather which often led to flooding of the pits. This reduced the possible depth of mining. Newcomen invented a first steam engine, probably around 1710, destined to pump water out of the flooded pits. This pump was overall successful so that the invention can be regarded as the prime for the Industrial Revolution. The optimization of this steam engine and numerous other

inventions set a completely new pace in emerging technologies. Improved steam engines were implemented into the railway system. That, together with the idea of giving people a day off per week to improve efficiency allowed for a first short vacation using the railway for a short trip to the seas. With a modest income new demand, leisure, amusement and lifestyles developed asking for more products.

Coal was one of the most important resources which not only was and sometimes still is mined under miserable (humanitarian) conditions. But its use severely impacted and still impacts the environment. Coal, i.e. fossil-carbon compounds formed as products of photosynthetic activities, and stored for millions of years, fuelled the industrialization. Its combustion then produced enormous amounts of CO₂. Next to the general negative impacts of the mining activities, especially the numerous burning coal fires, mainly in China, which cannot be extinguished, add continuously to all the other CO₂ emissions which are known to contribute to global warming. This major global issue of climate change and thus the need for CO₂ reduction drives several of the most dominant global developments; renewable energy generation being one of the most actual and most important ones.

Coming back to technological advance, in a next step the invention of the diesel engine and the implementation of mass production, driven by Henry Ford's automobile production of the Tin Lizzy, marked a further milestone in technological improvement. Now the need for power, electricity and fuels grew rapidly, both for the productive and the consumer side. Certainly the world wars fuelled production even more and the repair struggles after the wars set a new basis for further technological advance. Cheap transport and the invention of the twenty foot equivalent container (TEU) were fundamental for the globalization. In the advent of globalization Know How could join easily with cheap labor, science with industrial needs, so that an unprecedented technological push occurred which seems to be still ongoing despite partial global economic difficulties.

This short trip through history of technological advance shows that ever more materials were required and that the time in between major breakthroughs initially took considerable time with the gaps becoming shorter. Nikolai Dimitrijewitsch Kondratieff (1892-1938) offered a new explanation for the time beginning at around 1780 until 2000. He stated that economic growth phases are driven by basic innovations and that these are followed by an expansion, stagnation and recession

scheme before a new cycle will start. He identified five phases or cycles with 40 to 60 years duration each. The basic innovations began with the steam engine, followed by railway and steel, chemistry and electrical engineering, petrochemicals and automobiles, and information technology in the fifth phase. These cycles or loops are called Kondratieff Cycles or Theory of the Long Waves. Today a sixth cycle seems to emerge, whose labeling could be biotechnology and genetics, but also nanotechnology or just human enhancement. For each of these cycles specific materials and technologies were a prerequisite and of utmost importance to achieve a breakthrough in innovation. All innovative phases were accompanied by the invention of completely new materials or a fundamental change in materials use, Know How so to speak.

So in general the number of materials used and needed grew in an exponential shape which is illustrated exemplified in Figure 1 where the elements used for energy pathways were determined in a work done by Augsburg University (Achzet, et al., 2011).

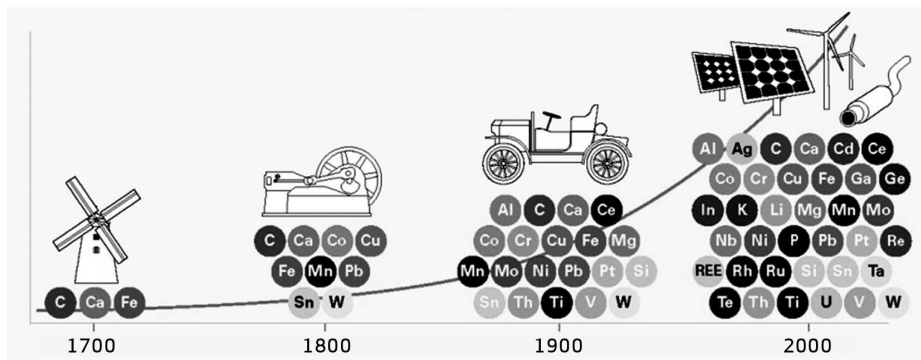


Figure 1 – Elements widely used in energy pathways

Initially, from the Stone Age through the beginning of the industrial revolution, the elements or materials like copper, tin and iron usually had a single functional, often mechanical use. From then on, the elements fulfilled several purposes and became *poly-functional* materials. Not only that an element showed characteristics to serve different uses, the intelligent combination of different elements showed ever more functionalities. Even though or maybe just because of new iden-

tified material functionalities a miniaturization could go along, reducing the size of many products. For most applications this reduction in size was accompanied by an increased efficiency. As new technologies depend more or less on such poly-functional materials and supply is often restricted by near-monopolistic situations, this poses one of the biggest challenges today.

So, coming back to the question of the *emerging technologies* (EmTech) of today, it can be said that there is no unambiguously accepted list of EmTech. In principle a list would be difficult to define and assemble mainly due to the fact that the development of technologies is per se dynamic, so the 'list' can only be a snapshot. As well there will be different suggestions on what is still emerging and what is already established. As an example an LED lamp may be considered both a (yet) emerging and an established technology. The search for EmTech on the World Wide Web primarily lists the acronym NBIC (nanotechnology, biotechnology, information technology and cognitive science), a concept hosted by the US National Science Foundation (NSF) called 'Converging Technologies for Improving Human Performance' in 2003 (Roco & Bainbridge, 2003). Other but similar categorizations have been created e.g. by Garreau (Garreau, 2005) with a system he calls GRIN (Genetics, Robotics, Information Technologies, Nano) or GRAIN (Genetics, Robotics, Artificial Intelligence, Nano) which was adopted by Mulhall (Mullhall, 2002).

Even though these approaches cover a wide bandwidth, they lack of some not so obvious technological fields like construction (homes for the growing global population) and the non-materialistic side. Therefore another attempt to summarize the relevant technologies is shown in Figure 2.

EMERGING TECHNOLOGIES - SORTING																											
sorting based on hierarchy of needs anda daily life requirements																											
Environment				Construction				(Daily) Life				Mobility				Information & Communication technology				Energy				Energy Storage			
• Catalysis • Lighting				• Buildings • Steel • Glass • Infrastructure (road, rail...) • Superalloys				• Medicine & Pharmacy • Desalination • Water Purification • Refrigeration • Heating / Cooling				• Electrovehicles • Hybrid Vehicles • Increased efficiency (optimization of existing technology) • Weight reduction • Traffic control				• Display • Communication network / infrastructure (urban & rural) • Mobile communication • RFIC				• Renewable Energies - Wind - Solar - Hydro - Biomass - Gethermal • Fission (?) • Grid Smart Grid • Hardware • Software (Control)				• (Traction) Batteries • Grid Stabilization • Grid Quality • Island Application • 4-C market			
N	B	I	C	N	B	I	C	N	B	I	C	N	B	I	C	N	B	I	C	N	B	I	C	N	B	I	C
Classic nominations NBIC (NSF 2003) • Nanotechnology • Biotechnology • Information Technology • Cognitives Science GRIN (Garreau 2005) • Genetics • Robotics • Information Technologies • Nano GRIN (Mulhall 2002) • Genetics • Robotics • Artificial Intelligence • Nanotechnology Note: tha table shows different colomns detailing emerging technology fields. These may be further pushed by either N - Nanotechnology, B - Biotechnology (Genetics), I - Information Technology, C - Cognitives Science. A bold letter states more, grey letters indicate less tendency as push factor. This list has been assembled by Chair of Resource Strategy, Ausburg University © RS Zepf / Reller 2012																											

Figure 2 – Emerging Technologies

EMERGING TECHNOLOGIES – A SELECTION

Even though NBIC, GRIN or GRAIN are emerging technologies, the focus should be shifted towards the growing world population with the inherent need for energy. Energy production is still based on fossil fuels and thus tied to CO₂ emissions which are identified as factors of global warming. So there is a need for energy saving wherever possible combined with renewable energy production as much as possible. As the renewable energy production is a decentralized system compared to the classic energy production complex with big power plants, new grids are required which can carry the electrical load over long distances, be it by means of supra-technology or via High Voltage Direct Current (HVDC) Systems. So these technologies will push the need for several additional and new materials.

As not all areas can be covered herein, a selection of EmTech is explained in more detail. Obviously this list cannot be complete and the descriptions themselves are not entirely embracing, but they should give a picture of the vastness of the issue(s).

Lighting - Incandescent lamps, using a tungsten filament, were identified as wasting too much energy, so that several countries worldwide put sales prohibitions in place (e.g. Eco-Design Richtlinie 2005/32/EG and Verordnung (EG) Nr. 244/2009). As well toxic ingredients like mercury are banned. So the need for energy saving lamps which are free of toxicity steered the development from compact fluorescent lamps and mercury-free lamps to Light Emitting Diodes (LED). The LED production and sales are gaining momentum at present. For these diodes especially the phosphors, i.e. luminophores or luminescent substances, are crucial for the achievement of the desired light and color. The first LEDs at around 1970 managed to radiate yellow and red light using gallium-arsenic-phosphors. Today aluminum, indium, gallium but decisively europium (Eu^{2+}) and cerium (Ce^{3+}) are indispensable for LED manufacturing. Terbium as well is widely used. As a substitute for europium and cerium, maybe manganese (Mn^{2+} or $^{4+}$) shows potential (Jüstel, 2011). In common fluorescent lamps (tubes) the phosphors used are mainly three-band phosphors, which are on the inside of the glass covers. They contain mainly the rare earth elements yttrium, europium, terbium, lanthanum and cerium in specific combinations and concentrations. Except maybe lanthanum and cerium the supply of rare earth elements is presently and at least in the near future critical, if not endangered. As China has set export restrictions and tariffs on rare earths due to own demand and environmental problems during the mining and processing phase (Chinese Ministry of Commerce, 2010). Another LED system emitting blue light depends on the use of indium-gallium nitride (InGaN or GaN) which again are materials with critical supply situations. Without modern lighting technology however, the global energy saving goals cannot be met. Substitutions for these elements are presently not available; maybe the organic LEDs (OLED) will prove as potential substitution.

The *Information and Communication Technology (ICT)* is mainly based on semiconducting materials and a high diversity of about 60 elements which are fabricated in these systems (Donner, 2011). These 60 elements serve different functions; e.g. as

casing, logic board, display etc. All these functions incorporate a special elemental composition and the fast dynamics in the ICT arena makes a prediction of the elements needed both in quantity, quality and time nearly impossible. A general idea of the vast use however can be attained. According to UNEP the composition of a cell phone is comprised of about 50% plastics – mainly the casing –, 15% for both copper and glass, 4 % both for cobalt or lithium (battery) and carbon and the remaining 12% are other elements like nickel, iron, zinc, tantalum, cadmium or lead (Cell phone composition, 2006). The noble metals gold, silver and palladium are contained as well. Hagelüken (2011) states an average of 250 mg silver (Au), 24mg gold (Au), 9 mg palladium (Pd) and about 9 g of copper (Cu) per mobile phone. Compared to the 1.6 billion mobile phones sold in 2010 approximately 400t Ag, 38t Au, 14 t Pd and 14.000t Cu (Hagelüken, 2011) were built into these phones within one year. This of course represents a (future) recycling potential. For comparison, the annual production of these elements were in 2010: 22.200 t Ag, 2500 t Au, 197 t Pd and 16 Mio. t Cu (USGS 2011a-c). So for Pd at least the quantities used are remarkable.

Back to ICT in general, main boards contain chips made mainly out of silicone, silver and copper; whereas capacitors and high performance transistors contain tantalum and niobium. Coltan is the main ore from which tantalum is mined. The biggest mining activities presently are in the eastern – southeastern part of the Democratic Republic of Congo, near the border to Ruanda. Illegal mining activities are said to have contributed to the civil war parties so that today a legal mining activity is pursued. USGS shows that the biggest tantalum producers are Brazil, Mozambique and Rwanda. The DRC is not mentioned individually so that question marks remain about the impact and reliability of the data. The German Federal Institute for Geosciences and Natural Resources (BGR) initiated an analysis method for proofing the source of Coltan to attain a kind of a certificate for ‘clean’ raw materials which were not produced by child labor or to promote civil wars and war lords (BGR, 2010).

Energy storage or batteries for the 4-C market (camera, computer, cellular phone, and cordless tools) represent the biggest market for accumulators. The most important technologies in this field are based on lithium-ion (Li-Ion), nickel-metal-hydride (NiMH) and to a decreasing amount nickel-cadmium (NiCd) technology.

The Li-Ion technology is leading the market with about 90% share as Li-Ion provides the highest energy density (Hanning, 2009). The materials used are of course lithium but also cobalt as cathode material and a carbon based anode material. Cobalt is problematic because about half of the annual global production comes from the Democratic Republic of the Congo where severe negative environmental and social conditions persist. Cobalt can be replaced by manganese and nickel to further enhance efficiency (Whittingham, 2004). More recent research points to a lithium-phosphor based cathode.

For NiMH next to nickel also lanthanum, one of the rare earth elements is used. Fortunately lanthanum is one of the most abundant REE but even lanthanum got into the maelstroms of finance-political difficulties resulting in rising commodity prices.

In the NiCd arena cadmium poses a problem as cadmium has toxic characteristics which led to a ban in several countries around the globe.

The short term energy storage is also getting momentum. Several capacitor technologies have been developed to satisfy the market demands. Especially tantalum based capacitors demonstrate high performance characteristics (Jayalakshmi, 2008). But again, tantalum is coated with a problematic mining situation as described above.

Storage for traction batteries in electric vehicles are a further growing market. Next to the capacitors for the short-term energy storage, mainly electrochemical storage systems are appropriate for the automotive sector. High temperature batteries (Sodium-Nickel-Chloride - NaNiCl), Li-Ion, NiMH, NiCd, lead acid batteries or Hydrogen Storage Systems are possible solutions. Li-ion technology is again the best available option at present, due to the specific energy density and cycle stability, so that the demand for lithium is expected to grow significantly. With an estimate of 100 million light vehicles to be produced annually by 2020, 3% are expected to be full electric cars, 2% plug-in hybrids and 15% full hybrids, this sums up to a lithium demand of more than 60.000 tons per year (Achzet, 2010), compared to about 30.000t in 2010.

Loudspeakers in mobile phones and ICT usually use rare earth elements based *permanent magnets* containing neodymium, praseodymium, iron and boron. Here the availability of neodymium and to a lesser extent praseodymium is critical – due to a quasi-monopolistic production situation in China.

Displays are based on the same technologies as LCD computer monitors or modern LED TVs. In liquid crystal displays indium-tin-oxide (ITO) layers are used as a transparent electrode in polarization filters as they function both as a transparent layer and offer electrical conductivity at the same time. One potential competitor for future indium demand is the solar industry producing thin film solar cells on copper-indium-selenide (CIS) and copper-indium-gallium-selenide (CIGS) basis.

The biggest producer of indium in 2010 was China with estimated 300 t followed by the Republic of Korea producing 80 t and Japan with 70 t. The world total is estimated at 574 t (USGS, Mineral Commodity Summaries. Indium., 2011). When reserve data were published in 2008, the range of indium was around 20 years of production; today no more reserve data are published so that a strategic supply decision is nearly impossible. So indium seems to be a perfect solution for both applications but supply constraints already push substitutions. A possible substitute for the main application in ITO electrodes could be fluorine-tin-oxide (FTO) (Ziemann & Schebek, 2010), antimony and some others (USGS, 2011).

IBM introduced processor chips based on hafnium to obtain higher performance (IBM, 2007). Again hafnium is a rare element with at least no supply in excess.

In 2008, the global share of *renewable energies* was 7% and is predicted to increase to 14% in 2035 (IEA, 2010). This in turn means that renewable energies will have to bring a considerable bigger share on the energy production. As neither solar nor wind energy are capable to provide the base load; and biomass, geothermal and hydro power cannot provide enough energy alone on a global meso- to macro-scale, a multitude of energy systems is necessary within a complex network to assure a stable energy supply.

The materials side asks for special steels with high corrosive resistance especially in case of hydro and geothermal energy production. The installation of biomass energy production facilities is of minor criticality whereas the fertilizers needed to achieve quantitative sufficient biomass for energy production are in direct competition with global food production.

In the *solar energy* several principle technologies are available. On one side there is the photovoltaic field which directly produces electrical energy and on the other side there are big plants like concentrated solar power plants (CSP) are operating. A third area is represented by small thermal solar systems usually used on a micro-

i.e. household scale. All of the available technologies are based on different elemental compositions with different efficiencies. Thinfilm panels based on amorphous silicon achieve between 5% energy conversion efficiency, Copper-Indium-Selenide (CIS) and Copper-Indium-Gallium-Diselenide (CIGS) panels vary from 10-12%, Cadmium-Telluride (CdTe) panels achieve about 10-16%, Gallium Arsenide (GaAs) panels up to 40% (Fölsch, 2009), (Bayerisches Staatsministerium WIVT, 2010). For all of these technologies research is underway to increase efficiency. Compared to efficiency levels of about 90% for hydro energy, this research indeed seems necessary. And the material quantities needed to provide sufficient energy with solar power are expected to be huge; comparative research is still required.

As has been said, the list could be extended way longer; so the number of 60 elements can be explained. Important to note is, that these elements are not always needed in big quantities, but often like spice (metals) which allow some functional characteristics in the first place. The issue however gets obvious when a map of the world is drawn which shows the sources of these elements. In principle they are mined all over the world, usually fabricated in the far-east regions and sold mainly in western countries but increasingly also in the far-east regions. So the geography of the elements tells a story that all this development is only possible with cheap transport to gather even tiniest quantities from outposts and bring them together into a small powerful gadget. These lifestyle and production products are indispensable from daily life, at least as merchandising tries to imply.

The realization of long term decisions for recycling or substitution in order to reduce potential material risks is very difficult to implement, mainly due to the extreme dynamics in this area and the dependency on poly-functional materials with an unsecure supply and demand situation.

Summary

This short description of just some technologies shows that several elements are indispensable and can only be substituted by elements who themselves are critical materials and where supply is as well not guaranteed. The list should have also shown the fact that not a single technology can be extracted and viewed separately. The real problem only is revealed when all possible competitors and factors next to the pure availability are taken into consideration. Even when quantitative data is difficult to gather the qualitative idea should give enough momentum for

early action. Augsburg University assembled a list of critical elements for energy pathways which are deemed as emerging or at least important technologies. Figure 3 shows the allocation of 19 elements to various energy pathways and highlights three grades of criticality: L – meaning no immediate action is necessary, M- indicating caution as action may be imminent and H – showing action is absolutely necessary to secure supply.

It should have become obvious that a discourse about the topic and further research is needed. Yet the message should be that for emerging technologies, no matter how advanced they are or how effective and efficient, the materials side could be a show stopper both on short, mid and long term.

Shortage and supply risks are given. Solutions show up of course in the classic re-phases (re-use, re-manufacture and re-cycle) and in substitutions; and in the thinking of functionalities rather than single technologies. Thinking in functionalities like solar energy leaves a wider application field than reducing the options down to e.g. CdTe-PV alone. If Cd would be prohibited due to its toxic characteristic the CdTe-PV would be dead and the search for substitutions in a timely manner difficult. An early opening of the options could have offered better solutions with an early avoidance of possible shortfalls.

On the other hand, the inventions made by EmTech may as well render technologies of today or other EmTech nearly instantaneously obsolete. Nanotechnology for example could lead to the ideal situation of fewer (material) quantities needed for the manufacturing of a product and probably of enhanced efficiency as well.

The general quest for maximizing performance should be shifted in favor of a technological design tailored and optimized according to criticality factors.

Finally the initial thoughts about resources should be called in mind again: Know How, education, research and all the non-materialistic features can and should play a more decisive role than just the gamble on best short term commodity prices. Only a wise use of all resources together and doing this by incorporating socio-cultural (moral), ecological and economic considerations, seems to be the most advantageous and promote successful emerging technology.

Materials	Cd	Cr	Co	Cu	Ga	Ge	In	Li	
	Cadmium	Chromium	Cobalt	Copper	Gallium	Germanium	Indium	Lithium	
R/P	30	>16	83	39	n/a	n/a	n/a	514	
Supply constraint	Environmental banning	Geopolitical & commercial	Geopolitical		Commercial	Commercial	Commercial	Geopolitical & commercial	
Oil E&P		(H)	(H)	(L)					
Biomass									
Gas E&P		(H)	(H)	(L)					
Coal mining		(H)	(H)	(L)					
Uranium mining		(H)	(H)						
Geothermal		(H)	(H)						
Wind				(L)					
Hydro				(L)					
Solar PV	(H)	(H)			(H)	(H)	(M)		
Solar passive				(L)					
Refining		(H)	(H)						
Electricity generation				(L)					
Delivery of oil, gas, biofuels		(H)	(H)						
Electricity grid				(L)					
Deliver of solar				(L)					
Electric vehicles			(H)					(M)	
Petrol and diesel vehicles		(H)							
Heat				(L)					
Light					(H)	(H)	(M)		
Electrical appliances	(H)		(M)	(L)	(H)		(M)	(M)	
	Cd	Cr	Co	Cu	Ga	Ge	In	Li	

This diagram shows the materials deemed critical to currently deployed technologies in the main energy pathways and indicates the likelihood of constraint in their supply relative to the time needed to develop alternative supply routes or substitutes.

(H) indicates risk from known constraints for critical material that could have impact within the timescale required to find alternative supply routes;

(M) indicates risk from potential constraints within the timescales;

Figure 3 – Sustainability indicators in energy pathways

	Mo	P	Pt	K	REE	Rh	Ag	Te	W	U	V
	Molybdenum	Phosphorus	Platinum	Potassium	Rare earth elements	Rhodium	Silver	Tellurium	Tungsten	Uranium	Vanadium
	42	369	n/a	288	823	n/a	23	n/a	48	n/a	>243
	Commercial		Geopolitical & commercial		Geopolitical & commercial	Geopolitical & commercial		Commercial	Commercial	Commercial	Commercial
	(M)								(M)		(M)
		(L)		(L)							
	(M)								(M)		(M)
	(M)								(M)		(M)
	(M)								(M)	(H)	(M)
	(M)								(M)		(M)
	(M)				(H)				(M)		(M)
	(M)								(M)		(M)
							(L)	(H)			
	(M)		(H)		(M)				(M)		(M)
	(M)								(M)	(H)	(M)
	(M)								(M)		(M)
					(H)						
	(M)		(H)			(H)			(M)		(M)
					(H)						
							(L)				
	Mo	P	Pt	K	REE	Rh	Ag	Te	W	U	V

(L) indicates no known constraint.

These sustainability indicators are expanded in each of the material spreads, starting on page 20.

The Reserves/Production (R/P) ratio across the top row shows that in all cases where data is available,

substantial reserves exist and there need be no imminent shortages that will prevent provision of energy. However the issue cannot be ignored as constraints other than reserves availability may apply and this book is intended to provide an informed starting point for areas requiring further examination.

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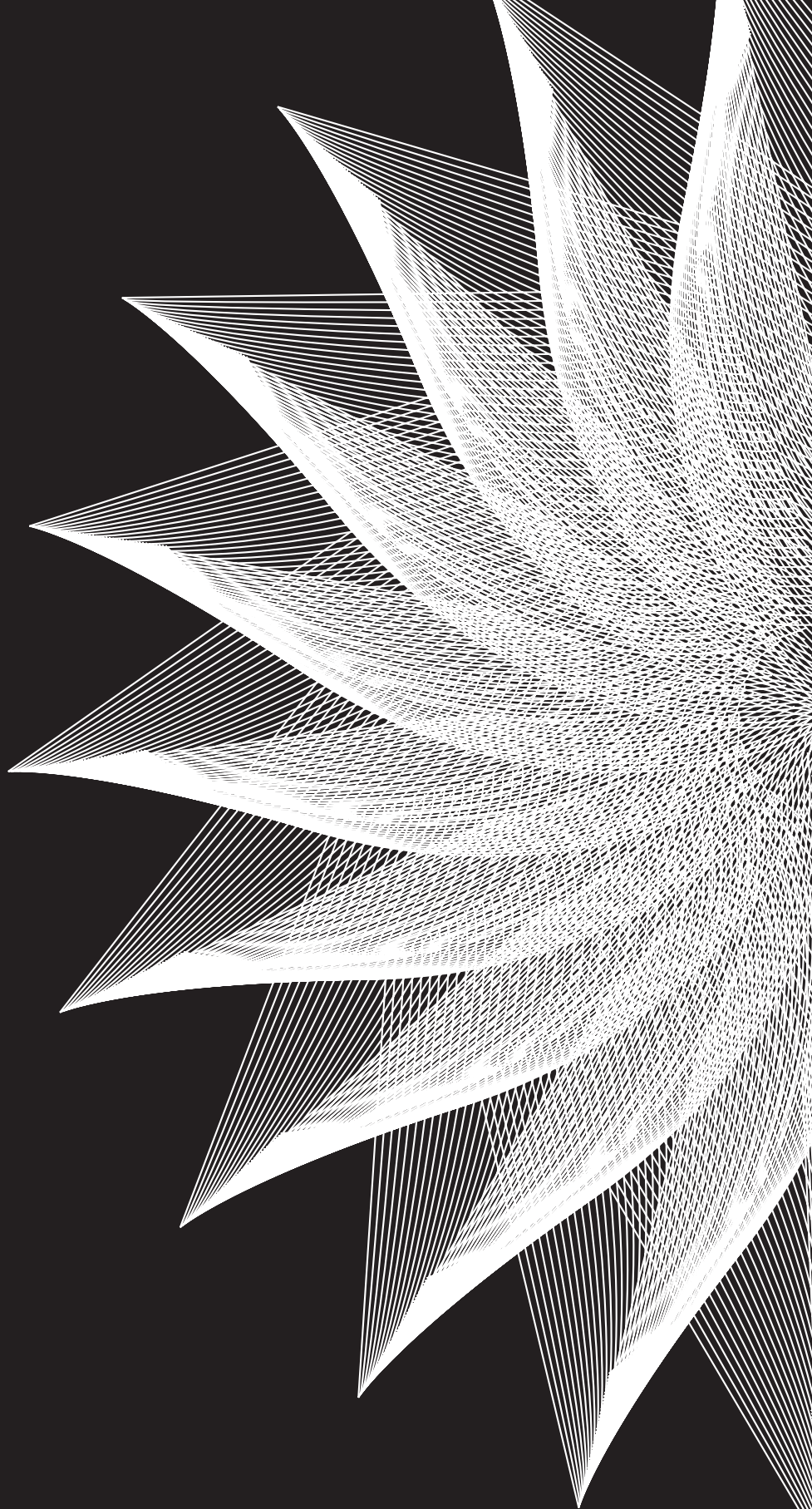
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GERMANY'S SUSTAINABILITY POLICIES IN GLOBAL PERSPECTIVE

MATTHIAS MACHNIG

When a society lives and works sustainably is a science in itself. When it plants as many trees as it cuts down? When it contracts no more debts than it has inherited? When it no longer needs any resources for transport and power that are not renewable?

However one works it out, one thing is clear: the world as a whole is only inching towards the goal of sustainable development, and the few advanced countries in this regard are generally only successful in isolated fields. This is also the case with Germany, a country regarded by many other states as a model for more sustainable development.

In Germany, for example, the share of renewable energy in power generation is now around 20%, significantly more than the 12.5% aspired to by today in the 2002 "National Sustainability Strategy". And with the emission of greenhouse gases the target value of minus 21% compared to 1990 was reached as early as 2007. The Federal Republic is rightly viewed here as a key player. The fact that this gives us a higher-than-average share in the global renewable energy market is a welcome, a probably calculated effect. 12 % of global turnover goes to Germany, that is 40 billion euros a year.

In Germany too, there is an urgent need for action in most other areas. Land consumption may have gone down according to the latest Federal Government progress report from 120 hectares a day in the nineties to 77 hectares, but that is still more than double the target value for 2020 of 30 hectares. We are falling well

short of our targets here, to say nothing of other indicators that have no firmly ecological impetus and thus receive little attention in Germany specifically. Indicators that measure economic and social sustainability.

Björn Stigson, President of the World Business Council for Sustainable Development says the following about current German efforts: "Germany is unfortunately behaving like one of those football teams that always play well but never score the decisive goal." More specifically, he adds: "Germany is not making progress on resource efficiency".

As Stigson sees it, the rate efficiency increase so far has been far from sufficient according to the Federal Office of Statistics to achieve the sustainability targets set by the Federal Government. A "grand design" is needed, he argues, a consistent national strategy for the sustainable use of resources. Germany's leading position in sustainability and climate policy is at risk; it lacks vision, strategy and credibility; potentials remain untapped.

This, incidentally, is exactly what the experts have been asking for with regard to the implementation of the so-called "energy turn". This change was proclaimed in Germany after the atomic catastrophe in Fukushima. But that is another story.

It is important to point out in this regard that sustainable development is a great deal more than just the issue of renewable energy. What is mostly forgotten with the issue of sustainability is that this policy complex consists of three equally important elements, which are not instrumentally limited to a stronger enforcement of the ecological aspects.

To recall: the following definition was established within the framework of the 1st Earth Summit for Sustainable Development in Rio de Janeiro in the year 1992: "Sustainable development is a development that allows present and future generations to meet their basic ecological, economic and social needs (essential needs) and conserves limited natural resources for future generations."

Based on this, the following goals are designated as the three pillars of sustainability: the preservation of natural resources, the safeguarding of social justice and equality of opportunity, and growth and employment. This is not, by the way, a matter of doing without. On the contrary: basic needs may, indeed should, be explicitly satisfied.

SUSTAINABILITY IS SOCIAL AND ECONOMIC TOO

In her bestseller “How the West was Lost”, the Oxford graduate and former World Bank economist Dambisa Moyo prefixes her foreword with a kind of parable that says a great deal about the challenges that all enforcement strategies for sustainability face. And it also shows the limited scope of action that western industrial states have in this through the shift of socioeconomic powerhouses, principally towards Asia and South America:

“A senior business executive tells the story of a conference where the head of an established and leading Western telephone company boasted about all the things the company could do, and the innovations it had in the pipeline. He went on for quite a long time, as he demonstrated the company's range, and depth, and brilliance. His speech was met with enthusiastic applause. Then came the turn of the head of a similar Chinese company; undaunted, pointing to the Western executive, he said: ‘We can do everything he can ... for 40 per cent less.’ He promptly sat down.”¹

The company head could of course just as easily come from Brazil, India, South Africa or other emerging states. And his voice is just one among many. The end of the limitless economising that many affluent actors in the economically highly developed countries of North American and Europe desire, is indeed no illusion. That would be a declaration of political bankruptcy. But it is still a far-distant goal. There are simply still too many people in the world who have just started out on the long path to prosperity. The emerging economies want to grow, and will do so. They tackle the international competition, and can win it too via cheap prices. The fact that social and ecological standards are frequently overlooked in the process is an unfortunate side-effect of the catching-up process.

To avoid misunderstandings, three things need to be referenced at this point. First, as has just been hinted: an end to growth is sheer fiction. A glance at population growth and the associated qualitative and quantitative increase in needs, which have to be satisfied with an increase in goods and services, is enough to justify this statement in itself. Soon, the earth will throng with 9 billion people; the number of people in the industrial states will double.

1. Dambisa Moyo: *How the West was Lost*. Penguin Books. London. 2011

Second, we need to caution against the risk of denying the emerging states of the South the right to growth and prosperity. Should we somehow deny the life of prosperity we have long enjoyed to the people in the catching-up economies? I understand the concerns of our partners from southern states who accuse the western industrial states of practising in this way a form of neo-colonialism – even if the trenchancy of the term is somewhat inappropriate, as it only produces additional reservations.

Third, it has to be clear that we, by whom I mean not only Germany, but Europe and North America, should for our part abandon the paths of resource-guzzling, environmentally damaging and antisocial production and growth. Although: must abandon is a more fitting expression, as we cannot anyway win the international competition through low prices. We can only achieve long-term market successes through quality, service and specifically the promotion of sustainability, in particular with capital-intensive high-tech products that underpin the necessary economic restructuring.

Overall, it is apparent that the sustainability of the future is always a sustainability of cooperation, knowledge transfer and utilising all kinds of expertise as well. As Luiz Oosterbeek describes it in his essay about the role of people in the process of finding solutions for dealing with global warming and climate change², “one aspect of globalisation is that knowledge becomes more interconnected, with a stronger inter- and transdisciplinary dimension”. We are, he continues, “approaching the end of the cycle of ‘national’ progressive dynamics, within a multi-centred geo-politics governed by local and regional questioning of old frontiers.”

Oosterbeek asks: “How can different interests, when considered from the point of view of economy or society, converge?” I would add: to master the challenges is to share the knowledge – and also the burden. This point is missing in most current debates. Instead of laying injunctions on our partners in the states and viewing them as competitors, we should rather collaborate with them. The last world climate change conference in Durban what progress can be made when, for instance, forward-looking European states act in concert with developing and emerging countries.

2. Exact title: “Is there a role for the humanities in face of the global warming and social crisis?”

We can operate as a supplier of knowhow for more sustainable development, our partners as users and optimisers. And what is to be said against being so successful at this that other states can do no other than emulate our way of following a path of clean growth and revitalising international competition and generating growth and prosperity in the coming years through expanding their production capacities? Incidentally improving social sustainability would be “collateral damage” quite in the spirit of Rio.

What is important is that sustainability must not just be invoked. Sustainability requires design. Investors, producers and consumers decide about sustainability. Imagination, creativity and technical knowhow are called for to advance environmentally compatible and resource-efficient patterns of production and consumption. Everyone, employees and companies, trade unions and associations, colleges and research organisations, needs to be actively concerned in the offensive design of the structural change.

The integration of all social groups is the prerequisite for an urgently needed integrative approach. And that is exactly what has been lacking. It is precisely for this reason that we have not really made any progress on the issue of sustainability in the past 20 years since the Rio conference.

“The original sustainability concept [...] has reached its point of obsolescence”, declares Eliezer Batista, former Mines and Energy and Strategic Affairs Minister of Brazil. According to him, any new sustainable development paradigm has to include “variables that the original concept has failed to contemplate. Cross-culture now permeates all other factors, which also include innovation [...]”. In turn, innovation and cross-culture “have come to tie the economic, social and environmental variables together. According to the original sustainability concept, they were met, but weren’t necessarily related.”³

Politics have to provide for these ties or clamps. As the state naturally cannot and may not encroach upon every personal sphere, it needs to create suitable framework conditions to enable science and research to develop convincing solutions and alternatives that industry and society cheerfully and, with a view to ben-

3. In the Essay: “The new sustainable development paradigm”

efit, assimilate. In Germany, this integrative approach has found its way into the political debate on progress under the title “Ecological Industrial Policy”. Let us take a look at the German case.

ECOLOGICAL INDUSTRIAL POLICY – TRAJECTORY TO FUTURE AND SUSTAINABILITY

Germany has come through the worldwide crisis, stemming from the financial markets, more successfully than many other countries. The strong position held by manufacturing has been a critical factor here. In Germany, financial services held, in 2010, a share of only five per cent of GDP. Industry, on the other hand, accounted for 23.1 per cent of gross value added. To this are added industry-related services, like the servicing and maintenance of machines and products already sold.

Altogether, the share in the economy of industry and industry-related services amounts to 35 per cent of gross domestic product. By comparison, Great Britain or the United States, for example has, according to OECD, an industrial sector amounting to only 12.3 per cent and 13.3 per cent of GDP. Both countries have to struggle with rising unemployment and with substantially lower growth rates.

The success of the German economy in globalised competition, built essentially on allegedly »old-fashioned« manufacturing, is sufficiently well known. In 2010, goods to the value of €959.5 billion were exported. With this, Germany is no longer the world’s no. 1, but comes second only to China. The cost of imports into the country was €806.2 billion. The trade surplus of €153.3 billion is a clear indication of the competitiveness and strength of the German economy.

In spite of these successes, Germany is confronted with the task of reorienting the structure of its industry. Not industry in itself, but sustainable industry has to be the leitmotif for the 21st century. Only those economies that adjust in time to the challenges of climate change and the need for energy- and resource-efficiency will have a lasting prosperous future.

We stand before the challenge of bringing mass prosperity in line with the absorption capacity of our planet. By 2050, industrial nations will have to lower their CO₂-emissions by 80-95 per cent by comparison with 1990 levels, otherwise collapse threatens. The population boom does not make this any easier. By 2050, the

world's population will have reached nine billion. Already by 2030, the number of people living in industrialised societies will have doubled to four billion. This will not be possible within the limits of today's production processes and technologies, since the hallmark of current industrial societies is, above all, extremely high consumption of energy and resources.

The need for alternative economic activity and management is not completely new, but has intensified. Ever since the Club of Rome published a study, in 1972, entitled *The Limits of Growth*, the ecological boundaries of economic growth have been the focus of attention. The core message was that: If the population, food production and industrial output, and also environmental pollution and the consumption of non-renewable resources continue to grow unchecked, then the world economy will, through scarcity of resources, collapse within the foreseeable future. Subsequent research has found that technological progress can delay this collapse, but cannot really prevent it. This assessment continues to be correct, albeit with one important limitation: It applies only insofar as we try to solve the problems of industrial society with the traditional answers.

From a political perspective, the matter is perfectly clear: We need growth, but growth with quality. The green markets of the future are forecast to show medium-term growth rates of eight per cent per year. That is, for a certain period of time, these markets should double in value every ten years. By 2020, the value of worldwide green technology markets is expected to have grown from today's 1.4 billion to 3.2 billion.

Enormous opportunities for employment arise from this economic dynamic. According to the forecasts of different research institutions, we can create up to 2 million new green technology jobs in the present decade in Germany. The most recent study on the economic benefits of measures to reduce greenhouse gas emissions comes from the Potsdam Institute of Climate Impact Research (PIK). The central finding is this: An intensification of the greenhouse gas reduction target, for 2020, in the European Union, from 20 per cent to 30 per cent, will lead to positive growth and job creation effects: Annual GDP growth, in the European Union, will rise by around 0.6 percentage points, generating up to six million additional jobs. The unemployment rate is expected to fall to 5.3 per cent (as opposed to 7.6 in the reference scenario) and the proportion of investment, in relation to GDP, is expect-

ed to rise from 18 to 22 per cent. According to the PIK study, all industrial sectors would profit, particularly the construction sector (+25 per cent per cent, industry +9 per cent) through insulation of buildings and infrastructural development.

Nevertheless, those wishing to profit from the growth-driving potential of environmental technologies must now set the course for an ecological industrial policy. The competitors do not sleep. The new ecological technology and production clusters are taking form now, rather than in ten years' time. We need a new, progressive concept for a third industrial revolution.

Above all, this has to include the efficient use of resources. As noted by the Federal German Statistics Office, resource efficiency is a »sleeping giant«. With 46 per cent of gross production value, the consumption of resources is the largest cost factor in the German manufacturing sector. According to the German Materials Efficiency Agency (demea), an increase of 20 per cent in the efficiency in the use of raw and other materials in the German industry would create savings of €100 billion per year! And yet politics, worldwide, continue to act as if wages were the only adjusting variable.

In the meantime, it has been understood globally that the conversion in the direction of a green economy brings with it enormous opportunities. If one looks at the recent economic stimulus plans, the following can be noted: The worldwide economic stimulus plans have staked 450 billion on green investments, that is, some 16 per cent of the overall packages. The importance of the topic is rising. It seems to have been understood that we must invest in the future, i.e. in the structural change of our industrial society.

TEN POINTS ON THE WAY TO A THIRD INDUSTRIAL REVOLUTION

The following defines the »imperatives« of an ecological industrial policy, illustrated with examples and concrete measures which were brought in, in Germany, by a socialdemocratic-led Department of the Environment. These measures have, in recent years, contributed enormously to the successes of the German economy in the fields of green technologies and show, in an exemplary fashion, what instruments are available for national efforts on ecological renewal.

1. Reinforce economic instruments

From a regulatory point of view, economic instruments play a key role, since the price of commercial goods represents relevant information. Ecological levies and taxes correct original prices and »price in« the costs of ecological consequences. Thus they contribute to price formation that tells the »ecological truth« or at least moves in the direction of this goal.

Trade in (emissions) rights is a further economic instrument, using the scarcity principle to pursue ecological aims. Rather than, as in the case of taxes and levies, it is not the price that is the immediate point of leverage, but the quantity concerned. Ecological industrial policy is not, however, about creating new revenues. It is rather about further development of ecological financial reforms, furthering of »public goods« and pushing up, via taxation, the prices of »public bads«.

Some starting points would be the reduction of environmentally harmful subsidies, the further development of resource-oriented tax deduction regulations, ecological differentiation of VAT rates, an expansion of the auction and trading of emission allowances to air and sea traffic and a reform of agricultural subsidies.

2. Encouraging investments

The ecological industrial policy aims to develop renewable energies and replace scarce fossil resources with renewable raw materials, and to increase energy and raw materials efficiency. This is not only a question of technological progress, but above all of investment in more efficient buildings, plants, processes and equipment and of better organization, servicing and maintenance of existing assets.

3. Facilitating finance

In order to promote the development of environmental technologies and to enable further growth of the sector, it is important that the financing of environmental investments and the setting-up of enterprises is ensured. In Germany, there is liquidity in the market, but it does not always flow to the right places. Eco-investments therefore often fail for lack of capital and/or a readiness, on the part of banks and financial intermediaries, to take risks.

By setting up a »GreenTech Fund«, the particular requirements of innovative green-technology-companies in their start-up phase can be taken into account. Such green tech fund should be conceived within the context of a public private partnership (PPP) as being a temporally limited early stage venture-capital fund, with a focus on green technologies. For Germany, a fund of €500 million could be fed from both private and public capital.

The development of leasing models for energy efficiency measures and the establishment of a GreenTech-segment of the stock market (GreenTech DAX) could further ease the financing problem.

4. Making use of regulatory law

Regulatory law is the classical environmental policy instrument. It is specifically targeted and applies equally to all. With decrees and prohibitions, as well as various limits and thresholds, it has not only contributed, in the past, to great successes in environmental policy, but also to German green tech having a good reputation, and to its manufacturers often being among world market leaders. High environmental standards have driven technological development.

Regulatory law is faced with a renaissance. However, it should give more room for innovative policies, and hence be more dynamic in form. This also includes an ambitious and reliable CO₂ emissions limit for cars, an increase in the waste recycling quota, and a binding obligation to use »smart« controlling and measuring systems.

5. Making benchmarks transparent and establishing labels and »top runners«

Ecological industrial policy, with its instruments, aims both at the supply and the demand side. The State, companies, trade associations and consumers are likewise asked to innovate and to set the economy on a course towards sustainability.

The purchasing power of the consumer is great. In order to be able to give conscious momentum to modernisation, consumers must have all the information available to them. Frequently, the only information available is the price, and is not really informative from an ecological point of view. Markings and labels give

important additional information, make the market transparent and help to identify the 'top runner' for the given product group.

Labels and markers are therefore an important precondition for strategic consumption and demand that drives innovation. In order to keep in step with technological development, we need dynamic development of energy and efficiency labels. There cannot be innovative lead markets without demanding customers. In order to inform consumers comprehensively and independently, it would be expedient to set up a public database for ecological and resource-efficient technologies.

6. Use and extension of market introduction programmes

Market introduction programmes are one way of creating new markets or dynamizing existing markets. Market incentive programmes stimulate competition for technological solutions and transport innovations into the market. Market launch programmes promote demand and product development and favour economies of scale, thus promoting dissemination. It is essential therefore, to bulk up existing market incentive programmes and to extend these with new elements like a programme of introduction of ultra-efficient household-appliances, efficient electric mobility and miniaturized combined heat and power plants (mini CHP plants).

7. Focus forces with an investment and a procurement package

The public sector has, in Germany, with annual demand of at least €260 billion for products and services, enormous market power. This market power has, until now, not been sufficiently used in connection with innovation policies: Public procurement and investment schemes tend to focus narrowly on immediate acquisition costs. Life cycle costs frequently remain unconsidered, as well as external costs. With the acquisition of products that are more energy-efficient and environmentally-friendly, not only the maintenance costs are reduced.

Furthermore, the public sector becomes the driving force behind the introduction of green technology to the market. Local authorities, in particular, which account for approximately 50 per cent of public procurement, have a role to play here. One possibility would be the conclusion of a public procurement agreement:

Federal and regional and local government agree to meet at least 25 per cent of their procurement needs only with products and services that satisfy strict, jointly agreed environmental criteria.

8. Improving education and training

Germany, as a country with limited raw material sources, has always been dependent on the efficient use of knowledge and the optimal allocation of human capital. The strength of the German economy is based on engineers and well-trained, skilled workers. At the centre of innovation and technological progress lie qualifications and thus people. Investments in education and training are the prerequisites for successful innovation, research and technology. Just as the environmental sector creates new jobs and provides bread and wages for engineers and skilled workers, so its growth and economic success depend on the availability of a qualified workforce. Dynamic and flexible orientation of employment promotion and further training programmes are needed in order to keep in step with the requirements of new branches of the economy.

9. Focusing research funding, creating beacons

The state has an important role to play in promoting research. It cannot order technological development from above, but it can set the framework conditions in such a way that company research is intensified. And, through financial support and pilot projects, it can contribute to advancing efficiency and technological leaps. Within the range of energy research there are, above all, projects on smart electrical grids, virtual power stations and efficient electrical storage technology that look promising.

Environmental-technological »beacon projects« represent signposts in uncertain terrain. They signal feasibility and provide orientation. Additionally, they contribute to social mobilisation and help to create public support. They thus also serve to society's understanding of itself. Terms such as »green bio-refinery, urban mining« and »electrical mobility« must find their way into our everyday life.

10. *Intensifying export initiatives and foreign trade*

Even if the domestic market is very important to companies in Germany, exports of environmental and efficiency technologies must be purposefully supported. German green technology offers solutions that, in many places, will be sought after and needed. At the same time, the employment growth in the field of environmental technology is driven by exports. Precisely because it is the provision of system solutions that is involved here, small, innovative companies risk falling behind large systems providers. Therefore it is important to overcome coordination problems, and to pool skills and capacities within the framework of export initiatives and programmes. Export initiatives are a proven means of bringing together supply and international demand.

ECOLOGICAL GROWTH, ENVIRONMENTAL SUSTAINABILITY AND SOCIAL RESPONSIBILITY

Instead of positing the limits of growth, it is about the growth of limits. Qualitative growth is feasible. Those who speak about the limits of growth are overlooking the capabilities of people, indeed their creativity. They fail to take into account innovations, that is intelligent solutions and new approaches that provide clarifying answers to urgent questions, such as yield explosions through systematic plant breeding.

The mistake of those who misunderstand the issue of sustainability and incline on principle towards pessimism about growth is to suggest an irreconcilable conflict between economics and ecology. Environmental protection and economic profit do not however pose any irreconcilable contradictions. Quite the contrary: a new model of prosperity and progress can dovetail economic dynamism, social cohesion and ecological rationality. Climate change and scarcity of resources will fundamentally change the economic game rules in the coming decades. Those who recognise the signs of the time and seize and exploit the challenges as an opportunity will be among the winners.

One of many vital components is the commitment of civil society. Politics must of course also provide the right basic conditions in the field of sustainability. That

however is a long way from creating the necessary awareness among the populace. On the contrary. As what politics does today is often rather regarded with suspicion than appreciated, actors in civil society need to lend their support to the politicians, provide clarification and develop local enforcement strategies.

“You can’t change the world if you don’t understand what your daily actions mean for the world as a whole” is how one of the tenets in the brochure for the “International Year of Global Understanding” (IYGU), an initiative of the International Geographical Union (IGU), is formulated. Here, rightly, connecting local action and challenges on a global scale and focusing on the global sustainability of local action are seen as one of the crucial drivers of sustainability. Hence the appropriateness of the IYGU approach, which aims to yield deep and realisable insights into how all people can live together more sustainably. Here, I would particularly like to thank Prof. Dr. Benno Werlen from the Friedrich Schiller University in Jena (Thuringia), who is coordinating this initiative.

In other words, with all the justified eagerness to disseminate ecological sustainability, humans must not be forgotten. They are the local drivers of global sustainability. Human actions play a part in creating worldwide challenges as climate changes. However, human actions will also provide solutions. If individual people are aware of what their day-to-day routines mean for the planet, they can take appropriate action. But they have to be in a position to do this, especially economically. Often, sustainable ways and solutions are more expensive ones. The question of ecological rationality is also a question of people’s chances on the labour market and the availability of sufficient salaried work.

If all this is true, and it is, nothing that is socioeconomically unreasonable makes ecological sense. The social state principle is the basis of responsible economies and sustainable prosperity. Anything that reduces the quality of life and financial autonomy must therefore be resisted – for the purpose of sustainability. And what must instead be promoted is an ecological industrial policy.

Ecology is the economics of the 21st century, and the concept of ecological industrial policy is drawing its conclusions from this. It provides an economic answer to the ecological question. Ecological industrial policy is a modernisation strategy for economics and society in terms of sustainable production and development. It aims to replace the material and energetic base of our economies by replacing finite

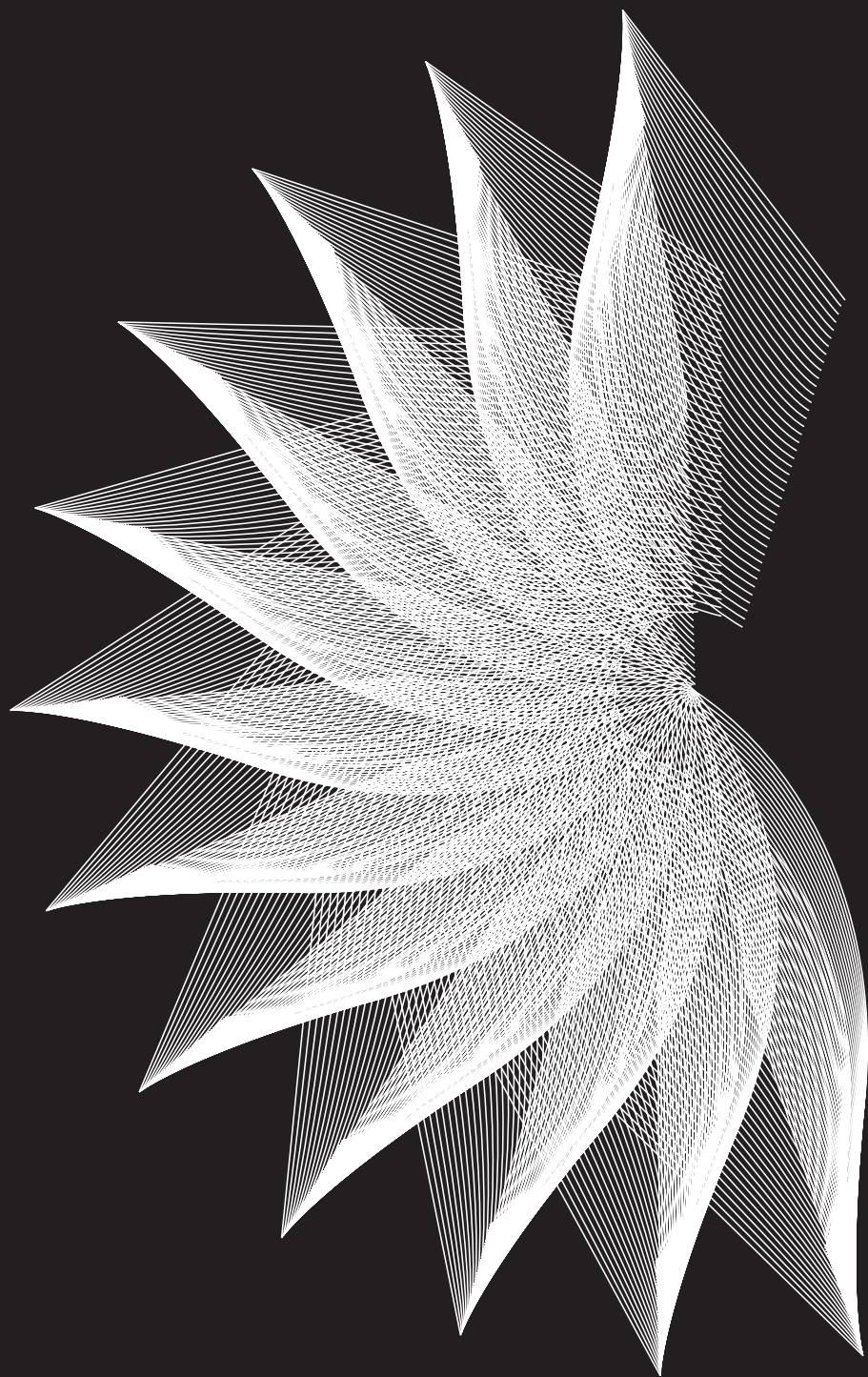
with renewable raw materials, and by developing renewable energy. This not only contributes to achieving a more environment- and citizens-friendly economy in Europe, but also to the formation of a transferable new model of worldwide economic development.

The strategy of an ecological industrial policy thereby links two issues that have until now been thought of as being mutually opposed: It seeks to modernise and reposition industrial society and, at the same time, to lay the foundation of a new thrust in economic growth. This is an opportunity that we should take – for the benefit of the environment – but also in order to keep our economies competitive, to ensure growth and employment, and to create high-quality jobs.

In the past, such economic developments have always been connected with social upheavals. Travelling the path of ecological growth will be no exception in this regard. Social and economic change will strike and it will no longer be possible to duck them. There will only be sustainable growth if the risks of socially centrifugal forces are adequately addressed and contained. The much-used term »new progress« must be given life and substance. It is the task of politics to provide a vision for the future, and thereby inspire people. The goal must be to bring ecology and society together.

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IMPORTANCE OF MECHANISM TO HELP FOR POLITICAL DECISION MAKING PROCESS IN THE XXI CENTURY SOCIETY

JEAN-PIERRE MASSUÉ

JACQUES AMOUROUX

PAUL SIFFERT

PREAMBLE

High fuel prices and concerns about energy security and anthropogenic climate change are encouraging transition towards a low carbon economy. Although energy policy is typically set at a national level, tools are needed for people to engage with energy policy at regional and local levels, tools are also needed to describe the interactions between renewable energy options and the other goods and services provided by a landscape: those concerns are the basis of Integrated Landscape Management (ILM) philosophy.

INTRODUCTION

The Earth's climate has changed throughout history, from glacial periods where ice covered significant portions of the Earth to interglacial periods, where ice retreated to the poles or melted entirely.

Nowadays we are entering a new period: The Anthropocene one where human activities are contributing to change the climate:

After the Pleistocene 120.000 to -20.000 B.T. and the Holocene one, from now to -10.000 B.T. we are entering the Anthropocene one, as proposed by Paul Crutzen, Nobel Price in chemistry.

We are facing a major question: Global warming what factors are governing the earth climate:

- Natural one?
- Anthropogenic one?
- A combination of the two?

And consequently a challenge: how can we contribute to a sustainable development?

Climate at the surface of the earth is a function of the quantity of energy received from the sun. Two main factors are interfering:

- The extrinsic one: the variation of the distance between the earth surface and the sun;
- The intrinsic one: the composition of the atmosphere trapping the energetic rays coming from the sun.

For the extrinsic parameters the pacemaker of the ice ages has been driven by regular Changes in the Earth's orbit: Changes in the shape of the Earth's orbit (or eccentricity) as well as the Earth's tilt and Precession affect the amount of sunlight received on the Earth's surface. These orbital processes which function in cycles of 100,000 years (eccentricity), 41,000 years (tilt), and 19,000 years to 23,000 years (precession) are thought to be the most significant drivers of ice ages according to the theory of Milankovitch, a Serbian mathematician (1879-1958).

The Eccentricity cycle: the earth's orbit around the sun is elliptical. The shape of the ellipse (eccentricity) varies from less elliptical to more elliptical back to less elliptical and take about 100,000 years to complete this cycle. Currently, we are in an orbit of low eccentricity.

The Precession cycle: The earth is rotating about its axis, like a spinning top. To make one complete cycle takes about 23,000 years.

The Tilt: Currently the axis of rotation of the earth is tilted at $23,5^\circ$, however the value changes from $22,5^\circ$ to a maximum of $24,5^\circ$. It takes 41.000 years to complete a cycle. It is interesting to quote that at $22,5^\circ$ the seasonal variation is small and at $24,5^\circ$ the seasonal variation is greater.

For the intrinsic parameters, human activities are contributing to climate change. The Earth's climate has changed throughout history.

From glacial periods where ice covered significant portions of the Earth to interglacial periods where ice retreated to the poles or melted entirely, we are entering a new period: The Anthropocene one where human activities are contributing to change the climate: after the Pleistocene -120.000 to -20.000 B.T. and the Holocene one, from now to -10.000 B.T. we are entering the Anthropocene one, as proposed by Paul Crutzen, Nobel Price in chemistry.

Different methods are used to determine Past Climate Change for example:

- Ocean Floor Sediments analysis

the principle of the method is to look at sediments on the ocean floor, :The sediment contains calcium carbonate shells from organisms that have lived near the earth's surface in the past, the type of calcium carbonate shell can tell you something about temperature.

- Ice Drilling

Determining Past Climate Change by looking for Oxygen Isotopes ratio from Ice cores from glaciers.

Normal oxygen contains 8 protons, 8 neutrons (O16). A small fraction (one in a thousand) of oxygen atoms contains 8 protons, 10 neutrons (O18) this is an isotope of oxygen and is heavier than O16. O16 will evaporate more readily than O18 since it is lighter.

During a warm period, the relative amount of O18 will increase in the ocean since more of the O16 is evaporating. Looking at the ratio of O16 to O18 in the past can give information about global temperatures variation.

In the atmosphere the increasing concentration of Carbon dioxide, Methane and Nitrous oxide is the main factor responsible for the global warming process on the earth surface and human activities are the origin.

The main greenhouse gases sources are:

- Carbon dioxide (CO₂): fossil fuel burning and deforestation with an anthropogenic increase of 30% and an average atmospheric residence time of 500 years;
- Methane (CH₄): Rice cultivation, cattle and sheep ranching, decay from landfills and mining, the anthropogenic increase: 145% and an average atmospheric residence time of 7-10 years;
- Nitrous oxide (N₂O): industry and agriculture fertilizers, average atmospheric residence time: 140- 190 years and an anthropogenic increase of 15%.

**DO WE HAVE MECHANISMS TO HELP FOR POLITICAL DECISION
MAKING IN RESPONSE TO GREENHOUSE GAS MITIGATION
RESPONSIBILITY AT INTERNATIONAL AND NATIONAL LEVEL?**

The trust of the citizen is the fundamental basis of the legitimacy of the public democratic institutions. Their contributions results from the democratic ideology asking that the Public Institutions work in a transparent way, that they follow processes which facilitate and encourage the participation of the citizens ... For Habermas, " The transparency is a regulating principle, an idea of the reason of which the democratic practice cannot get out unless giving up".

The right decision-making mechanism required that are supplied to the decision-makers at the deliberate moment, under the adequate shape, the structured, necessary and sufficient knowledge which they need to define an optimal decision.

The first meeting during which was laid the foundations for a european process of decision-making support at the level of the Parliamentary Assembly of the Council of Europe was held October 15th, 1975 under the Presidency of André Boulloche Former Minister of Education and of the High Commissioner of the Atomic energy Commission (CEA), Professor Jacques Yvon. It is at this occasion that had been create a French Parliamentary and scientific Association.

The first European Parliamentary Hearing was organized on the theme of the " specific needs of Europe in the field of remote detection. At this time, the European

countries were concerned by decisions on a program with the aim to launch the first European satellite of remote detection. By this time few " political decision-makers " were able to conceive the importance of this new tool and its applications for the service of the agriculture, the environment, of the research etc.

The mechanism of decision-making support was based on the presence in front of the European Members of Parliament, of a " Group under challenge " consisting of specialists of the world of remote detection at the level of the designers, users from the public and private sectors, asked presenting:

- The interest of a European satellite of remote detection of its contributions on the industrial, agricultural, environmental areas and its economic turn over,
- The possible disadvantages,
- The cost ...

The European Parliamentary Hearing was organized in the presence of a group: sampling of the society " aiming to represent the "society" and reacting by considering the positive and negative effects of the envisaged proposals.

DO WE HAVE A TOOL TO HELP FOR DECISION MAKING IN RESPONSE TO GREENHOUSE GAS MITIGATION RESPONSIBILITY?

The answer is that the Intergovernmental Panel on Climate Change (IPCC) was set up in order to undertake the assessment of climate change. IPCC was established in 1988 by the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO) to provide the world with a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences.

IPCC is a scientific body. It reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research it monitor climate related data or parameters. Thousands of scientists from all over the world contribute to the work of the IPCC on a voluntary basis.

Different viewpoints existing within the scientific community are reflected in the IPCC reports. The IPCC is an intergovernmental body, and it is open to all member countries of UN and WMO. Governments are involved in the IPCC work.

Indeed Governments are involved in the IPCC work as they can participate in the review process and in the IPCC plenary sessions.

Its major report, “Climate Change 2007”, clearly brought to the attention of the world the scientific understanding of the present changes in our climate and led the organization to be honored with the Nobel Peace Prize.

**A MECHANISM TO HELP FOR POLITICAL DECISION MAKING PROCESS
IN THE FRAMEWORK OF THE EUROPEAN PARLIAMENT: SCIENCE
AND TECHNOLOGY OPTIONS ASSESSMENT(STOA):**

The question: CO₂: a Future Chemical Fuel?

Climate change has become one of the major challenges for mankind and natural environment. Greenhouse gas (GHG) emissions released into the atmosphere in ever-growing volumes are known to be largely responsible for this change. CO₂ emission sources including emissions from energy industry, from transport, from fuel and coal combustion in industry, services, households, etc. and industrial processes, such as the production of cement.

Global warming, is caused by an increase of atmospheric carbon dioxide (CO₂) concentrations, Co₂ emission was around 30 gigatons in 2008,

Since now two Nobel Prices are engaged in that challenge :Joseph E. Stieglitz (Nobel Price in Economy 2001) who ask for a carbon emission taxes in order to increase the energy efficiency creativity and to promote innovative energy processes by investment in technical companies and home equipment; George Olaf(Nobel Price in chemistry 1994) who propose a sustainable technological carbon cycle or a carbon dioxide recycling for energy and chemical products.

Taking into account the last declaration of the secretariat of the DOE of America Dc Steven E. Koonim , the goal is to storage non carbonated electrical energy (nuclear ,PV, wind turbine, geothermal energy) into carbonated synfuel by using carbon dioxide for energy transportation and regulation of the electrical network ,we have to remember that the carbon material is one of the key of humanity development .

Carbon Dioxide is a good support for synfuels from $\text{CO}_2 + \text{H}_2$ mixtures in catalytic plug reactors. Many patents and pilot plants are starting because these processes are close to the financial balance if the petroleum gallon is between 80 to 100 \$.

4 ways are studied:

- Fischer Tropsch $\text{CO}_2 + \text{H}_2$ oil (USA, South Africa ,China Inner Mongolia)
- CH_3OH production $\text{CO}_2 + 3 \text{H}_2 \rightarrow \text{CH}_3\text{OH} + \text{H}_2\text{O}$ (USA, CHINA, EUROPE)
- CH_4 production $\text{CO}_2 + 4 \text{H}_2 \rightarrow \text{CH}_4 + 2\text{H}_2\text{O}$ (BP, JAPAN. Germany)
- Syngas production $\text{CO} + \text{H}_2$ from coal gasification with arc plasma torch using
- CO_2 or a mixture $\text{CO}_2 + \text{H}_2\text{O}$ at 5000°K (Russia)

We have to remember that a FT unit of production of 30.000 barrels per day is equivalent to a 1.200 MWh per day .

The continuous increase of the concentration of CO_2 in the atmosphere, and the related consequences, have pushed the European Parliament and the European Commission to launch a program for CO_2 sequestration in the ground (more details in many reports, including STOA (IP/A/STOA/FWC-2005-28/SC20 and 2008-01; PE 416.243).

Ten industrial units are programmed, with a unit price of approx 1.2 B EUR. Later, several hundred will become necessary for a noticeable result. The foreseen CCS model foresees essentially three steps: collect the CO_2 as close as possible to the source, transfer it by pipeline to adequate locations and pump it in the soil.

The model we are proposing consists in considering CO_2 as a *RAW MATERIAL* which can be *recycled* in a *CHEMICAL FUEL*, which can be used as energy source, generating a completely *NEW INDUSTRY* in Europe.

In order to do that we have to develop European hubs centers to mix industrial researchers and academic ones as it starts in Germany 2010 (project CO_2 RECT with Bayer,RWE,Siemens and 10 academic laboratories),in America (Novomer,Eastman Kodack,Calera,Alcoa),Japan (Mitsui chemical),China (Green Gen Shenshua Group) .

The goal is a good *understanding of economical and cultural implications* of these new technologies in order to reduce our dependence of imported oil, to reduce the green house gas emission in agreement with the EEC regulations , to permit the electri-

cal network regulations from the renewable sources and to *enhance European competitiveness and create jobs* which are not able to be delocalized.

THE STOA (SCIENCE AND TECHNOLOGY OPTIONS ASSESSMENT) WORKSHOP:

In order to contribute to the information of the Euro-MP a STOA workshop was organized at the European Parliament Building on the 22nd of March 2011 in order to better inform the Euro MP in a process to help them for decision making concerning a European CO₂ policy.

The STOA Workshop on **CO₂**: a Future Chemical Fuel was Chaired by A. F. Correia de Campos, MEP, STOA Vice-Chairman and G. La Via, MEP, STOA Panel Member. After an opening by F. Correia de Campos, MEP, STOA Vice-Chairman and P. M. Siffert, Secretary General E-MRS the content of the program was the following:

CO₂ to synFuel: Challenges and Perspectives:

- J. Amouroux, University Pierre and Marie Curie – E-MRS
- The international experience:
- USA: E. Toone, DoE, Advanced Research Projects Agency
- China: X. Wang, Chinese Academy of Sciences
- European Research Initiatives in the Energy sector
- W. Raldow European Commission, EU R&D programmes
- L. Mennicken, BMBF: Germany: Research funding programme on CO₂ utilization as raw material
- D. Clodic, ENSMP / CEA: Policy of the research cluster CLAIRE of Saclay on CO₂ capture and conversion
- F. Santana, FTUNL, Portugal: Convergence in Energy and Environment R&D policies

Round table – discussion with MEPs and participants

Moderator: R. Linkohr, former MEP

Panellists:

Chemical Industry:

- A. Bazzanella, Dechema: Technologies for Sustainability and Climate Protection
– Chemical Processes and Use of CO₂
- R. Gresser, Rhodia CO₂ valorization for a sustainable industry
- Car Industry: B. Loeffler, B. Loeffler Consulting
- Cement Industry: C. Haehnel, CO₂ head sector, CTG – Italcementi
- Oil and Gas Supplier: J. Roque, GALP
- Academia: A. G. Konstandopoulos, Aristotle University of Thessaloniki
- Suggestions for European RDT activities
- R. Martins: CEMOP/UNINOVA: Public-Private Technology initiatives
- J.R. Morante: IREC: Hydrogen generation by solar photons

Closing remarks: G. La Via, MEP, STOA Panel Member

Some data: Electrical production in the world 2020 2050

- coal **6.1** billion MWh **16.7**
- *petroleum* 694 million MWh **0**
- natural gas **5.6** billion MWh **13.9**
- ENR **1.4** billion 5.6
- nuclear power **2.2** billion **2.8**
- *waste* 694 million MWh **1.1**
- cogeneration **2.8** billion MWh **5.6**
- total **19.4** billion **45.7**

Evolution of CO₂ emission during the last decade

- *An increasing of 28,5%*
- This due to electricity demand : up to 36%
- Mainly produced by coal : 47%
- natural gas :29%
- oil: 13%

Carbon-dioxide emission evolution

- in America less 1,7%
- in China jumped by 123%
- in Africa 30%
- in Asia 44%
- in Middle East's 57%

Spot prices of electricity

- Spot price CO₂ 20 March 2010: 12.93€/T
- in 2011 november :9.89 €/T

Electricity spot Prices: (powernext)

- 19 March 2010 : 33.962 €/MWh
- 12 March 2010 : 50.709 €/MWh
- Industrial Price 2011: 42.0 €/MWh (just out side of the power electrical plant)

Retail consumer : 128 €/MWh ;corporate consumer : 78 €/MWh

- Price Japan 2010 : 120\$/MWh (US\$)
- Price Germany 2010: 90\$/MWh retail consumer 220 €/MWh
- Price US 2010 : 45 – 150\$/MWh to 240 \$ /MWh

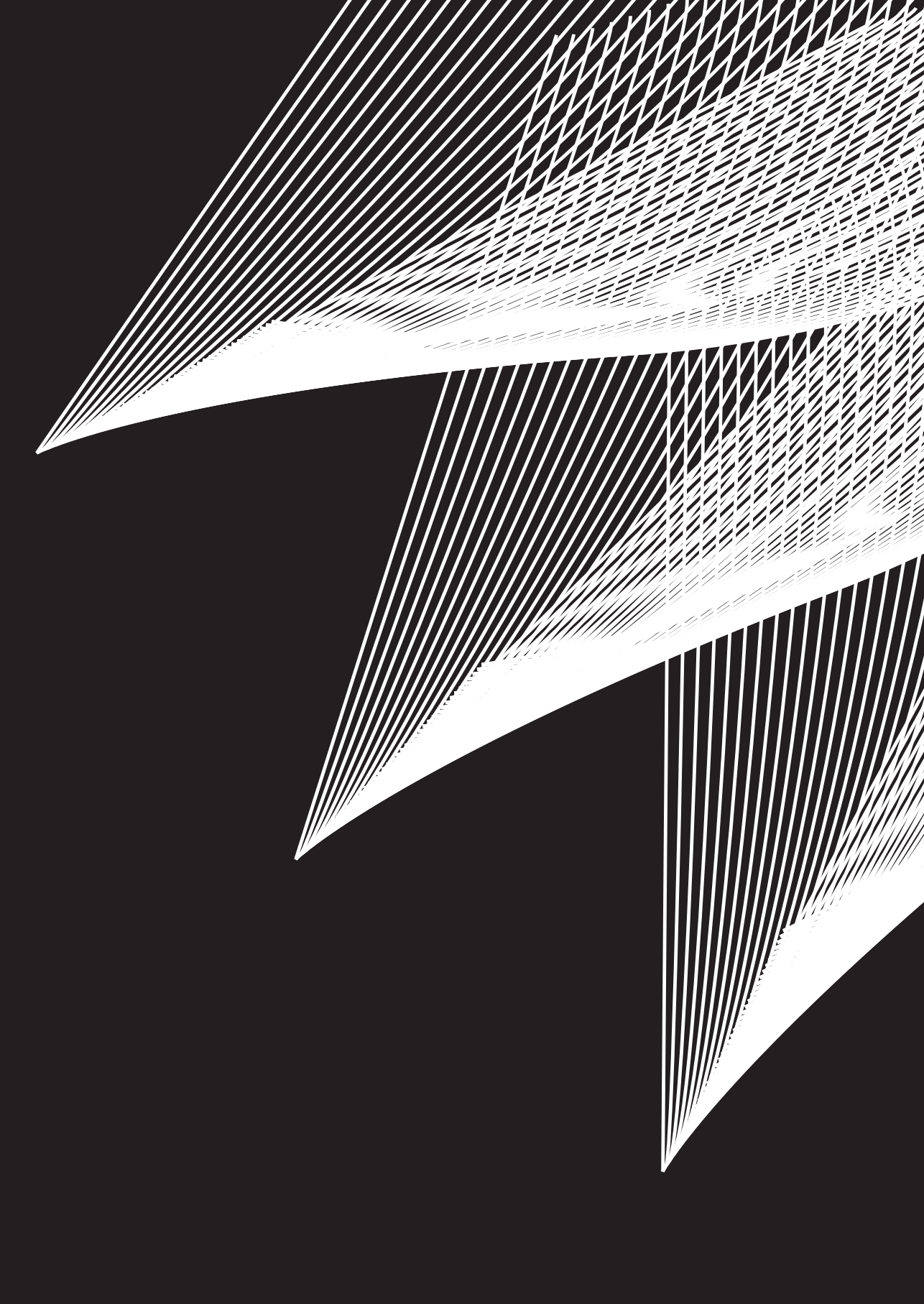
Propositions of George A. Olah Nobel Prize of Chemistry 1994

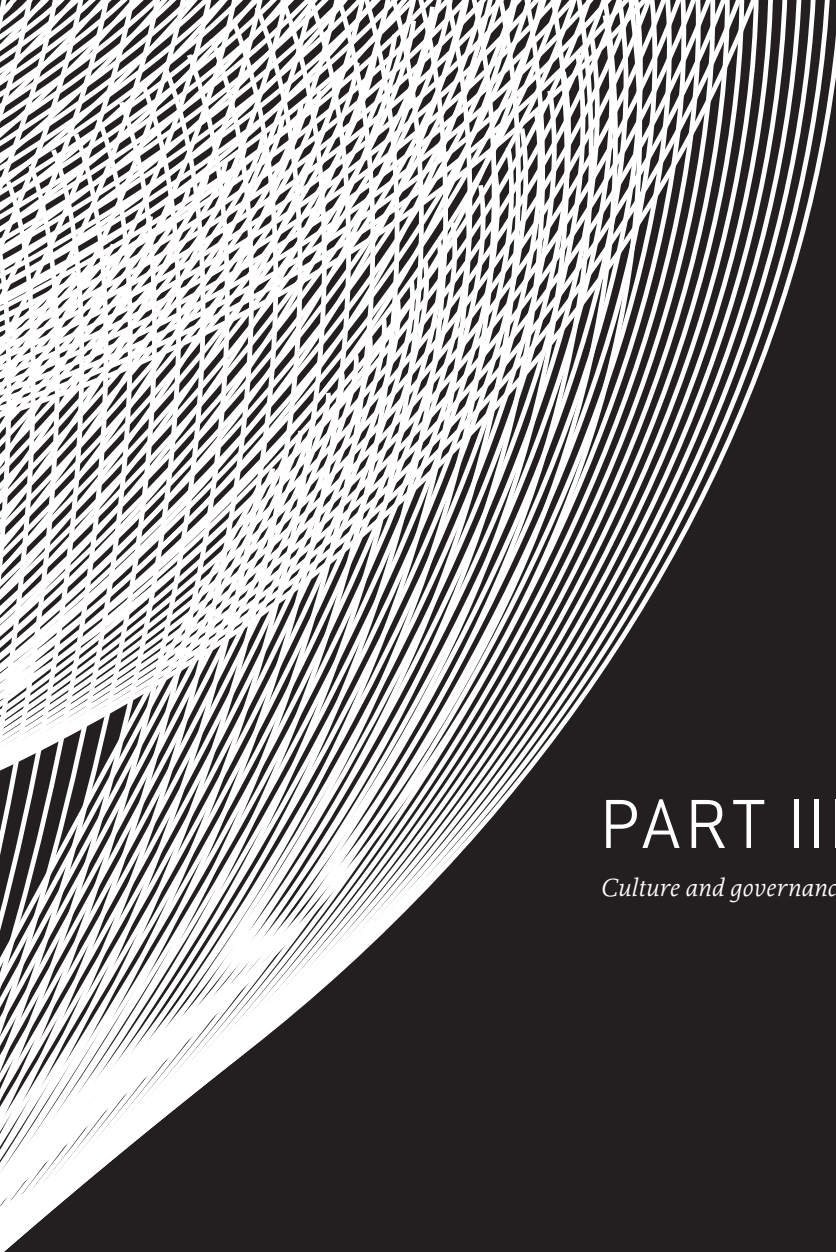
European research road map for valorization of carbon dioxide

- Carbon recovery that means: research for new catalytic procedures without expensive metals new nanostructures with specific adsorption properties (selectivity, energy efficiency, cost)
- Creativity for new molecules and materials from CO₂ including biodegradable polymers, insulating materials, fireproof materials.
- New biomass cultures from microalgae for food, proteins, and biogas European.

CONCLUSION

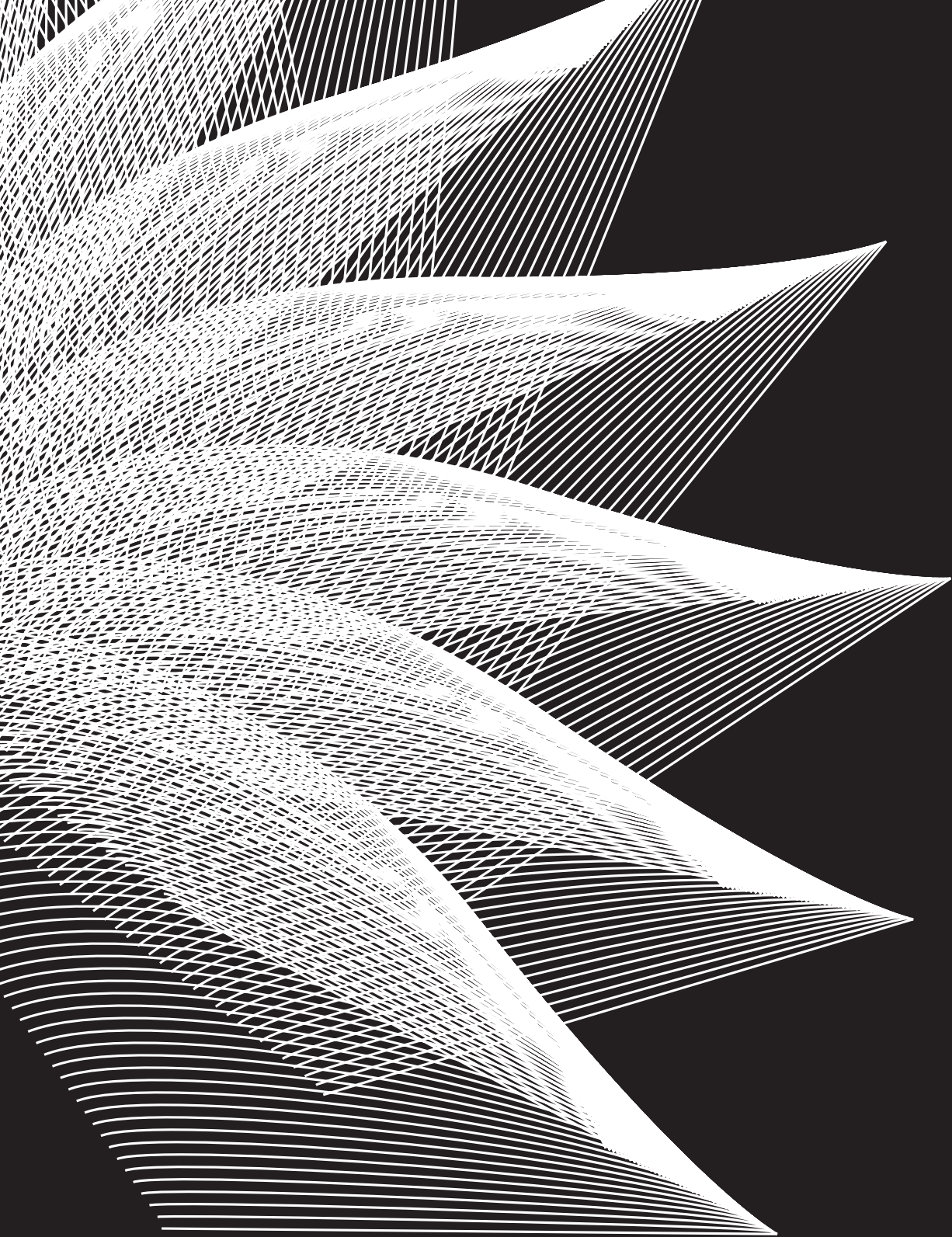
New Electricity sources (PV, Wind turbine, Hydraulien) mainly characterize by strong intermittent production need large storage capacities so that Hydrogen from electrolysis and carbon dioxide are the main key factors for the electrical network regulation and energy storage through CH_4 , CH_3OH , CO , and SYNGAS. In the framework of Rio+20 initiatives, energetic valorisation of CO_2 is a important contribution to sustainable development concern.





PART III

Culture and governance for sustainability



INDICATIONS ON THE CONTRIBUTION OF SUBNATIONAL GOVERNMENTS TO THE TRANSITION TOWARDS A GREEN ECONOMY

ANTONIO AUGUSTO JUNHO ANASTASIA

After twenty years of the UN Conference on Environment and Development (UNCED), known as Rio-92, dignitaries from all over the world come back to Brazil not to perform the bureaucratic task of quantify failures and achievements of environment policy in this period, but for the more ambitious purpose of setting an agenda of essential actions to be taken, in order to ensure the continuity of mankind's saga on Planet Earth. High expectations surround the event, since Scientists, with unprecedented accuracy, has presented to public debate data, analysis and projections indicating the imminence and dimensions of the environmental crisis, particularly what can be called the climate deadlock.

In addition to an appropriate response to the increasing deterioration of biodiversity, proposals on effective strategies to face climate changes become the more complex collective challenge that the seven billion men and women living in this planet are undertaking in the first decades of the 21st Century.

If science is fulfilling its function of clarifying factual relations, political system is now summoned to do the same, namely, to promote public debate and provide choices that lead to the best paths to a common future for human beings and

other species, in other words, to settle down prescriptions and coordination to collective action.

Although no kind of undisputable answers have been built on the matter, it is clear that national governments - as well as subnational governments - in articulation with economic agents must find new ways to organize the global economic system, assuming the use of natural resources as the prerequisite of wealth generation, within a paradigm less dependent on carbon, and at the same time, attentive to the possibilities of social inclusion.

It is not only a matter of finding the right ideas, but of drawing viable strategies for its rapid implementation. The twenty years of Rio 92 showed that the difference between political time and what could be called "Earth Time" needs to be drastically reduced. It is my belief that, between these two times, the "time of governance" must play the crucial and decisive role of catalyzing the process, in order

to transform, as effective as it has been, (good) ideas into action. In other words, desired effects into experienced effects.

The process of acceleration and practical transformation of economy brings out to light another dimension, the space. It is impossible not to be aware of the fact that the implementation of actions decided by the public sphere will necessarily be developed in concrete places. Spatial dimension, commonly overlooked at the expense of the ideological, political and administrative ones, imposes a new challenge, since there are more interactions unfolding within a given space than our ordinary consciousness can assume. Cultural interactions must be added to physical realm, and the result will conform a complex unit that needs to be recognized by governments, if they are indeed interested in impacting reality.

In this context, the aim of my contribution is to sustain, from a critical perspective, the necessary relation between the concept of sustainable development and the challenges of a green economy, pointing out some lines on the contribution of subnational governments in the process of structural changes that society must face in order to persevere itself and the planet.

This premise is a way of reaffirming my belief in the vocation of governments to undertake collective tasks, with commitment and efficiency, without what the environmental challenge will turn from a difficult task into an impossible one.

STILL A SUSTAINABLE DEVELOPMENT?

One of the main objections to the concept of sustainable development, as coined in the 80's by the famous Brundtland Report, is related to the fact that it would be too abstract, at such an extent that public policies and economic agents choices based on diametrically opposed models could be easily "greenwashed", as if they were protected by the big umbrella of "meeting the needs of current generations without compromising the same enjoyment by future generations."

It is true that the definition of sustainable development, with the opened structure typical of principles, is likely to generate operational deficit, in the sense that the high level of abstraction may fail to guide government and economic agents decisions, leading, to the false and dangerous impression that we were moving towards sustainability when, in fact, we are "racing to the bottom." According to this standpoint, the

phenomenon of greenwashing is a side effect of the vacuity of the concept of sustainable development.

Nevertheless, this risk can be absorbed with the comprehension of the semantic core that flows beneath the concept. Unveiling this dimension is my purpose on this topic, along with a brief analysis of its relevance in this particular moment of our history, since more than twenty-five years separate us from the original formulation of the concept, in a daily changing world.

A deep archeological excavation of the concept is not appropriate to my objectives. Therefore, I will present a conceptual delineation of the principle of sustainable development which I assume provides enough insights to escape the risk of paralysis caused by the lack of guidance. Thus, operational deficits and the unwanted greenwhasing effect can be avoided.

In its rationale, sustainable development can be understood as a (dynamic) relationship between economic and ecological systems in which the survival conditions of living beings and societies' prosperity are guaranteed, as well as the ongoing development of different cultures. The basic assumption of this relationship is the fact that social and economic systems are shrouded by a macro-system, the Planet Earth ecosystem, governed by laws, conditions and influences of physical, chemical and biological order.

The practical consequence of this assumption is that the larger system in which economy is inserted determines limits to be respected, in order to ensure not only life but the reproduction of the economic process itself.

If traditional economic production entails a linear process of extraction, production, distribution, consumption and disposal, the principle of sustainable development requires a non-linear operation mode in which the constant flow of matter and energy is not interrupted nor stagnated and where each one of those phases is developed with the least possible damage to the ecosystem they depend on. But comprehending sustainable development as a linkage between economy and ecology can lead to a narrow approach that does not reflect the complexity involved in the issue. To avoid the economic reductionism, and inspired by the classic study of Ignacy Sachs (1993), I advocate the necessary extension of the concept of sustainable development which has to be taken in five broader dimensions simultaneously:

- Social sustainability, understood as the consolidation of a development process based both on stable economic growth patterns and on the outlook that our common goal is to enhance "being" instead of "having", so that quality of life can be improved and the gap between wealth and poverty reduced, while fundamental rights are assured as widely as possible. In this context, both material and immaterial needs must be taken into account;
- Economical sustainability, meaning an efficient resources allocation and management as well as a regular flow of public and private investments in sustainable strategies;
- Ecological sustainability, referring to ecosystem limits (carrying capacity) and biodiversity protection;
- Spatial sustainability, focused on a balanced rural-urban configuration and on a viable territorial distribution of human settlements and economic activities;
- Cultural sustainability, aiming to identify and provide local solutions able to respect ecosystems specificities in each culture and location. The more diverse the solutions, the better.ⁱⁱⁱ

In addition to this conceptual delineation, the systemic approach developed by Michel Declerisiv is very clarifying. In his view, sustainable development is taken

as a socio-political system designed to (re)balance human activities and natural systems. From this perspective, the system called Sustainable Development is itself the result of interactions between seven subsystems: values, communication, hierarchy, governance, environmental control, reproduction and archetypes, each one responsible for producing predetermined effects.

To recognize and codify values and principles capable to guide the relationship between society (man-made system) and its environment, as well as nourishing other subsystems with guidelines for action (ethics) are tasks that pertain to *Values Subsystem*. These values are converted into goals to be achieved. In general, sustainable societies value sobriety instead of intemperance and overconsumption behavior is replaced by what might be called citizenship oriented consumption, denoting the calm and temperate enjoyment of things and human relations.

In sequence, the *communication subsystem* is responsible for generating, storing, processing (analysis) and distributing the information required by other macro-system elements, in order to turn pursued values into concrete facts. Science and Technology Institutions are protagonists actors in this field and their main challenge is to grasp

ecosystems limits and, at the same time, provide products, processes and methods innovation. On the other hand, the communication subsystem should promote intercultural communication.

Assigning specific objectives to competencies centers is essential to stability and efficiency of any system, so the hierarchy subsystem converts the information into objective actions. What is challenging here is the adequate control of goals implementation and the fact that it must be done through the use of tools and mechanisms that indicate, as precisely as possible, the impact of public policies on environment. Fostering social ownership is crucial, so that concrete feedback on the results can be reabsorbed by the whole system.

Controlling intermediary outcomes is another key-point to achieve systemic objectives, since partial targets alter the quality of final results. Thus, *governance subsystem* is responsible for unfolding strategic actions to be developed in medium and short-terms tasks (the long-term goals are defined by a higher systemic level, that is, the value system).

The subsystems described up to this point are immaterial, in the sense that they are nothing but sets of functions hierarchically organized. The following subsystem, environmental control subsystem (*sensu strictu*) belongs, so to speak, to the world of facts, or to the material realm, taking charge of the provision of resources and energy that ensures the operation of the greater system of sustainable development^{vi}. Obviously, the challenges of environmental control system coincide with the inescapable linkage between economy and ecosystem Earth.

How can we make sure that a sustainable way of producing society (or sociability) will subsist to men and women living at a given place and time? At first sight, this question may seem unimportant, but it is crucial to the viability of sustainable development. To address this question, the reproduction subsystem should promote a "culture of sustainability" molded in ways of acting (and even on objects) that reproduce and amplify social relations intrinsically balanced with natural systems.^{vii}

Lastly, the subsystem of archetypes, to which is assigned the task of setting roles for the members of the system. Albeit not always realized, our actions are influenced by behavior patterns deeply engrained in culture and tradition (hence, the Greek prefix *arché*), so that men and women are summoned to find an alternative identity to the passive consumer model and take active and committed citizenship seriously, in the sense that they ought to be aware of their obligations to present and future generations, as well as of their full responsibility for their own future and for the effects of the actions they have chosen. The heroes societies worship reveal much about how people relate to each other and to the surrounding environment precisely because they are archetypes. From this standpoint, the human model for 21st century doesn't find satisfaction for its desires exclusively in a mall as a kind of the Super Buyer, but in the quality of human relationships that things can stimulate.

Now that the conceptual delineation is presented, it is my intention to make a few comments on its usefulness and relevance.

As for its usefulness, I must remark that decision makers committed to outcomes know that decisions demand in order to be effective the setting of structural concepts which at the same time provide clear guidance and prevent institutions from getting lost in the political and markets circumstantial game. Since produc-

ing desired effects turns out to be the greater achievement of policy it entails knowing what we want, even if on imprecise and approximate basis. Besides fulfilling this function, other utility that public decision-making process can get from the sustainable development concept comes, precisely, from its generic and abstract form. The inherent conceptual openness makes it rationally appropriable by different worldviews, in other words, the semantic imprecision of the concept ends up being functional, insofar as the implementation strategies will be defined within the political arena, through the contrast of different projects presented to citizens choice. This process has the potential to legitimize future decisions. Thus, where its critics see vacuity, those who are obliged by mandate or corporate position to make sustainable development concrete see ductility, meaning a certain degree of flexibility to drive decisions in several ways, depending on the dynamics of historical circumstances without losing the core idea so that the risk of operational deficit

described above becomes an opportunity to adaptation and a way of ensuring social influence on decisions that define future.

To sum up, although it is important to be aware of its semantic core, the concept of sustainable development depends on the time and place circumstances in which it develops. Contrary to what may seem, this fact contributes to the effectiveness of decisions, insofar it provides social ownership. I conclude this topic by stating that more than a mere vogue of the 20th Century 80's, sustainable development is a valuable open-structured guide, able to adapt to space-time demands whose implementation rests as a moral and economic obligation on governments, society and to corporate decision-makers.

GREEN ECONOMY: SUSTAINABLE DEVELOPMENT AT THE DAWN OF THE 21ST CENTURY

The debate on the basis of a green economy proves this thesis, insofar as it intends to adapt the concept of sustainable development to the peculiarities of social and economic realms of the early 21st Century, preserved, however, the original intentions. According to UNEP's report (2011), the green economy as an economy that results in improved human well-being and reduced inequalities over the long term, while not exposing future generations to significant environmental risks and ecological scarcities.

It's no difficult to realize that green economy is not defined in more concrete terms than sustainable development, so the same risks and advantages I discussed in regard to the last are reflected in the first. To manage the risk of lack of guidance and operational paralysis, a conceptual minimum should be re-designed and, what is most important, a basic set of challenges ought to be clearly defined.

The solid ethical basis (value system) for the green economy can be summarized in the motto "Prosperity that does not increase disparity." If public and private agents are in fact committed to the maintenance and strengthening of social and political ties and with the continuous and efficient generation and distribution of wealthy through markets, then all government and corporate decisions should tend to, I insist, the prosperity that does not increase disparity.

Prosperity in times of economic meltdown and global warming, implies a dual strategy of growth: on the one hand, of the natural capital, which demands strong public and private investments in sectors with high impact to change economic structure; on the other of the universe of beneficiaries of the economic process so that the corollary of the motto must be, "the benefit of many instead of a few" (or the equitable distribution through the whole society of all the economic risks, including, of course, the externalities).

Assuming that the implications of climate change - as well as the effects of biodiversity loss - count on a high level of scientific consensus, the great challenge in terms of information in and for a green economy (Communication System) is to accelerate processes, products and technologies innovation in several fields including agriculture, energy efficiency, tourism, transport, waste and water management.^{viii} In addition to intensifying the generation of innovative solutions, it is crucial that they are appropriate by sectors traditionally excluded from the mainstream, such as small farmers, fishing communities, recyclers, and micro and small enterprises. A promising strategy is to recognize them as economic agents that hold future and make sure that they are inserted in wider production chains.

From another perspective, green economy reflects the transversal structure of sustainable development, in the sense that interaction between different areas of government and society sector is required if objective actions to promote the environmental shift can be efficiently developed. Consequently governmental economic sectors must play a leading role as well as another area, such as cultural or

environmental institutions, forming a multiprotagonist so, cooperation, integration and synergic effects generated from the largest possible number of systems must be encouraged and taken as decisive criteria to the distribution of skills. When it comes to institutional design, the creation of new competencies centers combined with consolidated sectorial agencies (ministries, departments, agencies responsible for developing specific public policies) is productive, in order to find an optimum balance between past and future, without falling into the trap of imposing the logic of green economy in disconnection with traditional goals. These, the main challenges I see for the hierarchy subsystem (HS).

Governance for the green economy (GS) is basically a function of time. The critical climate events and its harmful effects to which society must be very well prepared require that short and medium-term actions be defined and monitored not only efficiently, but with unprecedented speed.

Delays in the capacity of providing adequate responses or, what is worst, some kind of cynic inertia by governments and society will transform the environmental crisis into an institutional one, insofar the harmful effects will be gradually perceived by society. In this context, guiding public agents towards results unfolded into smaller goals till the level of concrete and measurable actions, more than an obvious managing technique, is a political requirement and all efforts to reverse the propensity of allocating too much time and energy on procedural issues are critical. In reference to management techniques, modern planning solutions used successfully by private agents are perfectly capable to be transferred to public sector context, *mutatis mutandis*. The lesson, when it comes to planning, is that it is critical to acknowledge the simple fact that the future is unpredictable, given the ever-changing factual conditions, so the governance subsystem must learn how to dynamically react to changes in reality. The mistake doesn't lie in failing to anticipate future scenarios (what always happens anyway on a greater or lesser degree), but in not replanning as quickly as the circumstances demand. Another challenge no less important is to ensure the continuity of actions able to induce new economics standards, so that green economy strategies must have a high degree of independence from political circumstantial configurations. The inclusion of these actions in long-term planning and broader political validation by parliaments has been proven effective. The broader and more qualified the political and

social validation of the economic changes the better results will be achieved. Thus, public decision-makers should take advantage of formal (legislation) and informal (participation of citizens in decision-making) mechanisms in order to consolidate and accelerate the process in a way that society embraces the task as a communal effort and not as the aim of a particular government. In fact, social construction/validation represents the step forward in the theory and practice of public governance and the promising experience in this field is to enhance networks that can connect government departments to each other and explore their interface with social institutions.

As for environmental control (EC), the challenge is well known. Whether the age of carbon-intensive economy comes to an end or humanity will exceed the limit of decent

living conditions. But changes in the energy matrix must be qualitative, through the widest possible combination of different energy sources, focusing on renewable ones, with no significant decrease in supply. In simple terms, the eradication of poverty will require energy (in all senses). Waste management is another field of wide possibilities, especially due to the fact that it represents a key-sector for low-income populations economic inclusion, especially in non-industrialized countries such as Brazil. Besides public management, the reduction, recovery (defined as recycling, reuse energy valorization, composting, etc.) and waste disposal is commonly undertaken by low-income communities. It has been noted that the action of recyclers produces substantial savings for public budget, so that a strong connection between public investments and the huge distributed network of recyclers must be fostered. Multiple gains potential is clear not only in terms of rationalization of public expenditures, but with regard to income generation.^x

The reproduction of the green economy means ensuring that a "green economical metabolism" subsists to concrete men and women. In order to achieve such intent, cultural aspects must be strengthened and sociability practices must allow new members of society to assimilate a balanced ways of living from a network of symbols, traditions and objects. Governments run an incredible cultural infrastructure, from public television to educational system, capable to shed light on the archetypes of the green economy (discussed below). If consumption achieved ubiquity in modern society, why not conscious consumption?

What leads to the last of the green economy subsystems, the archetypes (AS). Society's need for models is taken by many as poetry and fairy tale, but it holds a huge potential for accelerating the shift towards sustainability, since it acts directly on mental models that manifest themselves in the physical world as economic standards. The highest expected returns come from investing on the change of mental assumptions of younger generations. In terms of speeding the shift process, how catalyst would be a young entrepreneur who heads green profitable businesses that can meet their personal and business goals? How striking would be the changes in agricultural activities if farmers understand their activity as the management of valuable environmental assets? The answers should be converted into a funding stream of the new thinking. If I were given only one shot, my target would be the behavior that emerges from mental models.

I conclude these indications focusing on some pragmatic actions that can be immediately undertaken by subnational governments. First, it is necessary to grasp that economic changes will result both from the (difficult) coordination of national governments and pro-activity of states, regions and even municipalities in aligning their interests.^{xi} Partnership networks are to be encouraged, in order to boost potentialities of each part and subnational governments have to be aware of their bridging role, what must be done independently but in articulation with national governments.^{xii} The premise for this process is that cities and regions will be the locus of the green economy or, from another angle, the spatial basic unit of economic shift. Efficient solutions on transportation, solid waste selective collection, environmental building, should be regarded as top priorities and count on the consequent funding. When it comes to financing, subnational governments are able to provide their own resources, attract foreign investments, while fostering scale gains by increasing the demand for innovation. It is here where conjunction of green economy and local level can be seen as platforms for poverty eradication. At this point, I refer to the findings of UNEP Report, which recognizes the green economy as an important issue not only for the developed economies, specially for developing economies whose GDP, in some cases, is linked up to 90% to nature or natural resources. Finally, another aspect for subnational governments to work on is to make sure that local governments are aware of the importance and of the opportunities related to green economy, given that the local level is always pressured

by the daily issues and tends not to put enough attention to the movement of the international community which is increasingly inclined to fund local solutions. A concrete way to engage local leaders in such issues is fostering environmental policies through linking resources transfers as counterpart to the achievement of certain goals.xiii

TERRITORY, GOVERNANCE AND THE TRANSITION TOWARD A GREEN ECONOMY

As I highlighted in the previous topic, the lunge towards a green economy depends on the change in the mental models and on actions planning by the governmental and economic agents. I could not end my contribution without adding to this perception some lines about the importance of the concept of territory in the global strategy of transition

to be implemented and relate it to the wider strategy of subnational government performance.

In the foreground, it is necessary to clarify that the concept of territory is added to the sustainable development and to the green economy, becoming a triad of abstract, dynamic ductile concepts that shape the theoretical baseline of this analysis. Contrary of what may look at first sight, a territory is not limited to spatial boundaries. I take it as a social construct, as it is the sum of relations and concrete decisions taken by the society that relates to it. It is possible to clarify this notion illustratively realizing that the region formed by the XYZ polygonal area is not equal to the territory A, which is only full comprehended in its total complexity if we take account that subjacent cultural aspects operate in that area and influence decisively, for instance in the decision on which crops should be developed, where and how the workforce should be employed, on how the onus and bonus of an economical activity are distributed, and so on. Strictly speaking, in one area there may be as many territories as many agents there are to reflect on it. To manage properly a territory is to abandon restrict and unilateral views and to recognize, to deepen and also create ways to converge distinct and most of the time opposite interests. In terms of the territorial management, the widely diverse ways of appropriation implies effectiveness.

Based on this premises, subnational governments need to develop strategies that recognize and incorporate the diversity which is inherent to territories. Actually, it is necessary to develop techniques of immersion, so to speak, of the governmental apparatus in the complex territorial game.

However, what should make the governments to let go the distant, monolithic, linear way of public policies formulation and promote the approximation of the society and also deepen the way of looking at reality in order to make it more complex? Why going from the easiest to the most difficult? The answer is simple: territorial management has more chances of producing efficient results if compared to traditional approaches. Firstly, because it assumes that the actors of a territory are not merely statistic aggregates (often needed, by the way), but in the case of individuals, citizens acting like subjects of their future and, in the case of economic agents, productive units acting as dynamic as the market operate itself. No model is able to replace them, because models do not suffer (the expression is intended) the effects of their action in the world.

Therefore, if politics is about the production of intended effects, territorial management contributes to the legitimacy of governmental decisions, to the extent that it approximates to what is actually desired. Secondly, in addition to making explicit that the actors explain more accurately their distinct needs, territorial management ensures governments the opportunity to receive feedback on the results of their policies, without any biased interference in order to implement changes and continuous improvements in the speed that the circumstances require.

The transition to the green economy must assume the management as a strategy of action in space, after all, cities and regions are the places where the changes will be materialized and the subnational governments occupy such a position that enables them to be a bridge between the global, international and local levels, as before stated.

Following the intent of presenting indications so that the concepts of sustainable development, green economy and territory turn into pragmatic actions, I point, lastly, to network management initiatives.

In the State of Minas Gerais, since January 2011 a network management strategy is being developed in two levels.^{xiv}

From the standpoint of the governmental structure, the various public agencies are organized in Government Networks, consisting of the following core themes: integrated government network, health care network, education and human capital development network, social development protection, defense and security network, infrastructure network, rural development network, cities and sustainable development network, technology and innovation network, and “Minas Gerais” identity network. These networks have allowed the government to promote intersection of public policies to the detriment of the traditional fragmentation of competencies in areas that communicate with difficulty. Thus, plans, projects, programs and budget under responsibility of an organization can integrate various networks or interact with complementary initiatives, so that, on one hand, the positive effects of public policies are maximized throughout the structure, and on the other hand, the risk of dysfunctions is recognized more accurately and more quickly absorbed. As shown above, the transition to green economy is, so to speak, transverse in the sense that it involves several kinds of challenges in evident interconnection. The structure from which governments react to the challenges will influence the effectiveness of the results and because there is a network of real challenges, governments should operate similarly.

From the standpoint of the contact with the territory, it is interesting to note the experience of Network Governance. Two strategies are being developed: Regionalized Management and Participative Management. Both operate at the level of prioritization of public policies in regions of the State, from the dialogue between government agencies themselves and, what is more relevant, between those and civil society.

Participative management has been developed in practical terms through meetings with members of Civil Society Organizations in each region, where the challenges, objectives and strategies of each of the government networks are presented. The experience, however, has not been summarized as a soliloquy, in that the second result is the prioritization of government actions based on the perception of society itself. This is where the complexity of the territory comes out and the dilemmas surrounding the transition to green economy surely will find the institutional design complex enough to be decided. On the other hand, the central bodies of government will receive through these channels the feedback that will

enable new learning, adaptations, changes of direction and speed. This provides efficient balance of centralization and decentralization.

CONCLUSION

Efforts taken at the Rio Conference in 1992 were not in vain, although the mechanisms proposed to address the impasse surrounding the environmental limits of the western economic model did not reach the expected success. After twenty years of its proposition, the systemic model of sustainable development proved to be a useful guide to lead governments and economic agents, given its comprehensive and multidimensional character, especially since it is sufficiently ductile, which endows the necessary dynamism

to adapt factual changes over time. The challenges proposed by sustainable development model are yet to be faced.

The green economy is the way of sustainable development for the first decades of the 21st century and the transition of economic models will not come by chance, but that effect will result from direct, precise and well coordinated intervention of governments. A series of challenges of various kinds must be faced, from the establishment of new values and strategic objectives, going through the design level of a viable system of governance, until concrete action on the basis of the economy. Only this commitment ensures "the prosperity that does not increase the disparity."

Territorial management - assuming the territory as social construct- plays an important role in the transition to green economy, as it allows citizens and economic actors to take ownership, according to different views of the environment in which they live, and clarify the possible convergence of interests.

Subnational governments occupy a strategic position to act at various points of the "network of sustainable development", particularly as mediators between the global, international and local levels. However, the way these governments are structured is directly related to the results that can (and should) be achieved, so that new ways of structuring should be encouraged. Governmental networks have been designed and are promising.

In short, difficult issues as climate change and the loss of biodiversity should not be faced in simple terms.

1. The document defines sustainable development as: "... development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
2. It is interesting to note that the Brazilian Constitution acknowledges this fact treating the issue on its Article 170: "The economic order, founded on the appreciation of the value of human work and on free enterprise, is intended to ensure everyone a life with dignity, in accordance with the dictates of social justice, with due regard for the following principles: ... vi – environment protection, which may include differentiated treatment in accordance with the environmental impact of goods and services and of their respective production and delivery processes; ..."
3. As in SACHS (1993)
4. Michael Decleris in his book, *The Law of Sustainable Development*, clarifies the relations between the general systems theory and the concept of sustainable development, demonstrating the theoretical roots that guided the formulation of the concept.
5. DECLERIS (2000) parts from the general assumption that the Global System consists of the man-made system (social elements), the living system (biotic elements) and a geophysical system (abiotic factors).
6. If we draw an analogy with computation, the above mentioned subsystems corresponds to programming or software, while the environmental control subsystem corresponds to the equipment or hardware, as well as the power source without which the computer does not work.
7. Interestingly to note that the Brazilian Constitution of 1988 states that "ecologically balanced environment" is a fundamental right, making thus the reproduction of sustainable relations on social order a legal obligation.
8. It's always helpful to highlight the main message UNEP's Report: an investment of 2% of global GDP in ten key sectors can fight poverty and create a greener and more efficient growth. The key sectors are agriculture, construction, energy, fishing, forestry, industry, tourism, transport, waste and water management.

9. This statement is based on a research conducted by IPEA named: Research on Environmental Services to Urban Solid Waste Management.
10. Statutory Law 19.823 (November, the 22th , 2011,) sent to the Parliament by the Government of Minas Gerais, creates the Recycling Grant, a new category of payment for environmental services. It establishes the criteria for compensation for proven efficient selective collection of municipal solid waste carried out by recyclers .
11. Within the context of this analysis and assuming a federative framework, Subnational level holds a lower hierarchic position than the national level but is superior to municipalities. In Brazil, this difference is not related to political power but to competences and areas of interests. The Brazilian States are Subnational Governments in this sense.
12. The State of Minas Gerais has developed international cooperation with the following governments: Singapore; Jiangsu, China; Italy, Lombardy; Nord-Pas de Calais, France; Italy, Piemonte; Quebec, Canada; Queensland, Australia; Yamanashi, Japan .
13. Statutory Law 13.803 (December the 27th, 2000) links the transference of tax revenues from state level to municipalities, under the condition of the development of some public policies including environmental protection.
14. The legal framework for the network model is the Delegated Law No. 180 (January, the 20th , 2011).

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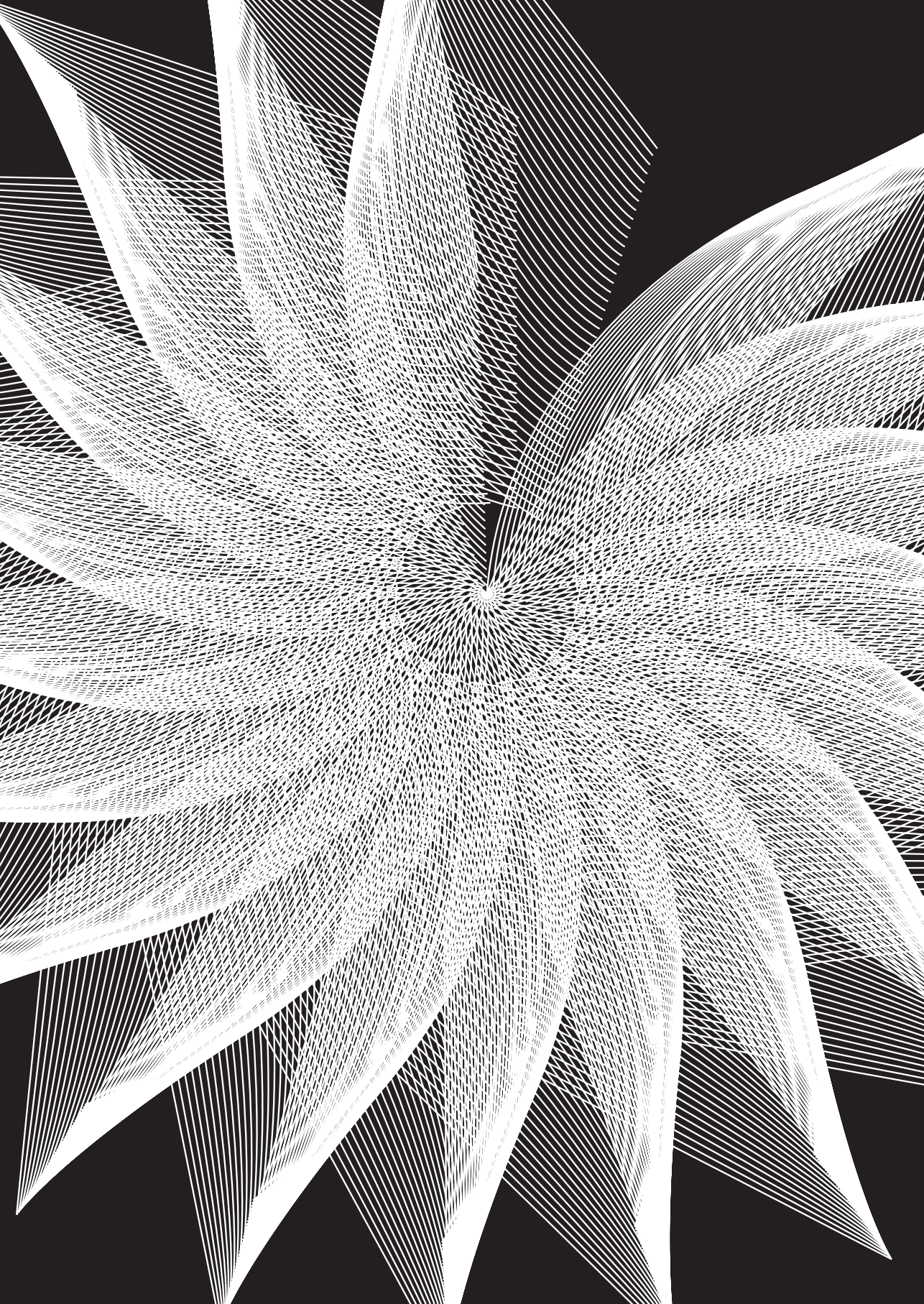
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EXPLORING THE DIMENSIONS OF INTEGRATED LANDSCAPE MANAGEMENT

GORDON A. MCBEAN

Although to most people the concept of landscape means a picture representing natural inland scenery, landscape here is analogous to a comprehensive setting or situation so that integrated landscape management addresses the needs of comprehensive natural and human environments and situations to be managed in an integrated way. The dimensions of a landscape which may be thought of as extending in all horizontal directions, in reality go into all four dimensions, including vertical, up into the atmosphere and down into the geosphere, and very importantly considerations of the past and looking forward into the future. In exploring the dimensions of integrated landscape management, the dimensions for management need to include all four dimensions, three in space and one in time. The Oxford English dictionary defines a landscape manager as a professionally trained and qualified expert in landscaping management for conservation and recreation stewardship of designed and natural landscapes. The sense of conservation of landscapes that are both designed and natural is an important concept as we look ahead.

Twenty-five years ago in 1987, the *World Commission on Environment and Development* (1987) brought forth the concept of Our Common Future that development needed to be considered in the sense of long-term sustainability and defined sustainable development as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*” In practice it means that societies need to look to the future and make investments now that will allow future generations to meet their needs consistent with those of present generations. Meeting the needs of future generations implies being able to foretell what will or

might happen and how actions and decisions taken now result in differences in the future (McBean, 2008). The basis for seeing the future with confidence needs to be based on understanding of the earth system, in all its dimensions including the human dimensions, and being able to know where we are “*now*” whichever time that is. One can see across the land and through global observing systems much of the bio-physical aspect of the planet can be observed regularly. Observing the human dimension is more problematic. In this essay the dimensions, including time, of integrated landscape management are explored. The additional dimension of the future makes for complexities as seeing the future is difficult.

To enable sustainable development means that this landscape must be managed such that literally our children and grandchildren and those of all on the planet can be confident of futures that are meaningful and economically viable and environmentally acceptable or sustainable. Interesting that during his first visit to Canada (February 19, 2009), President Obama held a joint press conference with Prime Minister Harper to talk about three issues: the global economic recession; cross-border cooperation on environmental protection and energy security; and priorities for international peace and security (McBean, 2009). Although he presented them as three separate issues, they should be integrated, both as key issues and policy responses. President Obama put the issue in the right perspective by noting that climate change is ‘*an issue that, ultimately, the Prime Minister’s children and my children are going to have to live with for many years*’.

In his popular book “*Collapse*”, Jared Diamond (2005) examines how climate and climate related events, as well as other factors, have led to the evolution and development of societies and, in some cases, to their collapse. Given this background, the subtitle “*how societies choose to fail or succeed*” is both interesting and provocative. The lessons of *Collapse* are particularly relevant today. Importantly, as Paul Erlich (2005) asserts, “*Collapse provides us with insights into how to avoid the grim fate of those past societies that failed to meet their environmental challenges.*” Societies need to learn from the past as they look into and move to the future. Climate change is just one of the stresses upon our planet now but it is a major one. In December 2009, many national leaders, Ministers, and others, present at the United Nations Framework Convention on Climate Change Fifteenth Conference of the Parties in Copenhagen, agreed to the Copenhagen Accord, with the opening paragraph:

We underline that climate change is one of the greatest challenges of our time. ... We recognize the critical impacts of climate change and the potential impacts of response measures on countries particularly vulnerable to its adverse effects and stress the need to establish a comprehensive adaptation programme including international support. (Copenhagen Accord, 2009: underlining added)

Climate change needs to be seen in the context of other societal and environmental issues and national security (Hulme, 2009). The debate needs to be in the context of values, fears, beliefs and both the way science is done and global governance. Its long-term and global nature leads to concerns about intergenerational and international equity. The result is conflict over how to value and protect the 'rights' of future generations in comparison to the aspirations of present generations and the 'rights' of developing countries to have higher standards of living while reducing the impacts on the climate system.

Unfortunately, there are barriers to taking action on issues such as climate change which we are seen in a global, long-term context. These barriers include: fragmented incentives and resources and the lack of political will; the lack of organized advocacy and public demand needed to gain that political will; and uncertain benefits and costs which are given as reasons for inaction (Henstra and McBean, 2005). The uncertainty on the need for investment is deepened by the fact that any benefits associated with reducing emissions causing climate change, must be weighed against immediate pressures on the economy, social programs and other issues.

From a political perspective, mitigating climate change and future environmental degradation is less appealing than other public investments because, while the costs of mitigation are immediate and often substantial, the benefits are only realized in the future, at least in the minds of some policy makers. In a political system predicated on a four year election cycle, investment costs borne by one government (and set of taxpayers) may only be realized by benefits to a future government and a different set of taxpayers. The costs are readily apparent while the benefits are not as immediately obvious.

A major factor affecting all parts of the globe is the occurrence of disasters triggered by weather-climate related events.

Over the last two decades (1988-2007), 76% of all disaster events were hydrological, meteorological or climatological in nature; these accounted for 45% of the deaths and 79% of the economic losses caused by natural hazards. The real tragedy is that many of these deaths can be avoided. Wahlström (2009)

Although Hurricane Katrina had a huge cost, it was a small fraction of the US GDP, while the hurricane in 1998 in Honduras amounted to over 75% of its GDP. Losses from natural disasters are substantial and in some countries represent a major fraction of national GDP. In some places, natural disasters have turned back the clock on development by years or even decades. Development is then not sustainable. Part of sustainable development needs to be the consideration of decisions being made now, including decisions to invest or not, and how they will alter societies' exposure to the risk and occurrence of natural hazards. In response, participants of the 2005 World Conference on Disaster Reduction declared that to meet internationally agreed development goals, including those contained in the Millennium Declaration, it was necessary to strengthen global disaster reduction activities.

The Intergovernmental Panel on Climate Change (2011) prepared a special report with the title: "Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation". Among the recommendations in the Summary for Policy Makers is:

Social, economic, and environmental sustainability can be enhanced by disaster risk management and adaptation approaches. A prerequisite for sustainability in the context of climate change is addressing the underlying causes of vulnerability, including the structural inequalities that create and sustain poverty and constrain access to resources.

We need to address these issues in the full sense of integrated landscape management. The Summary notes that progress towards resilient and sustainable development can benefit from questioning assumptions and paradigms and stimulating innovation to encourage new patterns of response.

Working together on addressing climate and other hazards, leading to disasters, requires a global effort, building on the sense of global understanding and connec-

tivity. This brings in the full spatial dimensions of “landscape management”. The International Geographical Union has been advocating the need to foster a widespread awareness of the dual embeddedness of our bio-physical and socio-cultural living conditions and social practices. For this purpose a UN International Year of Global Understanding (IYGU) is advocated to enable the sensitization of all the world’s citizens and policy-makers to the global consequences of human actions locally. Just a decisions to alter the landscape here, has implications further down along the river, for example, it needs to be recognized by all that the implications really do extend very far over space and time.

The original sustainability concept was based on the triple bottom line (economic, environmental and social aspects) but it needs now to be understood in a very broad context as discussed by E. Batista (2011) as the new sustainable development paradigm.

Now, as we approach the 20th anniversary of the Earth Summit of 1992, with the Rio + 20 meetings for June 2012, it is important to address these broader concepts. Although major advances have been made since 1992, there is a justifiable feeling of concern as we look around the planet and ahead to the future. The 2012 summit has set its objective as:

To secure renewed political commitment to sustainable development; to assess progress towards internationally agreed goals on sustainable development and to address new and emerging challenges. The Summit will also focus on two specific themes: a green economy in the context of poverty eradication and sustainable development, and an institutional framework for sustainable development.

In preparation for the Rio+20 summit, the United Nations Secretary-General established a High-level Panel on Global Sustainability (2012); its report, now available, is appropriately entitled: “*Resilient People, Resilient Planet: A future worth choosing.*” The Panel’s report makes a range of concrete recommendations as the directions in a path towards sustainability. They stress the importance of an integrated approach so that issues of water, food, energy and others are not considered as

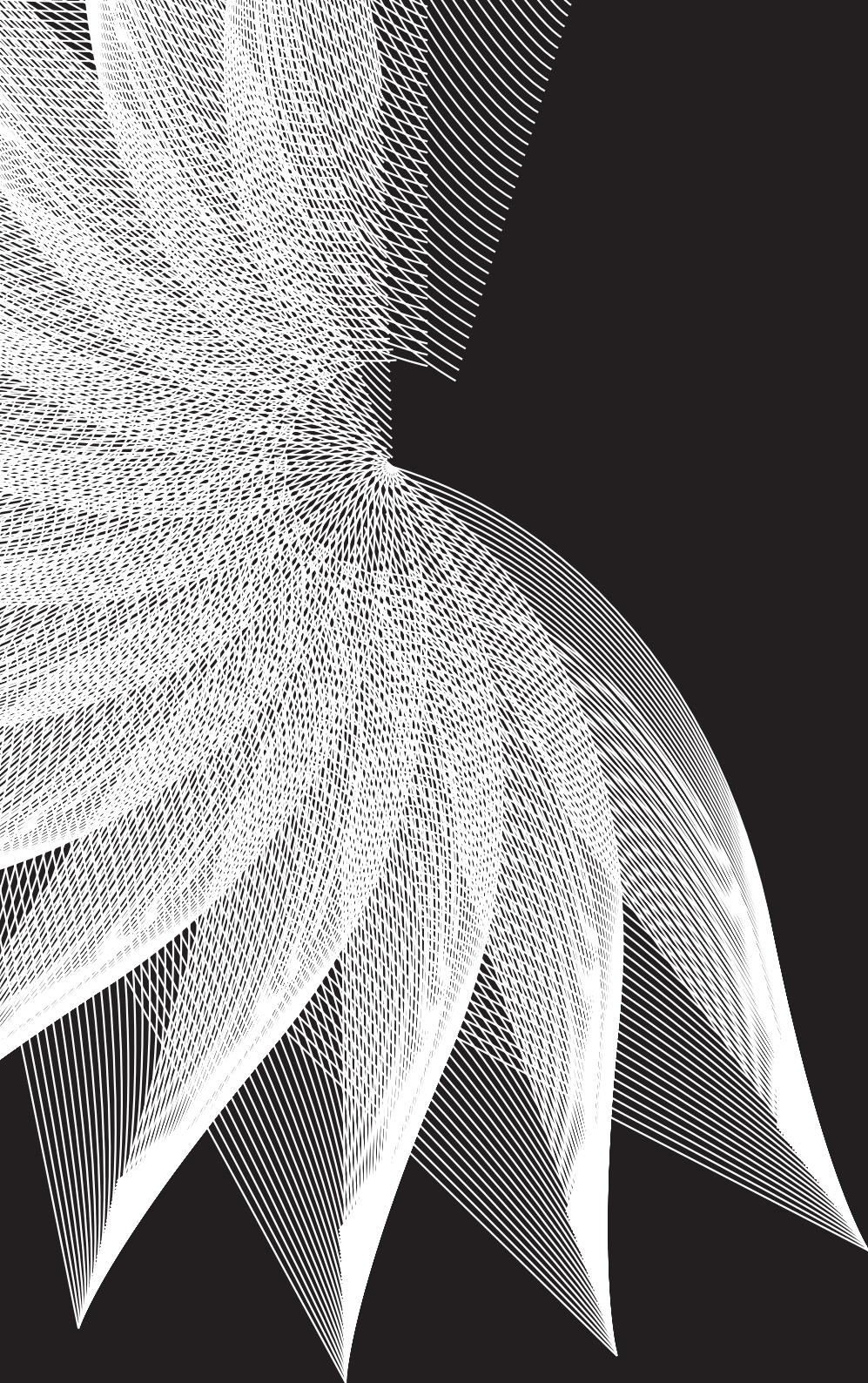
“stand-alone” items. They also stress the need for strengthening the links between science and policy and, in particular, address the issues of “planetary boundaries”, “environmental thresholds” and “tipping points”. A major recommendation is:

Governments and the scientific community should take practical steps, including through the launching of a major global scientific initiative, to strengthen the interface between policy and science. This should include the preparation of regular assessments and digests of the science around such concepts as “planetary boundaries”, “tipping points” and “environmental thresholds” in the context of sustainable development. This would complement other scientific work on the sustainable development agenda, including its economic and social aspects, to improve data and knowledge concerning socio-economic factors such as inequality. In addition, the Secretary-General should consider naming a chief scientific adviser or establishing a scientific advisory board with diverse knowledge and experience to advise him or her and other organs of the United Nations.

The global science community had already taken action in several ways. Most important is the “Future Earth – Research for global sustainability” initiative of the International Council for Science (ICSU), the International Social Science Council (ISSC), and the Belmont Forum of funding agencies. This initiative has now been broadened to include UNESCO, UNEP and UNU. The name Future Earth correctly points the direction of management towards the future. The Future Earth research program will provide the scientific basis for integrated landscape management in all its dimensions and enable people and policy makers to connect globally and look ahead for the benefit of all, as in the ICSU theme of strengthening international science for the benefit of society, all societies.

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TRUE GLOBAL UNDERSTANDING AND PERTINENT SUSTAINABILITY POLICIES

BENNO WERLEN

Ever since the elaboration of ecological theory and the start of empirical ecological research, they have been closely associated with the history of biology and geography. Both are embedded in the practical and theoretical European problem situations of their time. The same is true of the theoretical foundation of the sustainability concept's original elaboration. Ecological thinking is tied to the development of biology and human geography in the second half of the 19th century, and sustainability to the beginning of the 18th century's abuse of forests for early forms of industrial production. Both early forms were linked to the social and spatial formations that are historical today. Given the current problem constellations, we need to rethink these concepts. The transformation of the spatial as well as natural relations (Werlen 2010) that has occurred in the interim is based on the globalization process. This process is so radical that we have to reconsider the two key environmental policy concepts for the 21st century.

Today, global sustainability is needed. And global sustainability requires global understanding. To think globally and act locally, we must have a better understanding of how our local, daily activities impact global levels. Reaching true global understanding requires reaching a more sustainable planet through local actions. Our common future on earth depends on successfully establishing sustainable everyday actions. This is where the local and global become one – where scientific insights have always been applied. We need a widespread awareness of

how everyday actions create the challenges that impact humanity. This includes our capacity to connect actions and thoughts that may seem disconnected across time and space.

HISTORY AND SHORTCOMINGS OF ECOLOGICAL RESEARCH STRATEGIES

Since the origins of ecological research, biology and geography have played a key role in developing theoretical frameworks and in empirical investigation. The theoretical foundations of ecological research were largely developed at the end of the 19th century on the basis of biological by Ernst Haeckel (Haeckel 1866; 1878/79) and geographical investigations by Friedrich Ratzel (Ratzel 1882; 1902) into living spaces and into the evolution and differentiation of varied life forms. Hans Carl von Carlowitz (1713) developed the basis for sustainable ways of production in the mining and forestry contexts at the end of the 17th and beginning of the 18th century. The methodological approach that these scholars conceived remains valid today (World Commission on Environment and Development, 1989). The “natural” and “spatial” (including their ecological components) are still the starting points of ecological investigations, preceding all human actions.

If current ecological problems are indeed caused by human actions, the reasons for these actions lie largely outside natural science realms of competence. The nature of and the human reasons for non-sustainable practices are increasingly well understood, but gaining knowledge of how to change individual and social practices in respect of sustainability remains a major challenge for healthy nature-society relationships, as well as with regard to designing environmental policies informed by sound science.

On the other hand, social scientists excluded the natural world from the beginning. This double blindness led to the nearly total absence of social science and humanities insights into sustainability research and into such global change issues as the politics of climate change (Beck 2009; Giddens 2009; Stehr/Storch 2009; Urry 2011). This constitutes the second challenge for the nature-society and the science-policy interfaces. In short: the natural sciences don’t have a differentiated view of the causes of and reasons for human-induced ecological problems, and most social

scientific approaches suffer from a near absence of expertise regarding the bio-physical world.

A third approach is based on general systems theory that integrates bio-physical and socio-economic systems on the same ontological level. The ways bio-physical and socio-economic facts exist differ: Bio-physical facts can be characterized as existing in a realm of materiality and (causal) determination, whereas socio-economic facts reside in a realm of contextuality, meaning, and path-dependency. The two cannot be treated as if they are integrated into a single system governed by the same kinds of functional relationships; recognizing their distinctive logics is a prerequisite for grappling successfully with socio-cultural realities and ecological challenges, or dilemmas produced by human action.

In addition, much of the current literature on sustainable development is anchored by three pillars: economic growth, ecological integrity, and social equality. The major cultural differences in the meanings ascribed to these three concepts have received relatively little attention. Understanding the impact of cultural interpretations is a prerequisite for achieving sustainable development.

Consequently, the current status of integrated research lacks an ontologically sound and promising strategy for transdisciplinary problem solving and an acceptable consideration of the power of cultural schemas of interpretation of natural living. On the whole, we can conclude that we are facing a quadruple weakness, namely:

- A lack of appropriate understanding of the social world by natural scientists and engineers;
- A lack of understanding and integration of biophysical elements on the part of scholars in the social sciences and the humanities;
- A lack of ontological differentiation, with the (subsequent) reductionist implications of systemic integration; and
- A lack of sensitivity regarding the power of cultural differences when dealing with natural living conditions.

Calling for transdisciplinarity reinforces rather than questions the validity of disciplinary and interdisciplinary research. But switching disciplinary perspec-

tives alone will not yield an integrated view of the nature-society interface. To overcome disciplinary blind spots, we need a perspective that specifies and solves problem complexes independent of their disciplinary interests and boundaries. Such a perspective should enable us to address the society-nature and science-policy interfaces in new ways that are adapted to the globalized constellations of everyday local actions.

NEW REALITIES – NEW CHALLENGES

Political landscapes are changing, the geographies of the economic are being reshaped by new production technologies, time-space compression occurs through innovations in transportation and communication (Harvey, 1989), while resource and energy use is expanded. All these processes are interrelated, and transform daily life all over the globe. Along with all these changes, recognition of global processes' interrelatedness has increased. In addition, parochial discourses have become more forceful on the global stage, often in ways that seem to provoke discord rather than foster understanding. It is important that we deepen our understanding of the new global realities to address these interconnected challenges productively as they arise. Today, the exact opposite is very often exactly observable. Many of the discourses postulate the parochial interpretation of global processes instead of favoring interpretations based on global understanding as the guideline for local and regional action and measures.

Although it is clear that local and global issues are intimately related, attempts at addressing the global climate change issue have never focused adequately on the issue of scale. We believe that this is one of the central issues of environmental politics and entails two aspects. The first is the specific spatial constellations of politics and climate; the second refers to the regional bases of action and the problem's planetary reach.

The first scalar problem is that science develops planetary models, but decision-making bodies are primarily involved in finding solutions that have a national scope. The second scale-related problem affects the democratic legitimization of climate politics beyond national borders. In order to become fully politically potent,

the global orientation of political action and goal setting must ultimately achieve national endorsement. To reach this sustainably, the first necessary condition is that individuals develop a global consciousness of their own living situations. The development of global understanding in the everyday lives of the majority should be encouraged and established by international institutions such as the UN and political networks. In short: we need a stronger linkage of the global and the local.

A fully binding decision-making body with global jurisdiction can certainly not be established in the time frame available to humanity's most pressing problems. Global necessities require swift, yet considered, political action and goal setting. We must promote global justice while integrating local interests and concerns. In short: since it is unlikely that a global authority will be established in the near future, the most sustainable solution is to downscale planetary mitigation and adaptation programs to national and regional levels. In order to achieve global sustainability, political action and goal setting must first be nationally endorsed. Conversely, a necessary condition for national support is for individuals to develop awareness of the global consequences of their local actions.

THE IGU INITIATIVE FOR A TRUE GLOBAL UNDERSTANDING

In order to help establish the necessary conditions for such global awareness, the IGU initiative for an International Year of Global Understanding (IYGU) proposes a new geographical worldview that takes the specific spatial features of current living conditions into account. The initiative will attempt to develop a widespread awareness of the global consequences of local day-to-day actions. To achieve this goal will require a collective effort by the world's natural and social scientists, as well as by scholars in the humanities. In short: the reconciliation of the global and the local is as much a part of global understanding as the reconciliation of science and everyday lives. We need to encourage scientists, as well as citizens to effect a change towards sustainable social actions, habits, and routines.

True global understanding requires awareness of the global implications of everyday living. This IGU initiative will strengthen awareness of how the socio-cultural and bio-physical spheres in all our life-worlds are connected. A precondition

tion of global sustainability is achieving sustainability in everyday practices. And global sustainability relies on global understanding.

To systematically take the dual embeddedness of everyday actions in bio-physical and socio-cultural living conditions into account, the International Social Science Council (ISSC), in collaboration with its member organizations, the international umbrella organization for philosophy and the humanities (CIPSH), and a considerable number of ICSU member unions strongly support this initiative. The IGU initiative starts with the hypothesis that humanity's grand challenges are self-made and affect the entire planet. A widespread awareness of how everyday actions create the challenges that impact humanity is a prerequisite to find solutions. The IGU initiative addresses the why and how of peoples' distinct responses to similar ecological dilemmas. It aims to improve conditions for those policies and strategies required to deal with these difficult situations.

In recognition of this need for better information, the two most important international scientific bodies—the International Council for Science (ICSU) and the International Social Science Council (ISSC)—are cooperating to address the Grand Challenges of Earth System Science (Reid et al. 2010).¹ Furthermore, these scientific bodies are partnering the Belmont Forum² to build a global alliance. The alliance partners hope that this endeavor will establish a new ten-year initiative on earth system research for global sustainability.

The Grand Challenges, which have been identified as part of the ICSU-led Visioning Process, will act as the initiative's framework since they identify social and natural science research priority areas for the coming decade. The Grand Challenges emphasize that we are confronted with an unprecedented situation and that the world's climatic health is at stake. The situation is considered primarily human-induced, unintended, and partly the unpredicted consequences of 19th and 20th century problem solutions. Against this background, the Grand Challenges agenda calls for the full integration of social, natural, and human science perspectives, as well as for the inclusion of other sources of knowledge. There is also a dire need for

1. <http://www.icsu-visioning.org/other/grand-challenges/>

2. The Belmont Forum is an international collaboration of some of the world's major funding agencies, including those from the USA, Great Britain, France, Norway, Germany, and South Africa. The ICSU and the ISSC are members of the Belmont Forum

a broad range of decision makers and stakeholders to co-create new knowledge and to strengthen the relevance and use of existing knowledge.

BRIDGE BUILDING

Global environmental change research has produced unambiguous scientific insights into earth system processes. Nevertheless, these findings are rarely translated into effective policies to prevent the worst consequences of global change. Why not? It seems that, on the one hand, we need to deepen our knowledge of socio-cultural contexts and, on the other hand, we must improve the level of society's acceptance of scientific knowledge. Both are needed to allow effective and sustainable responses to the threats of global change. As already mentioned, true global understanding requires awareness of the global implications of everyday living. This is the main target of this initiative. It will focus on habitual day-to-day practices that may show the two-fold global embeddedness of local living conditions: the bio-physical, on the one hand, and the socio-cultural, on the other. The first attempt therefore lies in bridging these two main realms of everyday practices.

Secondly, it is imperative that we bridge the gap between global problems and national, regional, and local behavior and decision-making. Effective solutions based on bottom-up decisions and actions are therefore more likely to be effective than top-down measures. This bottom-up strategy aims to gain insights into the behavior of the individuals, households, and firms that make the majority of decisions that collectively cause human-induced global change. On the basis of these insights, we hope to convince households and countries to participate in efforts to mitigate global climatic change where possible, and to adapt to climatic change that cannot be mitigated. In the process, differing perspectives and insights from everyday experiences will be integrated with research results from the behavioral, natural, and social sciences in a geographical locality-based framework. The third bridging consequently addresses the world of sciences and the everyday worlds in their manifold constitutions.

SHORT OUTLINE OF THE PROGRAM

The IGU initiative posits that current climate policies operate on two levels: the global transnational level and the local national level, which consists of democratically legitimized political action. To balance the discrepancies caused by the gap between the two levels, the initiative wishes to establish and support global awareness and understanding of climate changes' effects on individuals' specific cultural practices in their day-to-day lives. The efforts are aimed at encouraging and enabling individuals to live sustainably and to respect cultural diversity.

The IYGU will draw on the Grand Challenges initiative, the UN Charter, and the UNESCO Constitution, as well as on specific UN programs such as Agenda 21, the Rio+20 agenda, the Johannesburg Plan, and the Millennium Goals. In addition, and specifically, it will elucidate crucial types of everyday practices that – under certain cultural and social conditions – not only influence and transform nature but are also constitutive of socio-cultural realities like eating and drinking, working and housing, communicating and interacting, recycling and preserving, etc.

These practices will be described and analyzed in the light of sustainability and conflict prevention. According to the bottom up logic, the design of initiative is open – if necessary – to identify other fields of practice in order to describe and analyze in a transdisciplinary effort. The focus points therefore include climate change, the resulting hazards, and the rapidly changing spatial and temporal conditions. All in all, we first need geographical and social science insights into the logic of everyday actions.

These habitual activities may show the two-fold global embeddedness of local living conditions in the bio-physical and the socio-cultural. In addition, this double frame of all human existence, this double bondage of all human life forms will be highlighted by referring to social scientific and natural scientific evidence and informal (everyday) knowledge systems. Consequently, science, the humanities, and lay people will be brought together for joint action. Altogether, the initiative will focus on the interfaces between the local-global, natural-social scientific, as well as between the scientific and everyday levels.

A further and core aim is to mobilize the world's sciences and humanities in a unified effort to arouse citizens' awareness of their capacity to affect natural and

social systems globally. The initiative will, therefore, focus on the collective effects of daily household and corporeal, body-linked routines, as well as encouraging, or even pressuring, local and regional policy makers to adopt global mitigation targets.

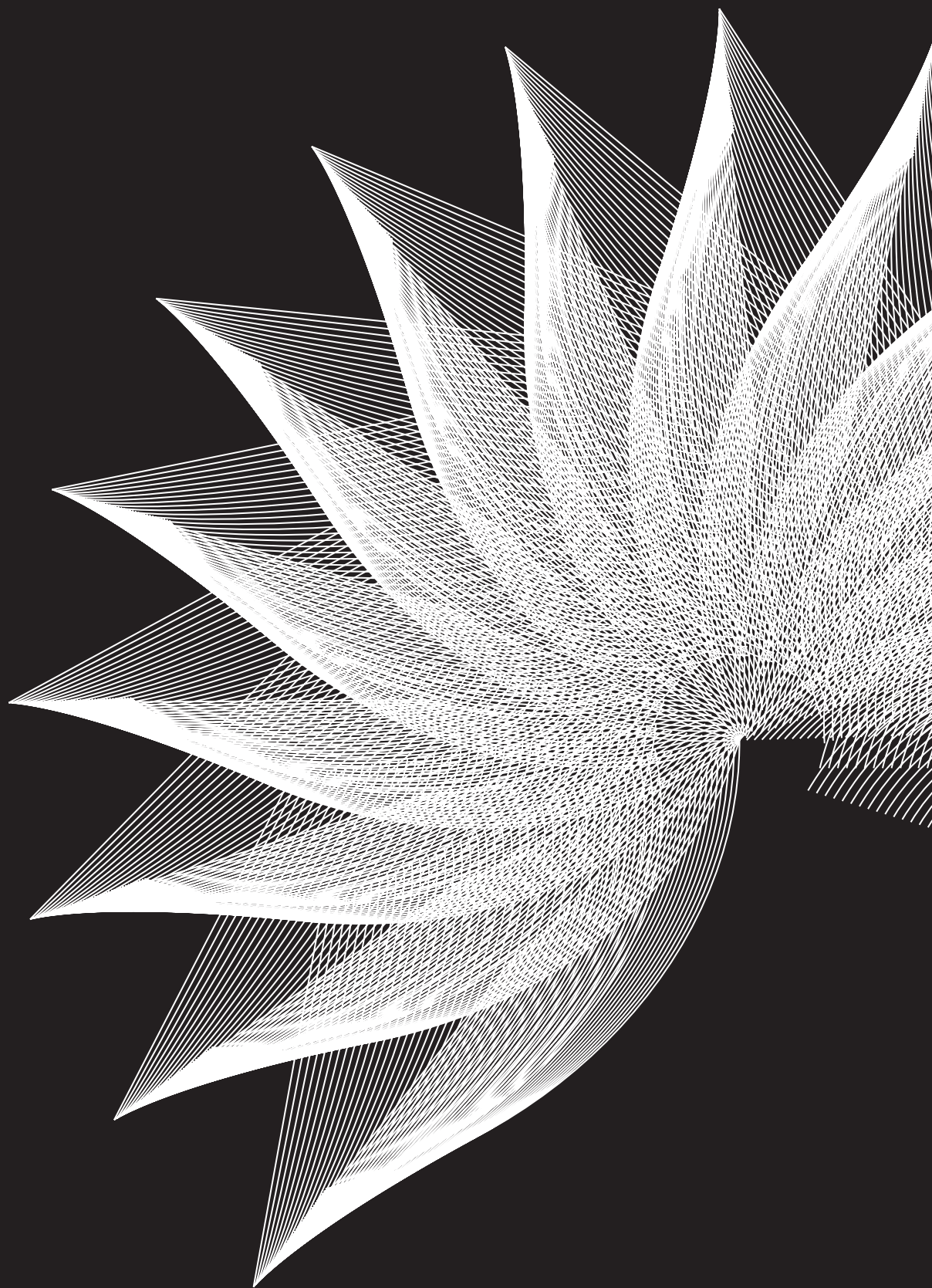
TARGETS

The IGU initiative hopes to yield deep, but actionable, insights into the ways all peoples can live more sustainably on and with the earth, as well as with one another. It includes action sets that will establish scientific research initiatives and improve public awareness of key human life issues. This initiative hopes to address many complex themes associated with global change. Furthermore, the initiative intends to boost the scientific community's enthusiasm for trans-disciplinary research. This type of research will explore everyday practices to identify local and global transformative actions. Outreach programs will be aimed at preparing the ground for socio-natural and local-global interrelatedness, and will also translate scientific and academic research results into language that can be used in the classroom of all countries, for all teaching levels, and in broader public awareness campaigns through publications, computer games, and TV programs.

With the accomplishment of these targets, the initiative will contribute to establishing sustainable everyday actions. To link actions and thoughts that may seem disconnected across time and space provide new opportunities, but also require accepting new responsibilities. In addition, global understanding will enable all of us to realize that our lives are doubly embedded – bio-physically and socio-culturally. Global understanding is therefore knowing and living global change as both global climate change and global social change. Finding the right balance between knowing and living is a way of achieving global sustainability for the sake of future generations.

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GLOBALIZATION AND THE ROLE OF COMMUNICATION IN BUILDING A NEW WORLD EQUILIBRIUM

RENALDAS GUDAUSKAS

Information dissemination and accessibility is underlying factor for sustainable economic, political, communal, and social development. Information policy affects all of us because without information, we don't function individually and definitely not as a society. The aim of the information society is to gain competitive advantage through using information and communication technologies (ICT) in a creative and productive way internationally. The information society produces enormous amount of information, ICT enable to collect, store, archive information and access it at anytime and anywhere in modern ways. The information policy is determined as the set of rules, regulation and standards that controls the access to information for society. A concept is difficult to understand when it constantly is growing and evolving due to the information it covers and as we know information is always changing. Still, the national information policy is a key issue of culture, knowledge and information institutions.

INFORMATION AND COMMUNICATION AS KEY ISSUE

Communication is a basic to the life of individuals and peoples. Communication also is crucial in the issues and crises which affect all members of the world community. In the People's Communication Charter it is written „...communication can be used as a force to support the powerful and to victimize the powerless and

that communication is fundamental to the shaping of the cultural environment of every society“ (6, p. 151). In spite of “Information revolution“, today's reality shows an increasing gap between the world's information-rich and information-poor countries, and between information-rich and information-poor sectors within society's. But ICT can enhance productivity and innovation capacity, as well as generate new business opportunities and jobs. The contribution of ICT is significant as recently ICTs have contributed around half of the growth in EU productivity and they will remain a critical factor in future growth (3, p. 1).

Development Communication is recognizing the power of communication as a catalyst for social development. It is also the utilization of existent communication tools and applicable theories for result-driven strategies for the advancement of society.

“It does not matter that the destination is not clear. There are no final destinations in business; nor in politics; nor in sustainable development. But directions are clear.“ Stephen Schmidheiny, Speech at the UN Conference on Environment and Development. (1992). Cross-culture now permeates all other factors, which also include innovation and a systemic-holistic vision of logistics.“ Eliezer Batista, The new sustainable development paradigm (2011).

Development Communication can also be defined as purposive communication intended for a specific target audience that allows for the translation of information into action resulting in a higher quality of life. The term “communication” refers to all interactive processes through which individuals and communities share opinions, information, and ideas“ (6, p. 154).

It is greatly linked with the concepts of Sustainable Development (which can be defined as the improvement of a community using information and technology and the community's ability to maintain the created ideal state without compromising its environment and resources). It also relies greatly on Community and People Participation, which is the voluntary involvement of a group of people in a development activity with full knowledge of its purpose that will allow them to grow individually and as a community. This way strategic communication is vital also to national securities and foreign policies. Strategic communication describes

a variety of instruments used by governments for generations to understand global attitudes and cultures, engage in a dialogue of ideas between people and institutions, advise policymakers, diplomats, and military leaders on the public opinion implications of policy choices, and influence attitudes and behavior through communications strategies.

Between now and 2020, the amount of Digital information created and replicated in the world will grow to an almost inconceivable 35 trillion gigabytes as all major forms of media – voice, TV, radio, print – complete the journey from analog to Digital.” (8, p. 21)

It will *bridge ‘physical’ with ,Digital’*. Development of Research Infrastructure’s (RIs) will foster emergence of a new culture that looks beyond established academic circles. It is the *social dimension* of RIs that ensures their good functioning: technological changes are bound to bring innovation only when intellectual and cultural resources are interacting and performing at the best of their potential.

CULTURAL AND CREATIVE INDUSTRIES

There are many ways in which ICT have impacted globalization and it is commonly believed that the information revolution made globalisation possible.

The European Commission has included financing for the EU public Digital library *Europeana* and digitisation of content in the provisions for pan-European e-services infrastructures in the proposal for the Multiannual Financial Framework 2014-2020. The Commission adopted a Recommendation on digitisation and Digital preservation on 27 October 2011. The Recommendation asks the Member States to step up their efforts, pool their resources and involve private actors in digitising cultural material and make it available through Europeana (3, p. 15).

So ICTs have impacted globalization, economically and materially, by creating global electronic networks that made global communication possible, which in turn made global business and global production possible. It is clear that without the development of ICTs, and specifically communication networks such as the in-

ternet and satellite phones, the new global electronic economy could not exist, and globalisation would not be as it is today.

The term cyberinfrastructure is meant to denote the layer of information, expertise, standarts, policies, tools, and services that are shared broadly across communities of inquiry but developed for specific scholarly purposes: cyberinfrastructure is something more specific than the network itself, but it is something more general than a tool or a resource developed for a particular Project (8, p. 5).

Globalization refers to the rapidly developing and ever densening network of interconnections and interdependencies that characterize modern social life. Modern communication techniques enable quick and easy interaction between countries and cultures.

Much like communication is an important tool of disempowerment, it plays a significant role in empowerment. People's power also needs expression, dialogue and the sharing of experiences. There is a variety of approaches to empowerment of people in the context of world communication" (6, p. 133).

ICT IMPACT ON GLOBALIZATION

Many of the problems that occur in the World are the direct result of people failing to communicate. Communication is the exchange and flow of information and ideas. Effective communication occurs only if the receiver understands the exact information or idea. In general communication is the chain of understanding that integrates the people. Communication also is a DIALOG.

Strategic Knowledge management (SKM) is primarily about management activities performed with the intention of enhancing Knowledge processing. In it's first wave, SKM was considered a purely technological process. The impact of new technology on all aspects of operation has been widely acknowledged, but equally crucial to success is the implementation of various changes in working practices. It's now recognized, that this view neglected the important role of social networks and relationships.

Strategic thinking consists from two major components: Insight about the present; and Foresight about the Future. A useful model to consider when discussing the concept of Strategic Thinking is the “Insight-Foresight” model. Within the context of Systems Thinking, insight refers to being able to “see into” by penetrating or understanding something previously hidden.

Within the context of Systems Thinking, Foresight refers to having the ability to see what is emerging – to understand the dynamics of the large context and to recognize new initial conditions as they form. Because the primary purpose of SKM is to help Society to exploit the many challenges in its future, rather to prepare for a single „tomorrow“.

Foresight Considerations: We need to understand emerging conditions, always look for connections, relationships and patterns of interaction. We also need try to access what is normally inaccessible or invisible in order to understand, where we are today, and apply that learning to where we need to go and in trying to learn what we’ll need to know to get there.

The first is the management of general conditions in an organization the cultural environment and the Knowledge Management processes. The second is the provision of assistance for the direct, inter-human Knowledge Management processes, i.e., *Communication*. The third is the management of generation, distribution, access and use of knowledge coded into artifacts (documents, training, etc), i.e., Information Management.

Strategic communication requires a sophisticated method that maps perceptions and influence networks, identifies policy priorities, formulates objectives, focuses on “doable tasks,” develops themes and messages, employs relevant channels, leverages new strategic and tactical dynamics, and monitors success. This approach will build on in-depth knowledge of other cultures and factors that motivate human behavior. It will adapt techniques of skillful political campaigning, even as it avoids slogans, quick fixes, and mind sets of winners and losers. It will search out credible messengers and create message authority. It will seek to persuade within news cycles, weeks, and months. It will engage in a respectful dialogue of ideas that begins with listening and assumes decades of sustained effort. Just as importantly, through evaluation and feedback, it will enable political leaders and policy-makers to make informed decisions on changes in strategy, policies, messages, and choices among instruments of statecraft.

STRATEGIC COMMUNICATION: THE CASE FOR A NEW VISION

Strategic communication is vital to countries' national securities and foreign policy's and institutions, advise policymakers, diplomats, and military leaders on the public opinion implications of policy choices, and influence attitudes and behavior through communications strategies. Strategic communication can help to shape context and build relationships that enhance the achievement of political, economic, and military objectives. It can be used to mobilize publics in support of major policy initiatives – and to support objectives before, during, and after a conflict. To be effective, strategic communicators must understand attitudes and cultures, respect the importance of ideas, adopt advanced information technologies, and employ sophisticated communication skills and strategies. To be persuasive, they must be credible.

Policies, diplomacy, military operations, and strategic communication should not be managed separately. Good strategic communication cannot build support for policies viewed unfavorably by large populations. Nor can the most carefully crafted messages, themes, and words persuade when the messenger lacks credibility and underlying message authority.

For some the case for strategic communication is not self-evident. Global media already provide an abundance of information they suggest. Commercial media are selective in ways that serve news and business interests first. And few politicians, corporations, or advocacy groups are content to leave their political campaigns, business objectives, and policy agendas to improvisation or the media. Every Government needs a strategic communication capability that is planned, directed, coordinated, funded, and conducted in ways that support the nation's interests.

It is highly recommended to National leaders to give higher priority to strategic communication – public diplomacy, public affairs, and open international military information. Engaging the right audiences at the right time can create diplomatic opportunities, reduce tensions leading to war, help contain conflicts, and address nontraditional threats to national security.

THE NEW STRATEGIC COMMUNICATION ENVIRONMENT

One way ICTs have facilitated and impacted globalization is by making the world economy electronic, through information systems and technology rather than organisational hierarchies. The development of ICTs, and specifically the internet, has facilitated the growing connection of large banks and corporations across the world through a series of information communication networks which are online, in terms of management, selling and production. Because the interests of citizens and those of the global ICT companies are not always aligned, the interests of citizens must be balanced with those of business.

As people start using the web and the Internet for the first time, they are particularly vulnerable to cybercriminals and unscrupulous traders. Vulnerable users, whether adults or children, need to be given every protection that would help them enjoy a safe online environment. Virus attacking of critical industrial control processes, the issue of cybersecurity and Critical Information Infrastructure protection is high on government agendas.

The World today is already *heavily dependent* on ICT for the creation of wealth and our quality of life. It is important that our growing dependance on ICT is matched by an increasing sophistication of security measures to protect critical information infrastructure (power, water, transport, security systems etc.) and to protect citizens from cybercrime. We also need to have strategic plans, how technology can respond to the needs of an ageing society, as ICT can help to improve their quality of life, stay healthier, live independently for longer and remain active at work in their community. A wide range of services could be offered in the area of communication, safety and health to name a few.

There are numerous audiences that can be affected differently by the same message. Crafting an influence campaign means precisely identifying the key audience, but also other audiences as well. We must also take the measure of new dynamics emerging from the information age. The speed with which information becomes available to the global audience, the convergence of means by which we can capture many different kinds of information (visual, audio, print, etc) in a single digital format, and the ability to get that information to a global audience all suggest some of the advantages and limitations.

Public policy considerations should include:

- Shaping themes and messages and choosing means of delivery to ensure that priorities are clear, overall themes are established, messages are consistent, and resources are used effectively;
- Identifying communication tools that will most effectively reach intended targets with the specific messages indicated by the policy;
- Mapping the results of public opinion polling and media analyses to specific policies and issues;
- Analyzing the potential impact of policies on public attitudes, strongly held personal convictions, and divergent interests;
- Understanding what constitutes “message authority,” the implications of cross-cultural communication, and how messages are “heard” in different cultural environments;
- Determining the nature, extent, and limitations of public influence on official decision-making in a given environment; and
- Evaluating results and providing short term and long term feedback to policymakers and public diplomacy program officers.
- convictions, and divergent interests.

BUILDING CYBERSPACE POLICY

Digital infrastructure is increasingly the backbone of prosperous economies, vigorous research communities, strong militaries, transparent governments and free societies. As never before, IT is fostering transnational dialogue and facilitating the global flow of goods and services. These social and trade links have become indispensable to our daily lives. „ Social and political movements rely on the Internet to enable new and more expansive form of organization and action. The reach of networked technology is pervasive and global. For all nations, the underlying Digital infrastructure is or will soon become a national asset“ (7, p.3).

To realise fully the benefits that networked technology promises the world, these systems must function reliably and securely. People must have confidence

that data will travel to its destinations without disruption. Assuring the free flow of information, the security and privacy of data, and the integrity of the interconnected networks themselves are all essential to global economic prosperity, security, and the promotion of universal rights. For these technologies to continue to empower individuals, enrich societies, and foster the research, development, and innovation essential to building modern economies, it must retain the openness and interoperability that have characterized its explosive growth.

The world must collectively recognize the challenges posed by malevolent actors' entry into cyberspace, and update and strengthen our national and international policies accordingly. Activities, undertaken in cyber space have consequences for our lives in physical space, and we must work towards building the rule of law, to prevent the risks of logging on from outweighing its benefits. The future of an open, interoperable, secure and reliable cyberspace depends on nations recognising and safeguarding that which should endure, while confronting those who would destabilise or undermine our increasingly networked world. (7, p. 3).

International cyberspace policy is the belief that networked technologies hold immense potential for the world nations international cyberspace policy should empower the innovation that drives our economies and improves lives. Cyberspace's Future is related to the reliable access to the Internet which is available from nearly any point on the globe, at the price that businesses and families can afford. Computers can communicate with one another across a seamless landscape of global networks permitting trusted, instantaneous communication around the world. Content is offered in local languages and flows freely beyond national borders, as improvements in digital translation open to millions a wealth of knowledge, new ideas, and rich debates new technologies improving agriculture or promoting public health are shared with those in greatest need, and difficult problems benefit from global collaboration among experts and innovators. (7, p. 7).

RESUME

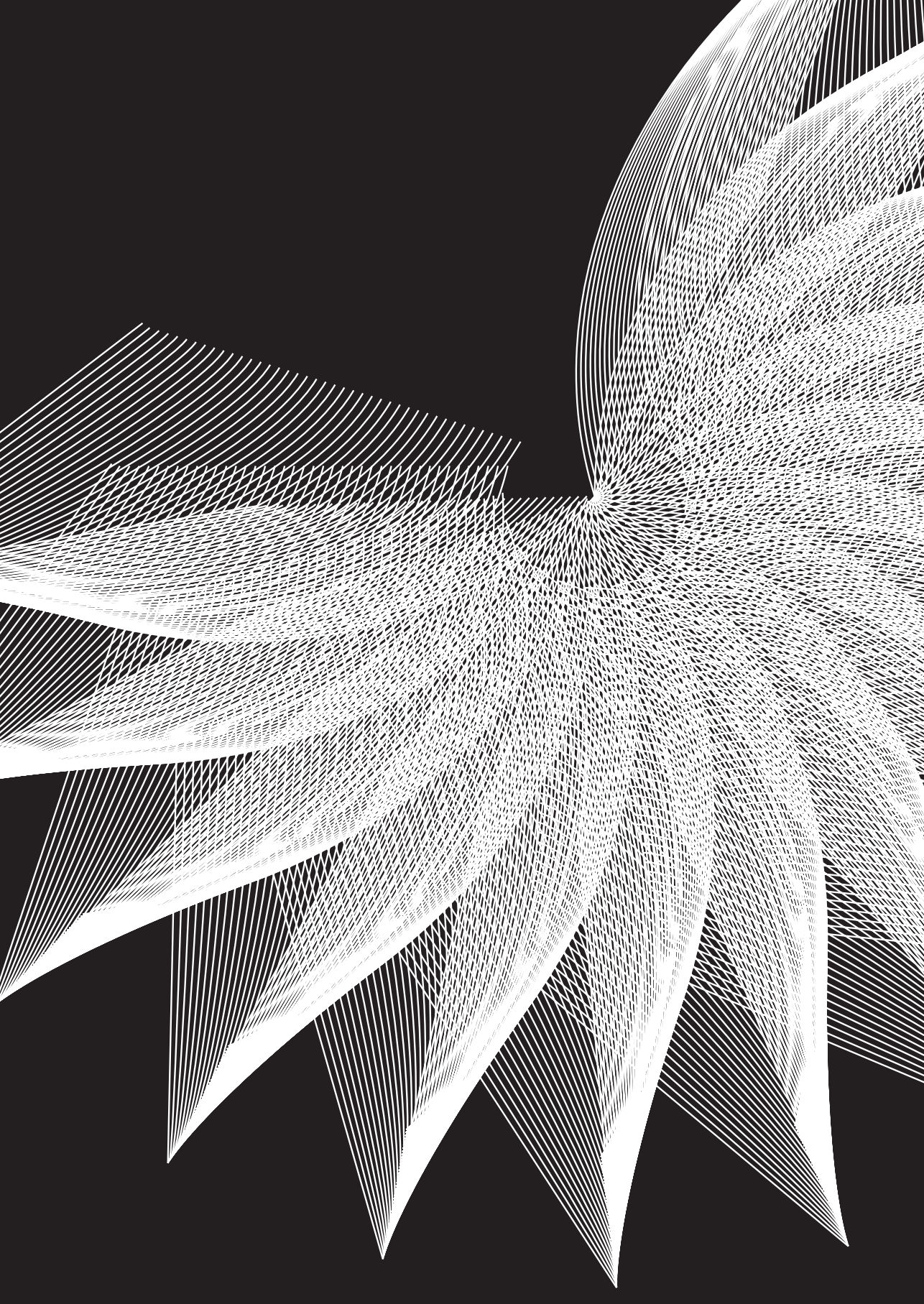
There is great need for critical mass of Highflyers – vision builders, change masters, strategic alliance managers, relationship builders, reformers and organizational re-architects.

Border-crossing knowledge, and its multiple impediments, are de facto problems. Four related keywords deepen understanding of the changing landscape of knowledge: *discipline, boundary, crossing, interface and classification*. (9, p. 18). New hybrid zones of intellectual discourse bordering on different fields of science have also been appearing at a growing rate. Information Society boundaries can be crossed, confused, consolidated or collapsed. They can also be revised, redesigned and replaced, but not entirely abolished. The idea of an interface overlaps with the idea that a border functions as a dividing line and a zone of crossing.

For an information industry to continue to grow globally, however, it requires that national policies evolve into stable international policy framework. If further progress is to be achieved, a coherent long-term global international communication strategy is required.

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THE USE OF FORESIGHT AS A PARTICIPATORY PLANNING TOOL IN THE PROCESS OF INTEGRATED LANDSCAPE MANAGEMENT

FERNANDO ORTEGA SAN MARTÍN

ABSTRACT

Foresight is a discipline developed as from the years fifty of last century, which has become a fundamental tool in participatory planning processes in which social agents are empowered to identify, analyze, evaluate and decide on what future scenario is the one that deserves to be built because it gives better conditions for sustainable development for an organization and / or territory. The main focus of foresight is the person, who is also the director and actor of the future, with responsibility and commitment to the new generations to create the conditions for the territory in which they operate to maintain harmonious relations with the environment, expanding the meaning of the term "quality of life."

KEYWORDS

Prospective, future, Integrated Landscape Management, planning, sustainable development, scenarios.

INTRODUCTION

While concern for the future has been ongoing over the years, at the dawn of humanity, the future was closely linked with religious ideas, to the extent that it was commonly believed that the future lay in the hands of God, whatever idea they had of him.

But as the different alternatives future, it became known and that futures were in the hands of men, the concept was secularized, and women and the men realized that the construction of the future was in their hands. It is clear that learning was slow and riddled with errors. We went through war, disease and disasters caused by our lack of respect to nature, to understand that in future we are all actors.

It was in the fifties, when the concept came to mature, first in France, then throughout Europe, and then crossed the oceans to reach America, Asia and Africa. Today no one discuss the need to build the future, though many evade that responsibility, making "others" accountable: rulers, politicians, businessmen, and academics, and military. It is understood that the future is shared, and if we do not work in building a better future for everyone, including ourselves, what will happen is that we will simply live the future created by others, for their benefit and not ours, so we will be accomplices in all the bad things that future may bring.

The co-responsibility in building the future has led to systematize that knowledge as a scientific discipline, foresight, now 50 years after it was founded, is still maintains the freshness of youth, because the future always renews the thoughts.

But the challenges are greater today. Nature shows us the scars that have caused thousands of years of a so-called "process of human development." And we look at what we have created with shame and with guilt for not knowing what world are we leaving to future generations.

It is time to change. It's time to take up the challenge of building a world in which we coexist with nature without depredating it. The work is hard, but we have to start from below, from the territories, searching that each geographical unit, economic, social, political, and cultural, build its own change, identifying a possible and sustainable future scenario.

As we will see throughout this article, foresight is particularly useful in helping the residents of the territories to begin this process of change, and not in a dis-

orderly way "trial and error", but systematically and consistently, seeking participation all and everyone.

EVOLUTION OF FORESIGHT

Foresight is born as a science and art out of concern and the need for researchers, politicians and businessmen to reduce the uncertainty of the future to improve their decision making. It was actually a reaction to the significant increase in complexity and uncertainty of the times we live in, mainly after the 70's. This explains its successful global spread as from the 80's, thanks to the work of French futurists and their British colleagues.

However, given that foresight is essentially voluntary, ie, is based on the concept that there is no predetermined future, but it is constructed in each fraction of time to come, their results, the prospective scenarios, not necessarily satisfy this need of "knowing" the future. Hence, for some, the prospects could be considered an "unhelpful" science, if only its mission is to identify scenarios and it did not give the next step, which is building on the "best" of them, as proposed by Godet.

Regardless if the scientific approach of prospective fathers is accepted, Gaston Berger and Bertrand de Jouvenel, or the strategic approach of Michel Godet, the fact is that foresight allowed the political, business, academic and social leaders counted with modern tools for planning at medium and long term. The economic development of Asian countries and the European Union's growth resulted from the application of foresight in formulating public policy and business, national and international.

But the real value of foresight has been discovered over the years, changing the formulation of scenarios of the original "top down" to "bottom up". The widespread use of foresight, through the efforts of the Academy to develop skilled human resources by organizing courses, diploma, masters and even doctoral, socialized the concept and prospective tools, taking them out of the office of planning and consulting firms to move to middle managements and then to all departments of corporations, sub-national and local governments, and to civil society organizations.

It has come to the understanding that, through the use of foresight, the future becomes a truly "collective creation" as the avant-garde theater. We all have an idea about the future and we can express, that individual vision, and added to the particular views of many others, helps to build the different possible scenarios, which are based on multiple buildings with different probabilities of occurrence, but all with the ability to become a reality, under proper conditions.

There is nothing as challenging as building the future. Hughes de Jouvenel rightly points out that "the future is the domain of freedom." And that freedom must be exercised by all members of the community, be it a corporation or a territory.

Today, the concept of "shared vision of the future" is repeated over and over again, all over the world. In corporations, is cited as a commitment by all partners to ensure the sustainability of the company over time. And the workers know very well that they should add their bit to the company, so that it does not lose market presence, because the ghosts of mergers and acquisitions are all about the organizations, seeking new victims. The prospective business or micro-foresight (as some call it making an analogy with economics and microeconomics), or using a more commercial name, the Corporate Foresight, is still being studied and implemented in all sectors of the economy from manufacturing activities "hard" to services. No doubt future uncertainty feeds the need to develop new analysis tools, but now, with a more inclusive approach: everyone from the young new worker to the CEO, are entitled to express how they imagine the future of the organization. And most likely, the future that actually will be lived is closer to the idea of the young worker, that the one thought by the CEO.

But how do we take this development of the prospective from the field of politics, economy and the market to build a "better future", holistically speaking? Because nothing is more distant to the reality than the cold aggregated data and then broken in "per capita" as if average-indicators were able to explain a truth full of gaps and inequalities.

For the futurists ask us every day about what will the future be? And our curious partners want to hear stories of wonderful inventions and technologies that hardly seem of this world. But the world's future lies not primarily in new technologies that will inevitably arise. What good it would be if the technology itself

could save humanity from its own mistakes! The future and its potential lie in the social, the interaction of people, in how people will share their hopes, beliefs and values, not an "intelligent" machine that will solve all problems.

THE FORESIGHT BASED ON THE SOCIAL

We should thank the cyclical economic and financial crises faced with increasing frequency by people, which allowed concerns about the future to increase, from the great halls of power (Boards, Ministries, Councils, etc.) to the ordinary citizen. We have learned to live with the crisis and it often helps us to strip the system errors and the incompetence of those who have held power, at enterprises and governments.

This has enabled the generation of public awareness on the need for action from the basis to build little by little, a new future, challenging but feasible. It is not easy to convince community members to move from being mere spectators of the future to be the main actors of change. We must overcome the natural reluctance to the new and the comfort of the status quo. As said by Javier Medina (2003):

"It is required to seriously address the future rather than resign to live guided by a pragmatism that is content with the immediate, often born out of comfort, to renounce one's own thinking or to be afraid of complexity."

Whether we are convinced that the future we can build or simply because we are totally disappointed with our leaders, the reality is that little by little, members of the communities are feeling empowered to make decisions about the future. It is not uncommon to hear of "participatory budgets" or "agreed plans", planning is being built with communities and not only they are called to "validate" what was done at desks far from the reality.

We can then speak of a social planning, from and to society. And the simplicity and easiness of use of prospective techniques (Environmental scanning, trend analysis, Delphi, abacus Regnier, Schwartz axes, back casting, etc..) that have contributed significantly to the transformation. Many of these tools are character-

ized by encouraging the participation of stakeholders, identify and evaluate their opinions and giving the corresponding the value, always under the criteria that all opinions about the future from relevant stakeholders are valid and deserve to be analyzed. For those not accustomed to the tools of foresight, we recommend revising the Manual on CD-ROM developed by the Millennium Project, entitled *"Futures Research Methodology Version 3.0"* (2010), which describes very clearly more than 30 of the methodological tools most used in prospective studies.

Thanks to the spread of Internet use worldwide, many of these tools can now be used via remote or "virtual", so it has become easier to summon the participants in a prospective study, no matter now their physical or geographical location, nor their number. It is not unusual then that in a given study, which applies the Delphi survey as one of the methods may involve several thousands of people.

Then the systematic planning of the future is no longer characteristic of some minorities, who had the knowledge or the resources, or power to exercise that function, but over the years, thanks to the development of modern technologies information and communication, there has been a gradual process of "democratization" of thinking about the future, that we must take advantage of.

THE PROSPECTIVE FROM THE TERRITORIES

The future is and will always be a very complex issue. So if we want to address it successfully, we must find the most appropriate gateway. Analyze the future of nations and now community of nations and the European Union, ASEAN or the UNASUR itself, has always been a challenge for the planning, because the interests, ideologies, needs and visions are not, or cannot be the same. This generates growing complexities that should be handled by technicians, but mainly by politicians, in order to create a minimum level of consensus.

But since the end of World War II, and mainly after the end of the Cold War has brought into questioning the concept of "nation-state" which was the basis for the constitution of the present borders between countries.

This gives place, in many regions of the world, to conflicts within countries, including sub-national regions that require equal treatment or at least differenti-

ated. It is these sub-national communities which begin to express and to revalue particular characteristics such as language, values and habits that enable them to demonstrate that they have their own identity, or not necessarily linked to a particular territory.

But in the process of search for "separate identities" it is found that in the same sub-national territories persist even several "identities" of distinct characteristics in particular local areas smaller in dimension. These communities are, in analogy to the biological, the "cells" from where the social process of building the future should start.

When working in the Integrated Landscape Management (ILM) it should be tried to identify such cellular communities, where the confluence of interests and wills constitutes a more homogeneous groups of the population, and which can establish processes for building a shared vision for the future.

It is always difficult to define the "territory" to be worked. The territories often transcend borders and geopolitical boundaries, even when referring to small spaces; are mostly social and economic units that have been built over years and even centuries, creating a very close bond between people and geographical areas where they dwell and work. This unity between person and environment is still a key to developing prospective planning processes on the territory's future.

For example, in the "territories" it is almost unnecessary to classify social actors as relevant or not to the planning process, as all people are important, and always have something to say about their own view of the reality they live in, and the future they would like to have. Work under this criterion, makes the whole planning process to be broadly inclusive, which is well perceived and received by the population.

A second approach, coupled with the first inclusion, that should to be taken into account in the planning process from the prospective territories, is that of sustainability, understood as a commitment to pursue the continuity of the community in time, for their contributions in social, economic and cultural to be maintained and develop over the years. And that is inseparable from the respect for the environment. Thus the ILM (Integrated Landscape Management) approach goes far beyond what can be a purely environmental cutting approach, but honors the concept of integrity that bears its name. From this it is sought an alliance between ter-

ritory-population-environment to face the challenges of planning assuming that there can be no development in the community, if we don't speak of a harmonious growth of the economic, social and environmental aspects.

Foresight, understood as a discipline to support the planning, becomes a crucial tool for the ILM, based on the criteria of inclusion and sustainability noted above, allows the inhabitants of a territory to be empowered with the ability to determine their future, not only by creating shared visions for the future by mere declaration, as it can be often the results of classical planning processes, mainly normative views, which are still very useful for the selection of strategies, and also serve for monitoring and evaluation by the inhabitants themselves.

The application for over fifty years of classical planning processes has led to boredom or disappointment of many people, tired of participating in processes that culminated in the formulation of plans that were beautiful on the shelves of government offices and that were not fully or partially implemented, simply because they ignored the complexity of the relationships of the variables in the future.

So, it is not uncommon to find areas with apparent specialization in mining activities, with serious environmental conflicts, where the population is faced with companies that exploit the minerals, or areas with agricultural specialization, where lack of water is still the source of conflict, because no one bothered to develop water storage infrastructure and programs for the proper use of irrigation technologies.

With foresight from the local areas, the planning process "bottom-up" can easily develop, systematizing the various territorial shared visions and adding them to the constitution of a shared vision at sub-national and / or national level, but always remembering to go beyond the traditional declarative views into normative visions, which are more achievable.

THE CASE OF LA LIBERTAD REGION (PERU)

An example of how to get to establish a shared vision for a sub-national territory is in the process of formulation of the Coordinated Development of the Region La Libertad (Peru) from 2010 to 2021, made between 2008 and 2009 by the Center Regional

Planning (CERPLAN) of La Libertad, with support from the National Council for Science, Technology and Innovation (CONCYTEC)¹.

La Libertad Region (RLL) is a territory of 25,570 km², which prides itself for having traces of cultural presence from 10,000 years ago, and where pre-Columbian cultures settled (Paiján, Cupisnique, Moche, Chimu, etc..) and that defined their particular way of seeing the world. Its capital, Trujillo is located at 550 km. north of Lima, the capital of Peru.

The RLL has two clearly defined territorial areas, the coast (from sea level to 800 meters) and mountains (from 800 to 4,700 meters above sea level), determining several ecosystems (27 microclimates, 7 agro-ecological zones 2500 wild plant species), ranging from super arid tropical desert to the rain tropical Andean tundra.

In the RLL there are two river basins, one of the Pacific Ocean and other of the Atlantic Ocean. The former determines five great valleys formed by rivers Jequetepeque, Chicama, Moche, Viru and Chao, of irregular flow increased from December to April and minimum discharges the rest of the year. The rivers of the Atlantic basin have a more regular flow and create valleys such as Chusgón, Coina, Cascas Huaranchal and whose rivers flow mainly in the Marañon River, main tributary of the majestic Amazon.

Although RLL is divided into 12 provinces, and those in 83 districts (political territorial constituencies), the reality induced the formation of practical units of social and economic mobility, that are mainly linked to the markets of the cities of the coast and circling the valleys of the Pacific basin that cut across the region.

The RLL is an area with many potential: nearly half a million hectares suitable for agriculture, 400,000 hectares of natural pastures, 80,000 hectares of natural forests and 2,500 acres of natural lakes. It also contains mineral deposits of gold, silver, copper, lead and zinc, which have begun to be exploited, and a vast sea area rich in marine species, which can develop a significant aquaculture activity. The Region has a public university (National University of Trujillo) and numerous private universities (UPAO, UCV, UPN, UCT, etc.). The main manufacturing activities are agribusiness and manufacturing of footwear, which employ thousands of people,

1. The executive summary of the Plan is available at the following address: http://www.regionlalibertad.gob.pe/sir/admin/docs/2version_resumen_PDRC_ultimo.pdf

as well as the services sector, which emphasizes tourism, as the RLL provides with first order attractions, as the remains of the Moche (Temples of the Sun and the Moon and the Wizard), Chimu (Chan Chan, the largest adobe city in the world) and Marcahuamachuco (called the Machu Picchu of the North).

As it can be observed, the RLL is an area rich with the potential to develop harmoniously. Therefore, before formulating a development plan using methodologies classic "top-down", the Regional Government chose to use a highly participatory approach, which encouraged the participation of hundreds of stakeholders, representing the public sector (regional government and local governments: provincial and district), private sector (chambers of commerce and associations of SMEs), academia (universities) and civil society (professional associations, grassroots organizations, political parties, etc.).

With all of them began the process of formulating the Plan and as usual, the first effort was to build a shared vision for the future of the region. Through numerous workshops at the district, first, then provincial, it was to identify a first regional and traditional vision, which reflected the aspirations and hopes of the people:

"By 2021 the region La Libertad has institutions and organizations strengthened and consolidated, interlinked with service-minded people and a culture of ethical values, duly represented by leaders trained and committed to regional development.

The population lives in decent housing with mass access to modern and quality telecommunications, with full coverage of energy services preferably clean and renewable sources.

The population is sensitized and trained in habits of environmental conservation and sustainable management of natural resources, environmental policies are implemented on the basis of ecological and economic zoning and land use plan. The conservation of water sources, forest plantations for protection, production and environmental services and economic activities that operate in harmony with environmental standards are common.

Extreme poverty is eradicated throughout the region, and equal opportunities regardless of sex, age, race, religion or physical condition is promoted and defended.

There is universal access and quality education with equity (based on values) at all levels without discrimination of any kind, adapted to the reality of the natural regions and provinces, with free public education, based on science and technology, with performance budgeting and working in complement to health, agriculture and other relevant sectors.

Access to health system is universal, with guaranteed quality and cordiality, without discrimination of any kind, with an emphasis on preventive health, with performance budgeting and by synergies with education and agriculture.

Liberty, in 2021 has a competitive agriculture: formalized, organized and with technology, integrated to internal and external markets, articulated with adequate infrastructure and access to credit, with efficient use of water resources and managed by ecological and development zones.

Mining and hydrocarbons subsectors fully formalized, creating processed products, operating in a sustainable and socially responsible way, more dynamic in their environment, development zones compatible with agriculture, livestock, aquaculture and social development.

Fisheries and aquaculture operating as conglomerates and / or sustainable value chains efficient and profitable, with high quality processed products and invigorating in their environment, development zones that enable decent and permanent employment.

There is urban and rural formal MSEs² operating in competitive clusters, creating innovative products and services and integrated internal and external markets. With medium and large industrial companies internationally competitive offering technologically advanced products and services.

La Libertad has brokers and tour circuits regionally macro integrated and positioned nationally and internationally with a diverse tourist offer."

2. MYPEs: Micro y pequeñas empresas.

As you can see, this is a development approach balanced and harmonious, but without an adequate correlation with the resources available to achieve that vision in the forecast horizon (year 2021). And this is where the contribution of foresight proved to be transcendental, by using the classical view as the main input for the identification of the different possible scenarios for the RLL and the choice of "stage-goal", ie, the best scenario given consensus that we must commit to build³. This meant moving from the classical view, basically declarative, to have a normative vision, the key to strategy formulation.

The stage-goal (normative vision) for RLL remained as follows (note the difference with the vision outlined above):

"By 2021, the La Libertad region has at least 80% of institutions and organizations strengthened and properly trained, at least 70% of them are in constant communication and positive interaction; public institutions run budgets results in a concerted and participatory manner and according to the targets set in plans, efficient control mechanisms operating in at least 08 provinces in the region.

In La Libertad, 80% of health and education facilities cater optimally; at least 50% of health establishment certified in quality and cordiality as their level of complexity, at least 60% of students in secondary schools developed comprehension and reading skills and 40% math skills, reducing by 60% the urban – rural gap, and completely closing the gap between men and women, at least 70% of teachers meet the requirements of public teaching career, characterized by high development and skills for the job.

At least 50% of small farms working properly organized and / or are articulated in building value chains diversity taking advantage of ecological compartments and ensuring food security with organic products and native to the region; 20% of the agricultural units are medium large companies working on a sustainable desert agriculture; fisheries and aquaculture supply seafood products of high quality and low

3. In the process of converting the classical view on the scenario-goal, the tool used was Challenging Futures Method, whose author is also the author of this article.

cost, thus increasing its per capita consumption by at least 50%; the MSEs operate in clusters and / or competitive value chains, integrated internal and external markets.

It has promoted a multi-modal transportation system with regional macro perspective, and all departmental roads are paved, with not existing district capital that is not connected to the transport system; it has harbor and airport of international standards that allow the input and output of goods and passengers of the region abroad in an efficient and competitive.

At least 20% of improvement projects and environmental conservation markets take advantage of carbon credits or other similar mechanisms, the environmental legal framework is completely fulfilled by regulating the provision of goods and services with environmental quality; water sources are preserved and managed on a sustained watershed; the population is susceptible and behaves in relation to eco-efficient energy use, water, telecommunications, emphasizing the use of renewable resources and energy."

As shown, the scene-target establishes a balance between desires and possibilities, but also provides elements for subsequent monitoring and evaluation plan. Thus the social actors of the territory can permanently ensure compliance with the objectives and goals.

For the Regional Government of La Libertad, to have the goal-setting has facilitated the formulation of development strategies by corridors or socioeconomic circuits, called "development zones":

- Julcan-Otuzco-Sánchez Carrión, Santiago de Chuco: agriculture and livestock for domestic consumption, mining and forest resources.
- Sánchez Carrión-Pataz-Bolivar: tourism, mining and interaction zone with the Amazon.
- Ascope-Gran Chimú-Otuzco: agricultural exports (asparagus, grapes, passion fruit, lime), sugar cane and livestock.
- Julcan-Santiago de Chuco-Viru: agricultural exports (asparagus, beans), tourism and forest resources.

- Trujillo-Otuzco: agriculture export and local consumption (vegetables and fruits).
- Pacasmayo-Chepén: export agriculture (grapes, bananas, asparagus), rice and beach tourism.
- Viru-Trujillo-Ascope: fishing industry (fish meal and oil) and agricultural exports (asparagus, artichokes, piquillo peppers, table grapes).

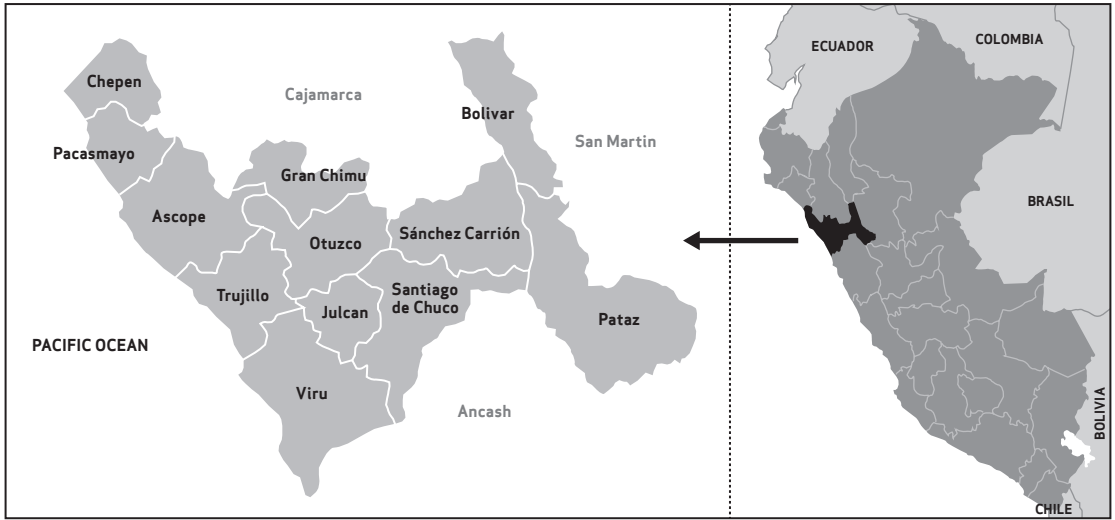
This establishes a first attempt of territorial organization, taking advantage of the potentialities of the valleys and socio-economic corridors, but from the views of stakeholders involved in their own lands, and not as was traditional, as a simple office work.

CONCLUSIONS

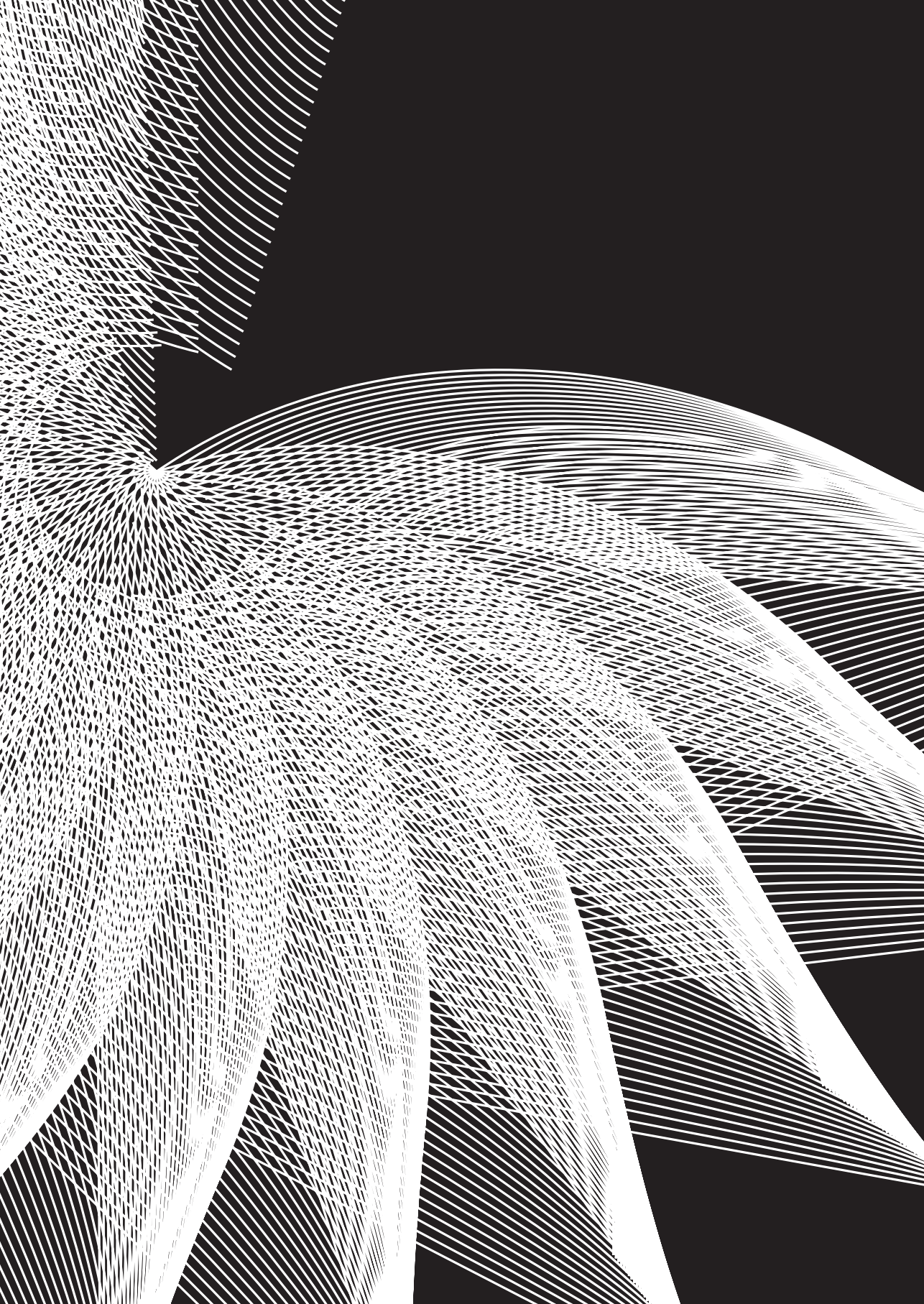
The evolution of foresight, from the academia to support corporate planning processes and especially territorial, is allowing the empowerment of stakeholders in identifying and building futures.

Given that the prospective approach is holistic, systemic and sustainable, scenarios goals that are selected by the consensus of the stakeholders will achieve higher levels of economic, social and environmental development.

Therefore, it is highly advisable to incorporate the prospective approach in the processes of ILM in order to develop a participatory planning, ensuring a high level of commitment of social actors with the results of planning.



Map of La Libertad Region (Source: lalibertad.info e INEI)



HENGQIN NEW AREA: A PIONEERING ZONE FOR INTEGRATED LANDSCAPE MANAGEMENT IN CHINA

WEI DAN

INTRODUCTION OF THE CONCEPT OF INTEGRATED LANDSCAPE MANAGEMENT

Since the notion of sustainable development took shape firstly in the report of World Commission on Environment and Development (“the Brundtland Commission”) in 1987, the world has undergone significant changes brought by economic globalization as well as environmental degradation. Despite the economic growth of the world economy and the progress achieved by the international community aiming to eliminate poverty in the last three decades, the tension between man and nature seems to be more intense than ever before. Today, climate change, land, water, air, energy and food safety become global issues. There is much greater awareness of and concern over the challenges of sustainable development.

Lands are essentials of survival for every nation or country. So far, the world’s answer to land degradation and land-use conflict has been less than successful. The United Nations Conference on Environment and Development (UNCED) in 1992

in Rio de Janeiro (Brazil) and the Agenda 21 (the document of the Earth Summit), recognized the importance of active participation of local communities and the strengthening of institutions in order to achieve the objectives of sustainable development by calling for an integrated approach to the planning and management of land resources. In order to guarantee the efficient and responsible use of land, in recent years, the paradigm of “integrated landscape management”, which enables strategic solutions to major sustainability challenges, is occurring and being applied in some territories worldwide.

Compared to the classical perceptions of “urban planning” or “land planning”, “integrated landscape management” uses a holistic and pro-active approach to manage the impact of human use on economic, social or environmental values. In accordance with Food and Agriculture Organization of the United Nations (FAO) and United Nations Environment Programme (UNEP),¹ “integrated landscape management” includes seven key elements, being (1) a clearly formulated objective and/or problem to be solved; (2) an enabling policy and regulatory environment, (3) effective institutions at local, sub-national, and national level; (4) an accessible knowledge base of the physical conditions including alternative land use, the socio-economic conditions and legal framework; (5) a recognition of stakeholders and their often differing objectives; (6) a platform for negotiation and (7) a set of planning procedures. Even though to date there is no universal and uniform understanding on the concept of “integrated landscape management”, it embraces and accepts the following guiding principles²: (1) be comprehensive and balanced in their assessment of the values, benefits, risks, cumulative effects and trade-offs; (2) be collaborative and inclusive, proactively seeking out timely engagement, sustained relationships and partnerships among participants; (3) be responsible and accountable for decisions and actions; (4) be consistent with the direction provided through guiding policies, plans and decisions; (5) be informed by knowledge and science; (6) use adaptive management to continuously improve tools and processes; (7) know the roles and responsibilities related to the achievement of outcomes and (8) respect the diverse values, interests, rights and knowledge of participants.

1. FAO and UNEP, (1999), *The Future of Our Land: Facing the Challenges*, Rome, p. iv.

2. Government of Alberta, Canada, *Describing the Integrated Land Management Approach*, ILM Shared Responsibility – Shared Future, ISBN No. 978-0-7785-8902-0 (Online Edition), p.5.

CULTURE AS AN KEY ELEMENT IN INTEGRATED LANDSCAPE MANAGEMENT

Very recently, more progress can be seen in terms of the contemplation of “integrated landscape management”. Some social elites and scholars highlighted the significance of “culture”, being one more variable and also a key in dilemma consideration. As described by Oosterbeek, “culture is representations and ways of achieving the economics”³. If we admit that integrated landscape management is a way of behaving, then culture is a means of education and a source of inspiration that enhances man’s self-cultivation.

Notwithstanding the diversity of economic development levels and social systems in our planet, culture carries out a noble mission for convergent global human behaviors. Human actions are always directed by their mentality and consciousness. Culture has its source in hearts and reaches directly the hearts. Communication between the hearts is what culture is all about. Compared with very flash statistical figures of economics, influences of culture on human society are everlasting. Culture permeates every aspects of our life and exerts its impact on man in a quiet way, like water trickling down and moisturizing all beings. Culture looks like fragile but is strong and resilient indeed, playing an irreplaceable role in enriching the mind, enhancing friendship among people, promoting social progress and advancing human civilization. In a globalized world, culture represents the character and the spirit of a nation.

AN OVERVIEW OF CHINA’S DEVELOPMENT STRATEGY AND LAND PLANNING

Thirty-four years after the reform and opening-up policy was launched, China has made historic progress and become the second largest economy in the world. As a late-comer of globalization, in the course of modernization, China has been confronted with a great difference between eastern and western cultures as well as a clash between the dissolution of a traditional society and the construction of a modern one.

3. Oosterbeek, Luiz, (forthcoming), *Princípios de Gestão Integrada do Território*, in *Gestão Integrada do Território. Textos de Formação para o I Curso de Gestão Integrada do Território organizado pelo Instituto Politécnico de Tomar e pelo Instituto Bio-Atlântica em Ipatinga* (2010), p. 18.

China, like other developing countries, has been pushed into the defensive in the context of present stage of globalization. The economic globalization amplified the risks and costs of development, as evidenced by the widening gap between the South and the North and by emerging global threats, such as power politics, terrorism, contagious diseases and environment degradation, etc. But looking from another angle, all these have brought about historic opportunities for development. The challenges of globalization for the developing countries in general embody mainly in two levels. The first is the link between the national economy and the world market challenges the existing institutions and the domestic governance capacity, for example, the structural imbalance within national economy, vulnerability of capital market, increasing inequality in wealth, big gaps in regional development, etc. The second is in the international level, the developing countries are bearing great pressures because the new world order has not been rebuilt while the old one was not fully destroyed; and there are still many unbalanced situations or negative discrimination against the developing countries in the current multi-lateral system which requires more impartial institutions and rules to safeguard sustainable growth and gain credibility from all participants.

China has drawn a lesson from past frustrations and begun to adopt an open and an active attitude by implementing significant measures to introduce market economy and institutional innovations to surmount both internal and external limits, because the national economy needs the stimulus of external markets and technologies for the transition to a higher growth trajectory. A good homework to respond the challenges of globalization depends on national capacity of reforms, training period of development, and above all, the domestic conditions and comparative advantages. As for China, it possesses abundant physical labors which represent nearly $1/4$ of world summation; with regard to the two main resources of agriculture, China is short of cultivated land and water, being each of them only 7% of world gross amount; China also lacks capital, technological and other natural resources. The domestic conditions illustrate that China has visible comparative advantage in exporting labor-intensive products and should import more capital-intensive and resource-intensive products, attract foreign capital and introduce advanced technologies. Therefore, the right strategy is to participate actively in the international division of labor and coordinate the domestic politics, society and economy with globalization process.

As far as the land is concerned, China succeeds in feeding 23% of the world population with 7% of its arable land. Domestically, conflicts over access and rights to land resources have proliferated in last two decades. Economic globalization and trade liberalization are the most important challenges for attempts to make land use sustainable. China remains a developing country with typical features of a transitional economy. Numerous clashes arise due to competitions between long-term welfares and short-term earnings. On one hand, since the constant growth of GDP in China was achieved at the cost of destroying the ambient over the past years; there has been increasingly severe environmental pressure from over-exploitation of land. On the other hand, with the acceleration of modernization and urbanization, China has also paid enormous social cost. Competition for land among different uses is becoming critical; discrepancies related to this competition are more frequent and more complex. Land is a very scarce resource and the economic value of land is also increasing persistently. The land tenure, land transfer system and payment of land premium become main political issues. In many cases, land planning and management turn out to be a game between Central Government and local governments, due to different interests and needs. Destruction of habitats or forced evictions of populations in many urban areas have led to serious social problems. As such, land management requires full consideration of many controversies among different interest groups and stakeholders, as well as a holistic approach to analyze the conflicts between communal interests and commercial interests, between public interests and private interests, between cultural interests and economic interest and so forth.

According to the core value of the Chinese traditional culture, conflict between man and nature and conflict in the human society remain to be fundamental conflicts in the evolution of human society. In recent times, in responses to the environmental and social pressures, Chinese government has put forward two new strategic policies: “scientific concept of development” and “culture rejuvenation”.

The scientific concept of development (or scientific outlook on development), in the words of Chinese Premier Wen Jiabao, “focuses on integrating humanism with overall, coordinated and sustainable economic and social development, while pushing forward the reform and development drive to coordinate development in both urban and rural areas and in different regions, achieve harmonious develop-

ment between man and nature, coordinate domestic development and open up to the outside world.”⁴ With regard to the emphasis on the harmonious development of economy and society, sustainable and all-round development, to some extent, scientific concept of development and integrated landscape management seem to have different tunes rendered with equal skill, because both concepts call for a people-oriented development, which is comprehensive, coordinated and sustainable, although the first one has a broader meaning in addition to consideration of ecological principles and endurance of environment.⁵

The other strategic policy of “culture rejuvenation” aims to stress the prominent influence of culture as development drive. Chinese former Minister of Culture Sun Jiazheng once said: “A philosopher observed when one is hungry, one is only worried about one thing; when one is well-fed, one is worried about many things. If one thing is about survival, then the many things arise in the course of development”.⁶ Cultural value has a direct sharing on the creation of economic value. The strategy of culture rejuvenation adopted by the Chinese government identifies the crucial value of culture for obtaining the goal of sustainable development and culture is increasingly becoming a key pillar for economic and social development.

Even if the idea of “integrated landscape management” has not been popular in China, the strategic policies of “scientific concept of development” and “culture rejuvenation” have created favorable conditions for the understanding and application of “integrated landscape management” in China.

4. See a report in People’s Daily, http://english.people.com.cn/200402/22/eng20040222_135467.shtml.

5. FEWSMITH, Joseph, “Promoting the Scientific Development Concept”, *China Leadership Monitor* No. 11, available at http://media.hoover.org/sites/default/files/documents/clm11_jf.pdf.

6. SUN, Jiazheng, (2007), *China’s Contemporary Culture: Dream and Pursuit*, Beijing, Foreign Languages Press, p. 82.

HENGQIN NEW AREA: AN EXPERIMENTAL ZONE FOR INTEGRATED LANDSCAPE MANAGEMENT IN CHINA

Hengqin is an island in Zhuhai, a prefecture-level city and Special Economic Zone in the Guangdong province of China. Hengqin Island is adjacent to Macau, a city ranked the first place of profitability in global gambling destinations by gaming revenue, and is connected to Macau's Cotai via the Lotus Bridge. Hengqin is the largest among the 146 islands of Zhuhai, being roughly four times the size of Macau. This area of 106 km² with a population of about a few thousand (a majority people with fishing and planting bananas for a living) is a resort paradise.

Until the year of 2009, Hengqin was largely underdeveloped although its potentials have long been recognized. Starting from 27 June 2009, “relatively sleepy Hengqin Island has been given a big wake-up call”,⁷ when the Standing Committee of the National People's Congress of China officially decided to give Macau permission to build the new campus for the University of Macau (UM) in Hengqin Island and authorize Macau to exercise jurisdiction over the new University of Macau campus on Hengqin Island.

The UM project is only a starting point. According to the State Council's Hengqin Overall Development Plan, Hengqin New Area will become the third “state-level special zone” after the Pudong New Area in Shanghai and Binhai New Area in Tianjin. What makes the Hengqin New Area something distinctly new is the emphasis on its four objectives: an “open island” interconnecting Hong Kong and Macau, a prosperous and livable “dynamic island”, a knowledge-intensive “intelligent island” and an “ecological island” with resource and energy conservation plus environmental friendliness.⁸ Moreover, Hengqin will be the first exemplary zone for regional cooperation between Guangdong and the two special administrative regions of Macau and Hong Kong under the formula “one country, two systems”. In-

7. EWING, Kent, (2009), “China's sleepy Hengqin wakes up”, 2009 Asia Times Online (Holdings) Ltd, available at <http://www.skyscrapercity.com/showthread.php?p=75721099>.

8. For more details, see information available on the official website of Hengqin New Area, <http://www.hengqin.gov.cn/show.aspx?id=152&cid=18>.

terestingly, Hengqin New Area, a new urban landscape development, was designed and launched largely due to the serious constraints in terms of land in Macau and Hong Kong. Both special administrative regions of Macau and Hong Kong's major shortage is on land supply and Hengqin can be a good help in developing Macau, in particular. In this real context in China, Hengqin can be considered as the pioneering zone of "integrated landscape management" and the approach applied in Hengqin is an innovation that has placed solid basis for integrated development and smooth operation of the principle of "one country, two systems". As such, land planning and management in Hengqin will have profound economic, political and cultural implication.

Hengqin New Area's uniqueness is the coexistence of different social systems, different levels of development and different legal systems. When Hong Kong and Macau was handed back to China respectively in 1997 and 1999, the Joint Declarations, the Constitution of China and the Basic Laws provide a "One Country, Two Systems" formula, endowing the two regions with a high degree of autonomy for internal matters, own constitutions guaranteeing legal systems and strict border controls with the mainland, except in defense affairs and some foreign affairs to be in charged by the Central Government. One decade or so after the handover, Mainland China has become an important source of capital and tourist income for Hong Kong and Macau and the two regions have become economically integrated with the Pearl River Delta. As commented by Ewing, when economic integration develops to a certain extent, some kind of physical (geographical) integration becomes inevitable.⁹ Hengqin will be a new Macau and Macau can find a good integration, in the economic, social, educational and scientific spheres, with South China.¹⁰

From legal point of view, many issues remain to be solved urgently in Hengqin Island due to the coexistence of different legal orders. Firstly, within the UM's new campus, Macau law will be applied. Secondly, under the Framework Agreement on Cooperation between Guangdong and Macau, the Guangdong-Macau Industrial Zone covering 5 km² is reserved for Macau's use. As a result, there is a need for

9. EWING, Kent, (2009), "China's sleepy Hengqin wakes up", 2009 Asia Times Online (Holdings) Ltd, available at <http://www.skyscrapercity.com/showthread.php?p=75721099>.

10. See a report of Macao Daily Times at <http://www.macaudailytimes.com.mo/macau/22926-GuangdongMacau-arrangement-Hengqin-shape-MSARs-future.html>.

integration and harmonization of different legal systems between Macau law and Chinese law. Thirdly, according to the Regulations on Zhuhai Special Economic Zone Hengqin New Area, Zhuhai Government will have overall responsibility over Hengqin development, but will give the area independent administrative power over personnel, property and assets, and help Hengqin to access the Hong Kong and Macao legal systems. This Hengqin New Area structure for decision-making, implementation and supervision is the first of its kind in China.

So far, a number of initiatives have been proposed to overcome the existing technical barriers. Mainland China exercises full sovereignty and administrative over Hengqin, however, the Central Government has agreed to offer the area policies even more “special” than those given to special economic zones. Macau shall pay an amount of rent for the use of the land in order to develop new industries, generate more jobs and diversify its lop-sided economy on gaming. For instance, the Traditional Chinese Medicine (TCM) Science & Technology Industrial Park of Cooperation is the first Guangdong-Macau co-developed project in the area of 1.5 km² on Hengqin Island, in which Hengqin provides land and Macau provides money. Another example is that Macau government has agreed to build a tunnel from its Coloane Island to Hengqin through which students and faculty of the new campus will commute without being required to pass through immigration. As far as customs clearance in Hengqin is concerned, two categories will be managed, the checkpoints between Hengqin and Macao are to be managed as Category One, mainly responsible for inspection and quarantine for entry and exit of persons, goods and vehicles; while checkpoints between Hengqin and the Mainland are managed as Category Two, mainly responsible for clearance and supervision of entry and exit of goods. New infrastructures, industries, services, property developments and other large-scale collaborative projects are designed to attract Macau population to move to the new region. Residents of Macau and Hong Kong and foreigners will be granted visa-free access to Hengqin and positive progress has also been made in gaining approvals in industry and IT, finance, land and partial service outsourcing preferential policies in Hengqin. The new area will still also enjoy free trade zone treatment.

When one analyzes the development of Hengqin New Area from the thinking of integrated landscape management (even though China has a long way to go to improve constantly this approach), one can still find some interesting implications.

First, Hengqin is the only underdeveloped area located in the Pearl River Delta. It was once labeled by Chinese Premier Wen Jiabao as a treasure. Notwithstanding its relatively small space, its development plan was approved by the highest political organ in China (Standing Committee of the National People's Congress). Different from the path used for exploration of other territories in Mainland China, more than half of the island's landmass of 106.46 square kilometers will be prohibited, making it a rare eco-friendly patch of China.

Second, the exemplary role of Hengqin New Area lies in to build eventually a zone for innovative regional cooperation under "One Country, Two Systems". Macau and Hong Kong are constricted by limited supply of land. However, through scientific and rational development of Hengqin, the core cities in the Greater Delta can act as the "backbone" to promote overall development of the Greater Pearl River Delta cities and Pan-Pearl River Delta region and to play a role as a national economic center.¹¹ In the empirical case of Hengqin, land becomes a valuable resource to achieve a win-win situation for different regions and groups of people. If Macau and Hong Kong are perhaps reaching a saturation point of development in the sense that urban space is insufficient, Hengqin will provide a golden opportunity for their sustainable development. At the same time, Hengqin will also benefit from rich financial resources of Macau and advanced management experiences and know-hows of Hong Kong.

Third, since the Hengqin Overall Development Plan was launched in 2009, one can find a more transparent and open access to relevant information released by governmental institutions as well as a much easier negotiation platform. The population involved have been widely listened and consulted and public participation has been highly encouraged.

11. For more information, see an introduction on the website of Macau Institute for Promotion of Trade and Investment, available at http://www.ipim.gov.mo/publish_detail.php?tid=14444&mode=print&lang=en-us.

Fourth, and perhaps the most relevant one, culture plays a key role in the development of Hengqin. Quite different from the old thinking to emphasize the maximization of economic benefits of a piece of land, culture takes a lead in the planning and management of Hengqin. The designers of the Central Government of China initiated this big project with an institution of higher education (University of Macau), hoping that university graduates in Macau's higher education sector will be able to satisfy the needs of the new developmental plans of Hengqin-Macau and Macau higher education institutions can train the Macau people in a strategic way to prepare for a new Macau in the area of Hengqin in the coming two decades. Culture industry will be a top priority in Hengqin's planning and development. The social systems in the three cities are totally different; nevertheless, Hengqin New Area would be a success because three places' cultures share a common origin and have the same roots (the Chinese culture with strong Confucianism influence). Culture is the spirit of the nation and links the hearts of its people.

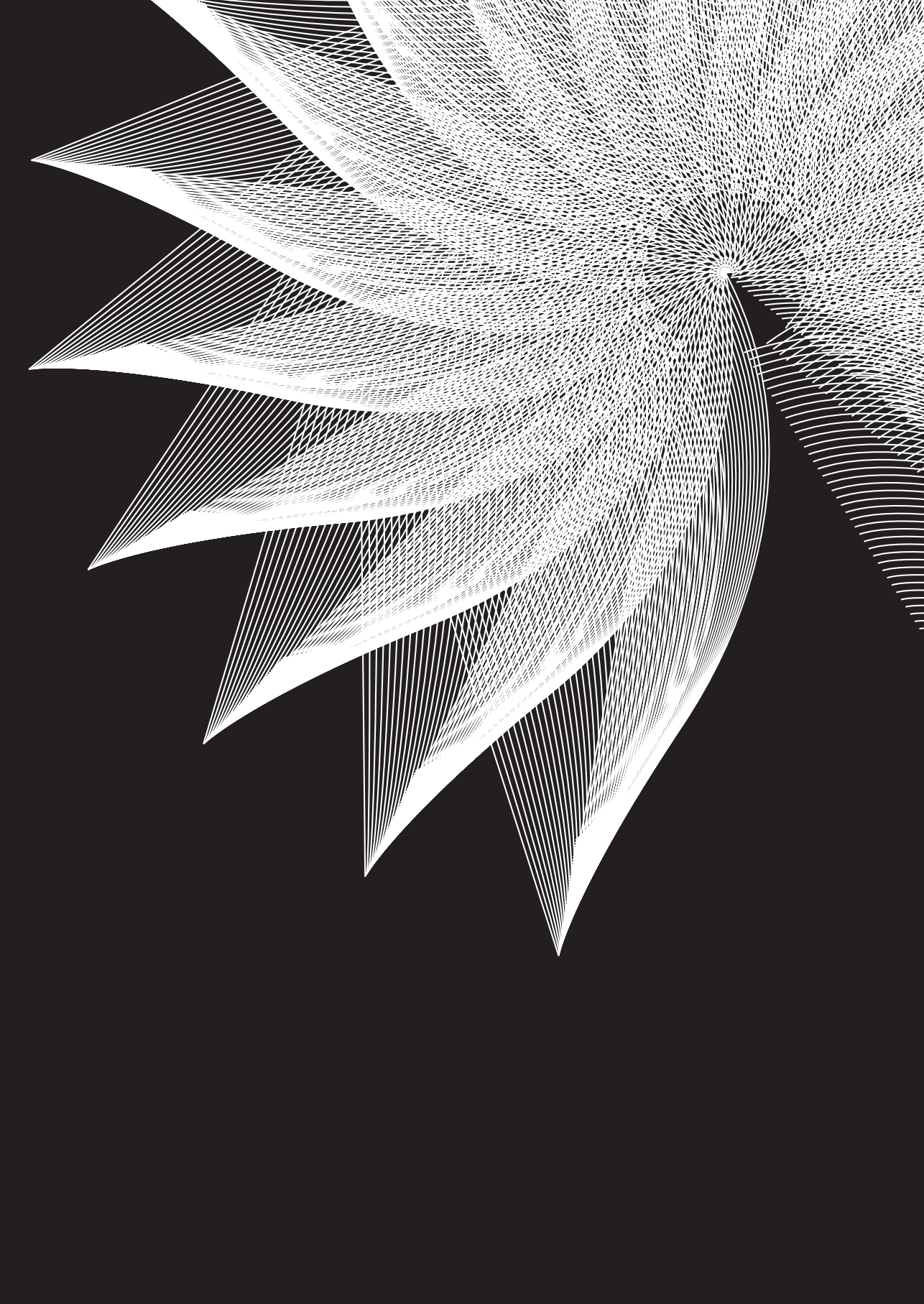
CONCLUSION

The above analysis on a pragmatic case of Hengqin New Area in China aims to illustrate how important cultural influence can be in integrated landscape management and in sustainable development at large.

To achieve sustainable development of certain territories, it is imperative to respect the wishes of different interest groups and fully release the potential of all stakeholders. It is also important to fully protect the basic cultural rights and interests of all people, and meet cultural needs of all social groups. Institutional building is a consistent priority in promoting cultural development and also a key solution in integrated landscape management.

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DOING IT RIGHT: EFFICIENT AGRICULTURE PROTECTS ECOLOGICAL INTEGRITY

JUAN DE ONIS

Brazil is facing the complex challenge of developing strategies to manage several new frontiers, all at the same time. There is the advancing agricultural frontier of the center-west that has become a dynamic region of food and energy production at the entrance to the deep Amazon biome, an ecologically sensitive area that runs a risk of climate change of global importance. There is the 7,000 kilometer maritime frontier where off-shore oil and gas discoveries have placed an entire marine domain under ecological stress. There is the urban frontier that has settled 85 per cent of Brazil's population in a dozen metropolitan mega-centers led by greater Sao Paulo's 20 million people and hundreds of new cities and towns that have received a massive migration from the rural interior. Each frontier poses different problems requiring huge investments in infrastructure, housing, energy, waterworks, public services, and communications that inter-lock one region with another in a vast national market. In the end, all the frontiers have in common the need to manage a territory in which human beings have to harmonize their economic and social activities with the natural surroundings on which all biological life depends. As will be seen, this ecological imperative requires a fundamental cultural evolution that can induce human behavior that preserves the environment in a specific territorial situation. What follows is a small case study of how this approach can overcome environmental inertia in a degraded habitat where inefficiency in law enforcement, public negligence and corruption create a vacuum of governance.

The territory in the north-eastern quarter of Mato Grosso, sometimes referred to as the Alto Xingu, is a frontier region known for a long history of violent land conflicts during a disorderly occupation that began 30 years ago and it still unfolding. Alto Xingu lies between the Araguaia River on the east, where Mato Grosso borders with Goiás and Tocantins, and the watershed of the Xingu River, a tributary of the Amazon. Between the two rivers are rolling plains that were once heavily forested but where more than 3.5 million hectares, an area bigger than Minnesota, have been cleared by pioneer farmers and ranchers and land speculators. In the Alto Xingu a hectare of forested land is worth about US\$250. When it is cleared to plant soybeans and corn or pasture cattle the price goes to US\$2,500. This is the powerful profit incentive that drives the land conflicts.

The Alto Xingu is an ecological “hot spot” because it is a transition corridor from the southern Amazon rainforest to the drier wooded savannah land called *cerrado* that makes good farmland. Federal and state agencies have created Indian reservations such as the Xingu Indigenous Park, where eleven ethnic groups totaling 9,000 people live in a densely forested area covering 27,000 km², a large island of preserved nature in the middle of the Alto Xingu. There are also conservation units that are supposed to protect the region’s rich biodiversity but they are not staffed by forest guards. Indigenous reserves in Mato Grosso are surrounded by ranchers and loggers who pay the Indians to use their pasture or extract lumber from the forests when they don’t send in squatters to invade the reserves. The local authorities of the National Indian Foundation or the federal Chico Mendes Socio-Environmental Institute that are supposed to enforce laws against violators rarely intervene because they have to confront armed ranchers and loggers who are powerful on the frontier. Mayors are murdered if they cross the land speculators who are often behind wildfires that are set to drive out a proprietor who resists selling his land. There are more than 30 municipalities in the region, many of them prosperous commercial centers, each with a unit of the state police, but the security conditions in the rural areas often resemble the Wild West.

This was the world that John Cain Carter encountered when he accepted management of a ranch in the Alto Xingu in 1997. Carter came to Brazil after marrying Ana Francisca “Kika” Garcia Cid, a member of a Brazilian family of cattle breeders who were pioneers in the development of the Nelore breed, imported from India,

which now dominates Brazil's beef cattle production. Carter, an American from south Texas, had worked on ranches during summer vacations, and after a stint with the U.S. Army's 101st Airborne Division in Iraq during the "Desert Storm" war, he met Kika at Texas Christian University where they were both studying ranch management. Carter, an outdoorsman and bush pilot, came to Brazil with a strong personal attachment to the conservation of nature. He took up the offer from his father-in-law to run a 8,200 hectare ranch on the Matos Grosso frontier and began flying all over the Southern Amazon and established strong relationships with local Indian tribes. As it turned out, this experience led to the creation of a social enterprise called Alianca da Terra that is organizing farmers and ranchers to produce efficiently and ecologically with preservation of forest and water resources.

Founded in 2004, Alianca da Terra brings together farmers, scientific researchers and people with innovative ideas to improve the sustainability of farming and ranching in the Amazon basin. Working in partnership with the internationally financed Amazon Environmental Research Institute (IPAM), the organization helps farmers achieve both agricultural productivity and environmental conservation. Alianca da Terra (AT) works with large and small proprietors, agrarian reform settlements, Indian communities, and protectors of native species. AT is also associated with Biobrasil, a cooperative that provides farm inputs and product outlets for member farmers at cost-saving prices. This is a system that integrates all the economic and social actors that want to contribute to environmental protection in a territory that needs better management. The motto is Doing it Right.

The Alianca-IPAM partnership grows out of the hard realities of the frontier, not from management textbooks or international forums on how to "save the Amazon". When Carter first saw his ranch, he was enchanted with the solid stand of trees, the wild animals, including jaguars, the crystal-clear streams, and the profusion of birds. Instead of clearing, he decided to reforest 1,200 hectares of the property that were degraded in order to come into compliance with the Forest Code while maintaining 5,000 head of top quality beef cattle in the already cleared pastured areas. The rest of Fazenda Esperanca, as it was named, was maintained as a nature preserve. It was not long, however, before Carter began to see that neighboring properties were undergoing a process of rapid destruction. The forested area of the biggest property, the Bordon estate, was invaded by squatters supported by the local mayor of Sao Fe-

lix do Araguaia. Other large forested tracts were destroyed by fire each dry season as land was cleared without environmental licensing or fire control. As a result, Fazenda Esperanca was invaded by squatters and the spread of fire from neighboring properties. The pasture for the premium cattle and the fencing for herd management went up in smoke, along with the profits necessary to sustain the ranch. In addition to the fires, Carter found he was losing cattle to rustlers from a Xavante Indian community bordering his property.

This all called for action to save Fazenda Esperanca and Carter is a determined man. First, he went to the environmental protection agency (IBAMA) and Indian affairs authorities (FUNAI) to seek measures to clear out the invaders of his property and take action to control fires. When this produced no results, Carter took matters into his own hands. He confronted Damiao, the Xavante chief on his reserve at Maraiwatsede and demanded that the rustling stop. Damiao, surrounded by painted warriors carrying clubs, said the Indians had to feed themselves and their families, a community of 900 people whose nutrition comes from rudimentary agriculture and hunting or fishing in depleted forests with diminishing sources of wildlife. After a tense exchange, Carter offered to provide the Xavantes with some cows and technical help to develop their own herd, as long as they agreed to act as breeders, not poachers. The deal worked. The Xavantes now have a growing herd of nearly 400 nelore cattle, vaccinated against disease and with insemination service for their cows with semen provided by ranchers who form part of Alianca da Terra. The Indians have a food source and an activity that can be maintained on their reserve with their own labor. The community received a fresh water system from a deep well it never had before, improving health conditions. Carter and Damiao are now friends and they collaborate on territorial issues, such as the annual fires that endanger the region, including the indigenous area of 170,000 hectares, much of which has been invaded by squatters. The Xavantes have formed a fire brigade that controls outbreaks of fire in the reserve and collaborates with a larger private fire control system that is one of the main accomplishments of Alianca da Terra, as will be discussed later.

The territorial advantage of collaboration with the local Indians can bring serious problems, however, with other actors on the land-grabbing frontier. The Maraiwatsede reserve is viewed by some powerful interests in Mato Grosso as one of the

most valuable areas for private land acquisition because it is located next to major highways that are being developed to provide transportation of profitable agricultural commodities to ports. Nothing has been done to expel thousands of invading squatters from the reserve, despite a federal court order to do so, and the Mato Grosso state legislature has passed a bill authorizing the state governor to swap the Maraiwatsede reserve for a state park (also heavily invaded by squatters) where the Xavantes would be relocated. The Indians reject this transfer and confront the organized squatter movement that wants the reserve, backed by big land speculators with influence in Brasilia. In this stand off, Carter began to receive menacing telephone calls from anonymous callers at his home in Goiania, capital of Goias, where he lives with his wife and two young daughters. As well, Carter realized that his phones were being tapped and an ambush set to get him at his ranch luckily was thwarted by his Xavante neighbors. Carter began to worry about his family. After a second major fire wiped out the pastures that Carter had restored at his ranch and damaged his forest, he decided to sell Fazenda Esperanca to a buyer who. promised to maintain the forest and waterways. Carter bought a new ranch in Querencia, an Alto Xingu district considered more secure, where powerful neighbors are members of Alianca da Terra. The Tanguro ranch at Querencia of the Maggi group, one of Brazil's largest soybean producers, is an AT member and IPAM maintains a research center at Tanguro that studies forest fire and hydrology.

Despite threats to Carter, the Alianca-IPAM consortium continues to expand its activities with nearly 500 registered farmers and ranchers representing properties with over 2.8-million hectares of productive land. Plans are being laid to expand the membership base to 1,000 in two years. With offices in Cuiaba, capital of Mato Grosso, and Goiania, capital of Goias, Alianca's management is staffed by 30 highly qualified young men and women who are strongly committed to the success of their social enterprise. Alianca da Terra generates a mystique. The work method developed by Alianca da Terra combines good agricultural practices with ecological disciplines that protect the environment, as required by Brazilian law, but which are often overlooked.. Since law enforcement is weak-to-non-existent on the frontier, the application of the Alianca method requires voluntary compliance by the proprietor and monitoring of performance. This formula grew out a meeting between Carter and Daniel Nepstad, chief scientific director of IPAM, with long research ex-

perience in Amazonia, a PhD. from the Yale School of Forestry in tropical ecology, and as an environmental lobbyist. Like most militant environmentalists, Nepstad was part of the critical chorus that blamed cattle ranchers for forest destruction in Amazonia. Carter invited Nepstad to his ranch and convinced him that there were good ranchers who could be part of the solution, not the problem, if they were shown how to farm and ranch with environmental responsibility. The deal that was struck created a technical team, with support from environmental philanthropies, like the Moore and Packard foundations, and international aid agencies from United States and Europe. With an annual budget of about US\$1.2 million, the Alianca has satellite monitoring capability that can pinpoint and map properties and teams of young agronomists and earth scientists that visit properties that are candidates for Alianca membership. These visits provide services that most proprietors on the frontier have never had before. Their property is geographically positioned accurately on a map that backs up an often murky paper title. The technicians diagnose the environmental liabilities on the property, such as degraded water courses, erosion, destruction of forest cover in protection areas, and locations of high fire risk. The diagnosis also covers the social situation of workers on the property, including pension coverage, housing and hygiene. The proprietor then decides whether he wants to sign up as an Alianca member which takes the form of a contract to correct the environmental and social failings identified in the technical report. The property is then monitored by Alianca to measure compliance. A proprietor who fails to meet the contract commitment over a defined period is notified that he will be scratched from the Alianca membership rolls.

Why is membership in Alianca important? A proprietor usually has to make a significant investment to fulfill his contract and there is rarely financing for environmental restoration, such as expensive replanting of native species in damaged riparian forest. After five years of field operations, it is clear that there are responsible farmers and ranchers who value the Alianca objectives of clean production chains and are making the necessary investments. There is also a growing market demand from large buyers of soybeans and beef cattle, some of which support Alianca financially, for products that have a certificate of origin associated with environmental conservation. The Alianca da Terra seal, a majestic tropical tree, is a valuable asset for a producer who wants to build a commercial image of good environmental behavior.

Alianca membership will become even more attractive when the associated cooperative Biobrasil provides Alianca members with advantages in procuring farm inputs and marketing their products. The AT label can only be attached to products from properties that are in compliance with the social-environmental contract signed to obtain membership. Wilson Mancebo, director of Biobrasil, believes the cooperative can provide many farmers with valuable know-how on efficient use of land, water, and protected forest areas as can be seen on Mancebo's own 3,500 hectare farm near Cristalino in Goias. This property combines soybean, corn, cotton and cattle production in a year-round system that irrigates during the dry season and counts on improved soil fertility for rich pastures that help maintain a herd of 10,000 head that are also fed in confinement with corn produced on the farm. This is high-tech farm management but it can be extended to many low-yield properties with technical assistance. "The coop will provide many farmers the opportunity to increase their yields and income on land that is now producing less than it can. We don't need to deforest more land to expand Brazil's agriculture and livestock production," said Mancebo. The concept that economic profitability can sustain environmental quality is summed up in Biobrasil's brochure to producers: "Biobrasil believes that producers in the red are not going to be protectors of the green."

Fire is the most damaging form of forest destruction in Amazonia today. Satellite images show the "hot spots" where fires break out all over the Amazon basin in the dry season. Most of these are in remote locations where they burn freely until it rains. Many other fires, usually caused by local populations, are a constant threat to existing properties and need to be controlled. The Alianca da Terra Fire Brigade, inaugurated in 2009, is an encouraging example of what can be done when local actors assume responsibility for protecting their territory.

Through personal contacts, Carter got in touch with the U.S. Forestry Service and proposed that a team of professional fire fighters be sent to Mato Grosso to help the Alianca train a fire brigade. The proposal was accepted and financing was obtained from the U.S. Agency for International Development. From their base in the Rocky Mountains of Idaho, the U.S. trainers arrived in the tropical setting of Alto Xingu, but despite very different climates, they brought fire control methods that are largely the same for any forest. With volunteers organized by Alianca da Terra,

including Xavante Indians, the trainers put together a fire fighting unit equipped with tools and protective clothing that has put out 89 large forest fires since 2009 with support from local proprietors in 15 municipalities of Mato Grosso. The central unit has trained 320 fire fighters in the region and is expanding its work to other areas of Brazil where proprietors have asked Alianca to organize brigades. Alianca claims that there was a 55% reduction of fires on its registered properties. Any member of the Alianca has access to a hotline telephone number to request help from the brigade. The fire fighters get a daily stipend when they are controlling a fire and during the rainy season they work on recovery of degraded areas. Alianca conducts educational courses on fire control in strategic areas with the participation of agrarian reform settlers, rural proprietors, and Indian communities. The Alianca fire brigade will have the support this year of a specially equipped aircraft that can spray tons of water from the air to contain a wildfire. Amazonia would be at less risk of forest destruction if the federal and state governments followed the Alianca example and created a regional network of voluntary fire brigades supported by adequate training and equipment. This system could be of great institutional importance because fire brigades in Brazil's better organized territories are respected for their social services.

The quest for land on the frontiers of central Brazil is not limited to large property holders. Many thousands of small settlers have migrated from nearby states searching for new opportunities in the unoccupied territories. This has produced frequent land conflicts because the small settlers usually occupy properties that are claimed by some big land developer but are empty except for some cattle. A typical case is a big ranch in the Alto Xingu called Fazenda Florao, a property of over 60,000 hectares that runs for miles on the banks of the Rio das Mortes, a major tributary of the Araguaia River. In the nineteen-seventies, Fazenda Florao was a wilderness grant from the state of Mato Grosso to a powerful Sao Paulo textile magnate who pursued frontier land development, like many other corporate speculators in Brazil. But the Rio das Mortes also brought small settlers who came with their families and squatted on portions of the Fazenda Florao. The conflict that ensued pitted police and hired thugs against the settlers with some bloodshed. This led a democratically elected state governor to expropriate Florao and create an agrarian settlement holding over 500 families on lots of 100 hectares. Like many other

settlements of the National Agrarian Reform Institute (INCRA) this produced poor results. After stripping the forests of valuable timber and over-fishing the river, the settlement declined into a degraded region where dairy cattle and small subsistence plots provide a precarious farm income supplemented by a monthly governmental social subsidy called Bolsa Familia and farm credits that are never repaid.

The attention of Alianca da Terra was drawn to the settlement on the Rio das Mortes because one of Carter's ranch hands, Edemar Souza, who has become the commander of the AT Fire Fighter Brigade, was from Novo Santo Antonio, a river town where many of the Florao agrarian reform settlers now live. A team of AT agricultural technicians visited the settlement and came up with an innovative idea. A new form of small-scale cattle breeding by settlers, who have some pasture on their lots and experience in herd management, could be profitable without clearing any additional forest. Using artificial insemination of genetically selected cows, the settlers could produce quality calves that would be sold to ranchers. The settlers would increase their incomes substantially and the remaining forest on the Rio das Mortes would be protected and restored by an agreement with the participants monitored by Alianca da Terra's technical team. This project awaits bank financing, but it is economically viable, ecologically sound, and socially desirable because it integrates many local actors in a sustainable clean production chain. The Rio das Mortes is a micro-territory with its particularities, but the principle of integrated management can be adapted to many similar low-yield rural communities that are environmentally at risk. INCRA's settlements are among the most in need of this innovative approach and Alianca has been approached by INCRA to help organize production for settlers at the Bordon site where fire control is a major environmental problem. The agreement depends on the settlers accepting Alianca rules against use of fire and in favor of maintaining riparian vegetation along water courses. INCRA settlers are among the most notorious violaters of legal limits on deforestation and maintenance of permanent protection areas on their small lots.

A visitor to the Amazon frontier comes away with the impression that Brazil lacks an integrated territorial policy for the region. The big hydroelectric projects in the Amazon watershed go forward with very little social and ecological planning. All-weather highways through densely forested regions of Para and Amazonas invite disorderly occupation that is not easily controlled. Public initiatives

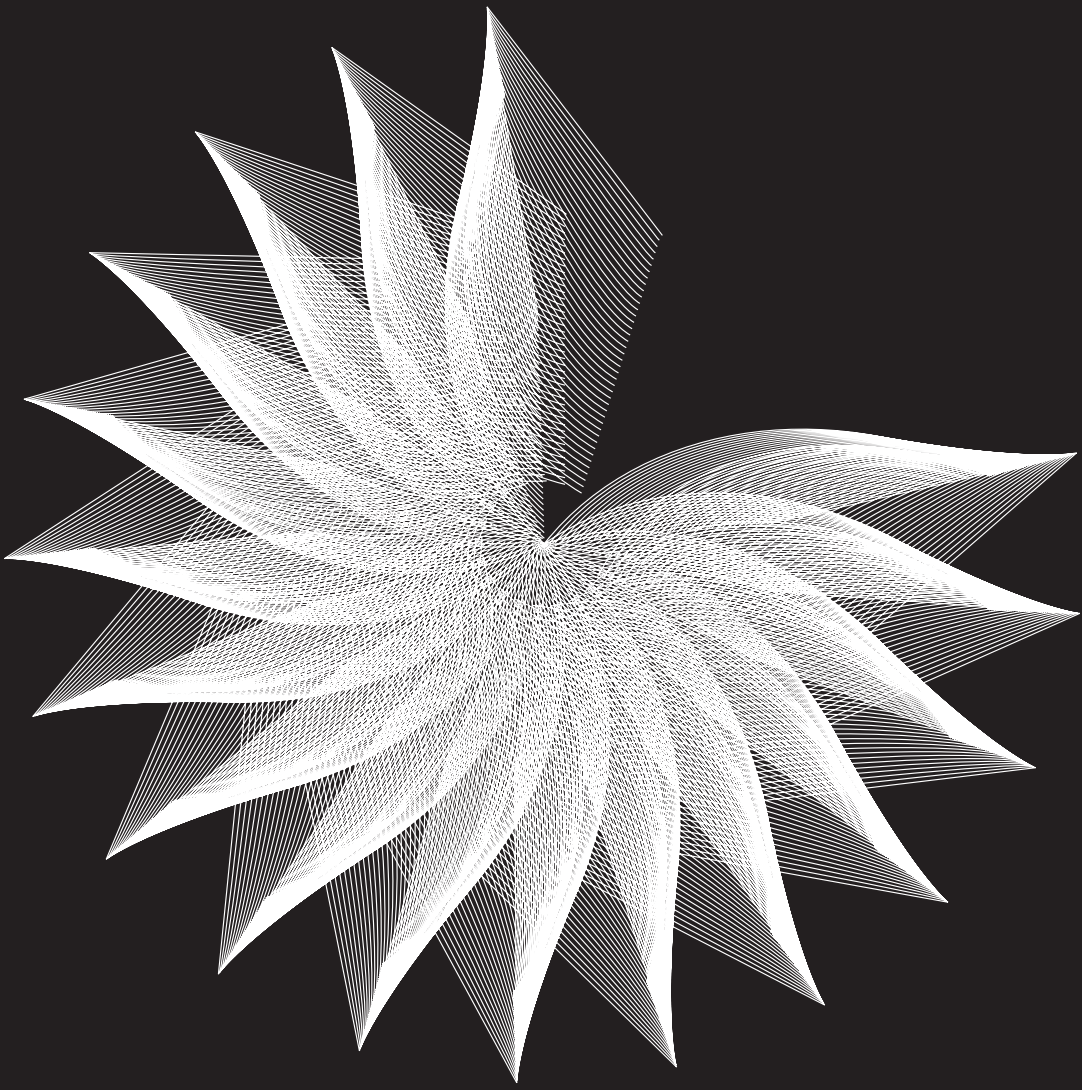
to rationalize land tenure in Amazonia don't advance and economic-ecological zoning of the region is at a standstill. Land tenure and zoning are essential instruments for developing governance in the region. With the exception of the state of Acre, which has partially imposed economic-ecological zoning of its territory, the rest is still much the dominion of the Wild West.

Yet, despite the adverse conditions of weak public institutions and dissonant cultural currents on the frontier, the possibility exists of establishing territorial management on a local scale when there is leadership for community action. Alianca da Terra is one example, but there are others, such as the conversion of the municipio of Paragominas in Para from an area of forest devastation into a model for community policies that preserve protected areas and forested private reserves on a municipal scale. Paragominas was created by settlers who came to occupy land that was opened up by the Brasilia-Belem highway in the nineteen-sixties. The settlers tore down 10,000 km² of forests and supplied dozens of sawmills with logs that became construction lumber trucked to Sao Paulo or tropical wood panels exported to Europe. After 30 years, when half of the forest was gone, the lumber mills began to move out because timber became scarce. What was left was being consumed in charcoal furnaces to produce fuel for pig iron foundries with huge emissions of CO₂ and toxic gases. IBAMA put Paragominas on a blacklist of 34 municipalities where illegal deforestation in Amazonia was most severe. Large ranchers were hit with a reduction of public credit and the slaughterhouses they supplied were threatened with an embargo on foreign sales. Mayor Adnan Demachi, a lawyer who quotes Cicero as his political mentor, and enlightened leaders of the association of rural proprietors, saw that the future of Paragominas, a city of close to 100,000 people, required a civilized response to the ecological devastation. With advice from IMAZON, an NGO with strong international credentials for its research on forestry and land use in Para, the community leaders put together a policy to establish Paragominas as a Green Municipality, and thereby get off the blacklist. The essential reform was the enrollment of 80% of the properties in a municipal registry requiring mapping of land use and a commitment to maintain forest and water resources on their properties. This registration target was reached in two years and Paragominas is now the postcard model for municipalities in Para and other states that are adopting measures to register properties and reduce il-

legal deforestation. Cattle raising remains the main activity, with a herd of over 500,000 head, but plantation forests have begun to supply a large plywood industry and furniture makers in Paragominas with renewable raw materials. There has also been a strong increase in agricultural crops, such as soy, corn and rice, and investments to recover degraded pastures. This diversification reduces dependence on logging that is supplied by illegal deforestation. IMAZON supports a new system of forest concessions on public lands controlled by the Brazilian Forestry Service that require operators to apply management techniques for timber removal that are supposed to produce renewal of the native forest over a period of decades. The concessions provide revenue for the badly funded Forestry Service and provide a flow of legal timber to Amazonian towns that live off sawmills. In some town, IBAMA has closed sawmills for receiving logs from illegal deforestation. So, the system is popular with mayors who want to qualify as Green Municipalities without losing the employment provided by sawmills. It remains to be seen whether the forests being logged by the concessions will renew naturally and maintain their ecological properties.

Scientific researchers at IPAM and other institutions, including Brazil's well respected Agricultural Research Enterprise (EMBRAPA), are finding growing evidence that the Amazonian biome plays a vital role in the emission of "greenhouse gases" that can increase global atmospheric temperatures. Depending on deforestation and land use, tropical forests can either capture huge amounts of atmospheric carbon used in photosynthesis by growing trees or emit equally huge amounts of carbon from a dying forest that has been degraded by fire or drought, or both. If observations underway confirm that deforestation reduces the amount of water reaching the atmosphere by evapotranspiration from leaves, this could alter the rainfall patterns on which agricultural crops and pastures depend. If benign rainfall seasons are disrupted, agriculture and livestock production in Brazil's center-west could suffer serious limitations; but, reducing this danger presents an opportunity for Brazil to develop its forestry vocation in an environmentally sustainable way. If producers become convinced that the rainfall on which they depend is at risk from deforestation, they will invest not only in protecting forest on their land but they will see plantation forests in a new light. Brazil is already a major producer of cellulose from planted forests in the Atlantic coast states. In the center-

west, there are vast cleared areas suitable for tree plantations but transportation infrastructure and energy costs discourage large investments. The main obstacle is financial, because tree plantations are a long-term investment with slow return for which development lending is necessary, along with infrastructure investments. But an active forestry policy that combines plantation forests with agriculture and livestock production can contribute to protecting natural forests if conservation units are effectively guarded. That would make Amazonian plantation forests a strong candidate for international carbon credits from industrial polluters who need to offset their environmental deficits by capturing greenhouse gases abroad. This is a territorial management challenge that calls for a culture of cooperation between governments, private local actors, international financiers and environmental regulators who have the will to enforce laws that protect public assets, like the great Amazonian forests. Brazil has for long been alerted to threats to its national sovereignty from unspecified external forces that “covet” the riches of its Amazonian territory. More attention should be given to the need for stronger governance in the region to control the destructive actions of native exploiters. As Bismarck said, sovereignty only exists where national laws are enforced.



GLOBAL ENVIRONMENT, CULTURES AND INTEGRATED LANDSCAPE MANAGEMENT

ADAMA SAMASSÉKOU

The global environment is, nowadays, at the heart of all the issues relating to our very existence: from History to Genetics, from cultures and languages to governance, from religions to mass media. The challenge is fundamental for Mankind since the survival of the species and of the Planet are at stake. Uncertainties are hovering above our world in crisis, a multiple crisis which is the consequence of some of our actions and behaviour of dubious rationality. Serious threats are appearing directly due to our politics and practices, which in most cases are more likely to kill the patient than cure him, and which are compounded by our careless tendency to let matters slide.

The sooner our worldwide community becomes aware of Humanity's common destiny, the more efficient we' will be in facing the environmental challenge that concerns us all, whether we are well-off or not, powerful or weak, technologically advanced or not, and at whatever latitude we live. Each individual, each group, each community, each country, has its part of responsibility in the failings that are affecting the global environment, although some stakeholders are more responsible than others; and all nations have their role to play in the voluntary process of re-establishing the balance that needs to be restored and preserved.

Climatic change has sounded the alarm in Nature's immense décor and provoked a planetary awareness of the looming danger. These changes are like a red card being held up to the egregious exploitation of ever-scarcer resources that we

know to be finite, to our deliberately polluting activities that contaminate, destroy and provoke corrosive waste at all levels: at risky genetic manipulations, the consequences of which have been insufficiently evaluated, and which may, for all we know, cause irreversible contamination; to our harmful production techniques and our devastating consumption habits increased by toxic waste, that are damaging the maintaining of ecosystems and reproduction of life; and so many other invasive practices that are a cry of alarm to anyone with an enlightened conscience.

Our world is beset by various forms of alienation that seem to restrict the politicians in their choices. Even scientists, to a certain extent, seem to limit themselves to the official line, although there are a few courageous exceptions.

In the strong economies, the overproduction of the consumer society goes hand in hand with wastage; energy, industrial and transport equipment are licensed polluters; other types of investments, like chemical, cosmetic, or phytosanitary products, as well as the interests of influential groups such as multinational corporations, dictate or direct these decisions: all this in the game of jostling for position in a setting of strategic competition. These countries thus cling to their vested interests, despite the evidence of the harm they are causing. For example: there have been recent instances of oil wells contaminating our seas, and indeed the truth about the extent and seriousness of these disasters is often covered up.

In the less well-off regions such as Africa, one is often confronted with the taste for prestige amongst the newly rich who thus reproduce unsuitable patterns in mimetic extravagance. There is also the problem of run-down nonstandard equipment (that have already been diminished, recuperated or recycled); the ignorance of the general public about the devastating effects of unsuitable habits or the use of harmful substances; the multiplier effect of demographic pressures. This is not all. There is also the inadequacy of a governance that suffers from insufficient human resources and skills and a lack of forward-looking policies, and thus does not have the foresight to support research in order to improve the global management. Despite attractive stewardship programmes, many administrations are moribund, corrupt and run by demotivated agents. This is an as yet unsolved equation which compounds the chronic dependence on exterior financing, despite the immense resources. Poverty seems to give a new twist to the management of reserves, which were formerly protected, and the decline of connections and relations that used

to provide structure is an aggravating factor. For example: deforestation is taking place at a frightening pace, resulting in the destruction of the vegetal cover, drought, and desertification in the Sahel.

The long list of predatory behaviour that can be attributed to our machine-run civilization is well known. Our intention is not to fuel controversy about the relative responsibilities of the over-equipped and under-equipped countries. The question that is posed is: what can our sciences do? What contributions can the scientific community we belong to make; how can we work towards solving the issues that affect the future of our planet and its inhabitants?

Human and Social Sciences examine man and Mankind as a whole. The debate does not only concern the material world and natural phenomena, but also ideas, and the individual and collective conscience.

Human and Social Sciences, the Sciences of life - from paleontology to philosophy – inform us about the being and man's relationship to himself and his environment. The aim is to understand his attitudes and behaviours in a given society regulated by rules that determine the scope of what is possible, in keeping with a given logic. The intention is thus to identify the conceptual sources of man's motivations between instinct, nature, and intention, within a given culture, and to consider the whole in relation to a global environment. Man, a social being with a conscience, shapes himself. He is at the same time the subject and object of his action, be it a creative or a predatory one. The effects of the change he provokes, inexorably change his own being.

The ultimate aim of science, in all its fields is to understand and master the phenomena of Life, of Nature and of the Universe, in order to free ourselves from those constraints, to adapt, to vanquish, and to improve the condition of man and society by providing security. The Science of elements, of thing, provides us with knowledge of and explanations about natural realities as well as the phenomena related to the global warming of direct interest to us today, such as unusual modifications of the weather and environmental disasters: the Science of Man, helps us better situate and manage people according to their conditions, their relationships to others and to the world that surrounds them, in the course of their life's journey. This understanding of people's situation is essential in order to successfully engage individuals in a social healing process to eradicate the vices that affect their global environment, and search for adequate and lasting solutions.

In Africa, especially in Mali for example, tradition designated masters for everything: the earth, the watercourses, the forests, and the vegetation. Those dignitaries were in charge of protecting the codes, conventions and rules, and making sure they were respected. This assured a healthy management of the collective property and the protection of the biodiversity, which Totemism also combined to bring about. The pauperization of the rural populations created an economy of precariousness, which breaks with the one thousand year old ecological ritualised rules which had up till then ensured the preservation of the fauna, the flora, the soil and watercourses against an abusive usage which can only lead to disaster.

It is therefore pointless to expend huge amounts of energy to ward off dreaded changes, if we cannot use our science to probe and come to some understanding of the mechanisms that underlie our behaviour, rational for some, irrational for others. This behaviour springs from our upbringing and hence to the socialization of the individual, and to the characters forged by our background.

In the North, wealth, abundance and the logic of gain for a few, seem to be at the source of the scarcity of resources which threatens our very future; in the South, on the other hand, the problem is often one of the reproduction of exogenous models of exploitation of the environment, in the broad sense of the term. It is this that provokes the damaging of resources, thus compromising the future and bringing forth poverty, food shortage and the rationale of the survival of the greatest number. In both cases, as we by now understand, it is Man's action that is damaging the general balance of the biosphere.

However, this fundamental question of the interactions between Man and Environment must be understood by us within the twin dimensions of the study of Humanity's past and of its evolution, on the one hand, and the consideration of the diversity of human societies, cultures and languages, on the other. This is the main concern of ICPHS and its member organizations, and it is with that perspective in mind that it contributes to the important initiative of the UN-International Year for Global Understanding (IYGU), and also to this volume.

Besides building global technical solutions, it is crucial to build local specific responses to given human groups anxieties. A good outcome of the IYGU could be the identification of a certain number of major regional realities where Integrated Landscape Management processes could be identified, i.e., merging of social,

economic and environmental concerns, within cultural diversity. This will lead towards building new governance mechanisms and with innovative educational processes that enhance the understanding of the roles of reason and technology.

It is also important to consider the issue of the world diversity of societies, cultures and languages, which should be at the core of the process of the IYGU, and of Integrated Landscape Management, reflecting a rather “bottom-up” approach.

Indeed, in a world where perceptions tend to be standardized, we need to fight to preserve more linguistic – and hence, cultural - diversity, despite globalization and thanks in part to a wise use of Information and Communication Technologies.

The eurocentric approach, the western-centred approach, the matrix of which is the standardization of the world's cultures, cannot be allowed to prevail at the expense of the languages and cultures of other areas!

A promotion of the model of euro-centrism which works towards the uniformization of the world's languages and cultures, amounts to breaking with the roots, for language is the most fundamental component of identity, the bedrock of culture and the matrix of creativity.

We know that cultural and linguistic diversity is to the human society what biodiversity is for nature: the ferment, the linchpin of what I call our humanitude.

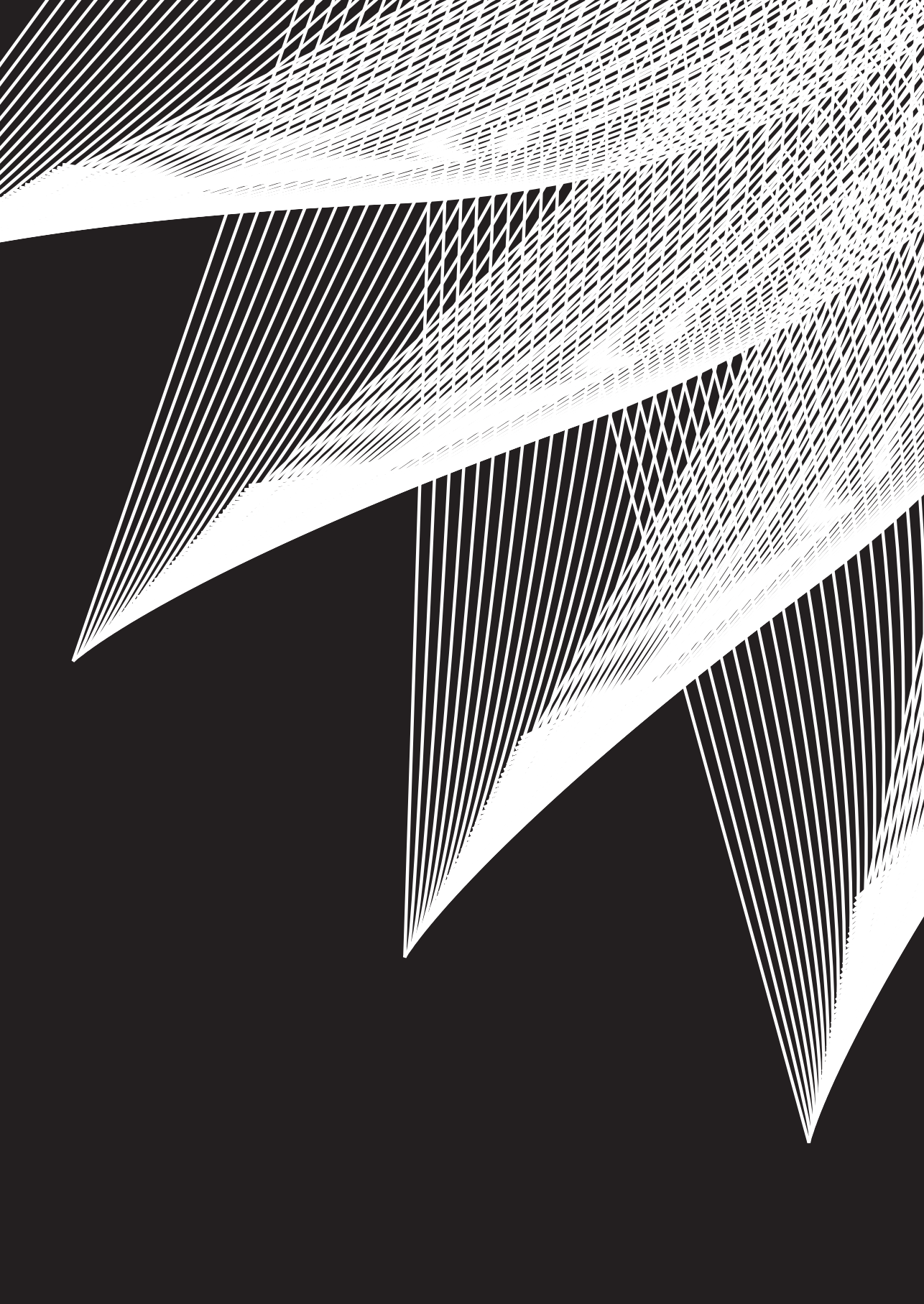
If we really want to end the ongoing process of dehumanization, if we are to safeguard and consolidate around the world the societal and civilizational values of solidarity, sharing, consensus and moderation, then we must make the choice to preserve what is essential: linguistic diversity, this great wealth of peoples, which allows us to water our parched relationships, the reification of human contacts and ensure the human communication our world so strongly needs.

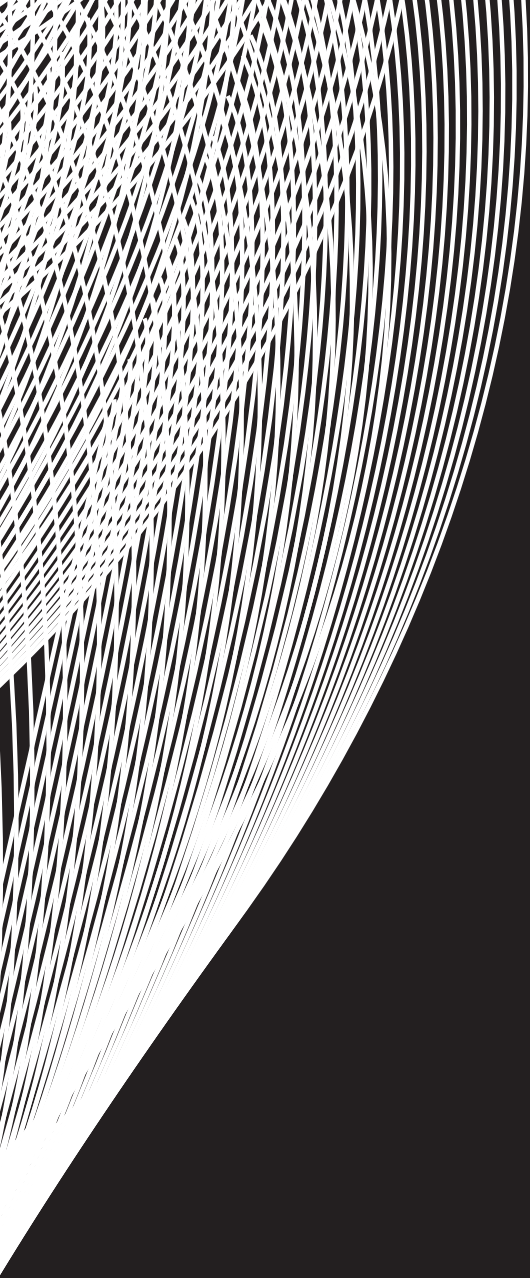
Globalization should be seen as a factor of enrichment, a means of strengthening intercultural relations, whereas it tends more to be a factor leading to the destruction of diversity and cultural pluralism. Globalization today is a globalization of “gain” while it should be a globalization of “being” and “gain”, leading to a genuine – and, importantly, endogenous - economic and social development.

It is therefore time for the Humanities and Social Sciences to re-mobilise, to embrace the values of all human societies. These values are embedded in language – which is the vehicle of culture and thought.

The Humanities, especially Linguistics, Anthropology, History can help us bring to the fore the cultural fundamentals of our societies. Linguists and Sociolinguists now more than ever need to make sure that the endangered languages of the world can be safeguarded and preserved. Better still, it is a matter of some urgency to promote multilingual scientific societies so specialists in the Humanities and Social Sciences can use their own languages in their scientific work, foretelling the multilingual and multicultural societies of the future.

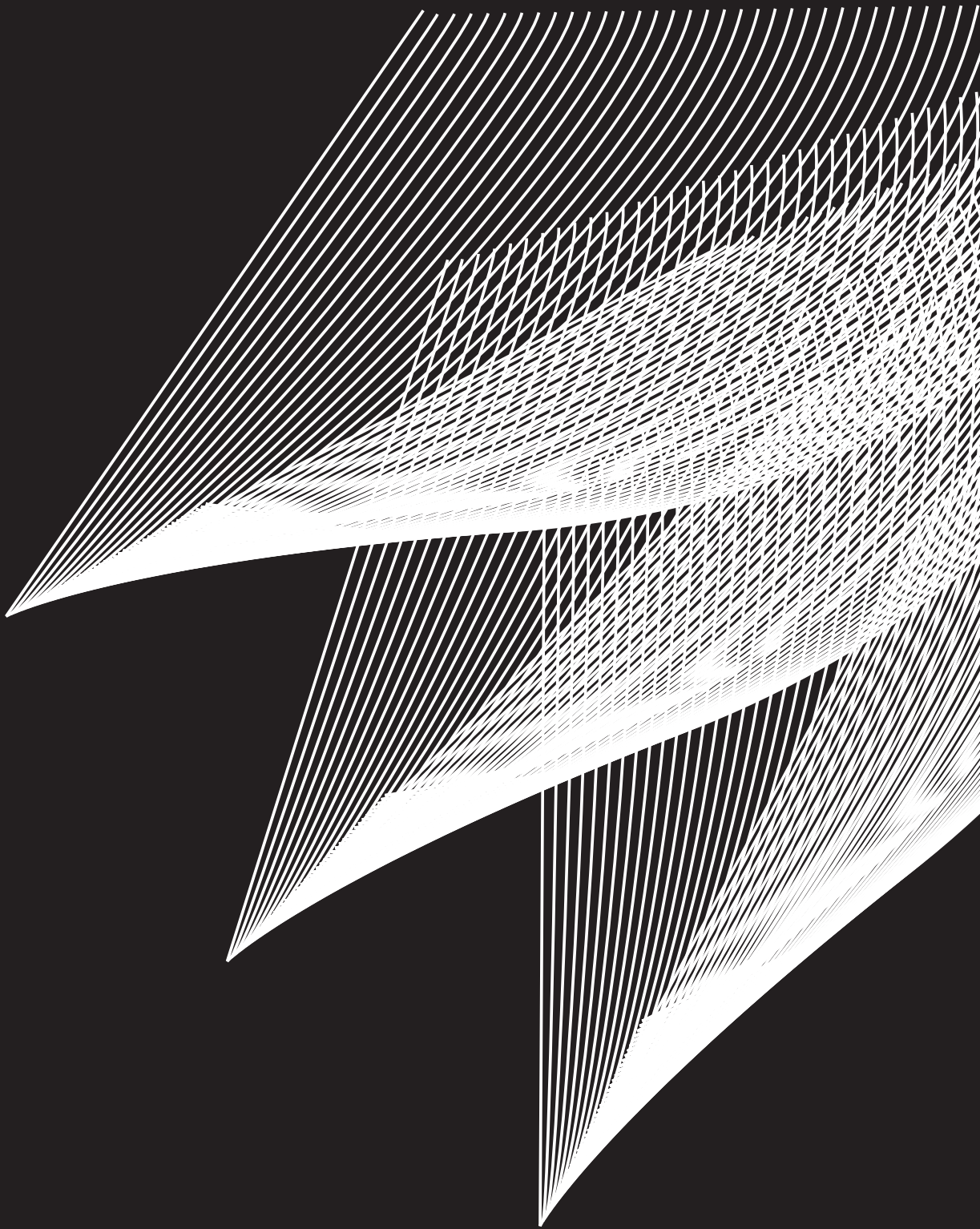
This approach to Integrated Landscape Management can be a good opportunity to contribute to the realisation of the needed paradigm shift from a eurocentric approach to a polycentric vision of the world.





PART IV

Final considerations



INTEGRATED LANDSCAPE MANAGEMENT

ELIEZER BATISTA

Paraphrasing Lord Keynes, the reality has changed and the concept of sustainability as well. One of the most important agendas of humanity in the third millennium – to promote growth combined with the commitment to sustainability – has gained new contours. The original idea of sustainable development has reached its fatigue point. The validity period of the *triple bottom line model* – economy, environment and social – has expired. The greater degree of knowledge sophistication on the subject has brought improvements and declared an epistemological break. We have reached a new paradigm of sustainability, which incorporates a key variable not contemplated in the old conception: culture. It started to have a cross-cutting effect on all other factors. Sustainable development is dead! Long live the sustainable development, reborn under a much broader perspective. We have entered the era of the Integrated Landscape Management.

Man is facing a major challenge: how to weave the threads of economic growth and sustainability without allowing one side to shred? This is an increasingly complex fashion in which the public and private managers can no longer elude. Intricate problems require ingenious solutions. The theory of sustainable development was the first attempt at combining the economic, environmental and social interests. Curiously, although little is said about this, the *proxy* of this concept took place in Brazil. The Carajas Project, from Vale do Rio Doce, was the practice that originated the theory. The disorder of the plots does not change the final product. Carajas was the first major enterprise to adopt rules and procedures that later would be grouped and conceptualized and would lead to the sustainable development model.

All social and environmental actions added to the Carajas Project were held based in intuition. A manual of sustainability did not exist at that moment. The concept was not streamlined. Its variables were not even contemplated in the drafting of such a project. However, Carajas became a world-class combination of economic interests, social and environmental concerns and was the example on which organized the theory of sustainability.

At the occasion of ECO 92, the Swiss entrepreneur Stephan Schmidheiny, visited Carajas and identified in a single project the simultaneous and interwoven of economic, environmental and social aspects. From this observation, Schmidheiny created the concept of sustainable development, beyond the assumption of environmental emphasis coined in the Brundtland Report in 1987.

Curiously, Carajas was a squared example. It served as a mirror to create the model of sustainable development and, years later, showed the need for an improvement on this original concept, exposing its vulnerability and obsolescence points. The city of Parauapebas (PA), created from the construction of Carajas, was sized to hold about five thousand people. But, intuitively, there was a concern with the environment, the public areas outside the territory under the responsibility of Vale. Time has shown that this concern was relevant. Over the years, the local population reached 120,000 inhabitants due to the proportion that the project achieved, obviously avoiding the social order previously conceived. This episode revealed the limitations of the original model of sustainable development: the concept was not properly applied to the region as a whole.

The Integrated Landscape Management, by contrast, relies on a wide angle view of the project, a definite improvement on the principles that gave rise to sustainability. Any economic enterprise whether is a factory, a hydroelectric plant, a railroad or a mining company, is treated in a holistic-systemic way. The micro gives way to the macro. The Integrated Landscape Management includes the surroundings of the project, anticipating actions for the entire region directly impacted by it. That is, sustainability is no longer locked up inside the walls of the enterprise. It goes on a greater perimeter, benefiting not only the project itself, but an entire territory to which it is attached for economic, social, environmental and, here's the big difference, cultural reasons.

The culture, from which the original model of sustainability has gone completely off, gains a position of prominence and becomes one of the most important variables of this new *Konzept*. The cultural transversality joins economic, social and environmental factors, which are now being interrelated.

This approach has an innovative look by the researcher Inguelore Scheunemann, from BioAtlântica and Institute and Institute of Territorial Certification. Inguelore is a pioneer in the process of integrated management of numerically certified areas, a proposal which complements the original concept of sustainability. She works for 16 years with Luiz Oosterbeck, noted researcher and leader of this subject. Oosterbeck is part of the Polytechnic Institute of Tomar, Portugal, and is a committee member of the European Commission, UNESCO and the UN.

Studies conducted by Inguelore Scheunemann and Luiz Oosterbeck and several other leading researchers are based on a transdisciplinary vision of reality. This, in turn, allowed a new model of sustainability grounded in strengthening social capital. This evolution has as a central point management of the territory, which requires the integrated measurement of its components, including perceptions of the citizens who inhabit it, regardless of geographic scale in question.

TERRITORIAL CERTIFICATION

It is noteworthy that the Integrated Landscape Management is not the end itself. It is a bridge built on solid scientific basis that leads to another important advance over the original concept of sustainability: certification planning. When we refer to the territory, it is precisely from a wide area, covering the economic project and a considerable radius around it, precisely the premise of this new and comprehensive concept.

The methodology developed by the Institute of Territorial Certification allows measuring, evaluating and reporting, on an integrated and shared way, the universal elements of the territories. Without underestimating internationally validated indicators and measures and through simple visual representations, this concept has the great merit of pointing the development level of territorial components, comparing these results to the individual and collective perceptions. Therefore,

citizens gain an unprecedented level of awareness regarding the challenges of their location and the contrasting views that build it.

This territorial management methodology allows project tracking via certification, with semi-annual or annual assessment of variables that allow the monitoring of their economic, social and environmental development. It is an element that marks out of the process, which enables the crossing of variables through software that enables the adjustment of research areas and trends. It is also a methodology for making decisions for businesses and governments.

It is a process based on a larger perspective, in order to create governance systems, not just governance. One of the ultimate goals of a project on Integrated Landscape Management is the implementation of supra governance systems, which are not confined only to public management. These systems include government, civil society and enterprises.

In short, the certification gives the Integrated Landscape Management a practical and tangible aspect that was not necessarily contemplated with the old concept of sustainable development. The scientific process of measurement of economic, environmental, social and cultural variables enables the quantitative measurement and especially qualitative outcomes. It is as if the sustainability had its own system of weights and measures and no longer being something ethereal or excessively impressionistic.

The concept of certification is wide, beyond the mere calculation of the area around an enterprise. Let's take as an example the steps that precede the installation of a specific project. This process includes factors such as infrastructure, transport and impact on the environment, among others. These are topics with direct influence, even because this calculation shall take effect later in time to deal with the problem of infrastructure. To think of the logistics in an integrated way is the path that allows a better understanding of the territory itself. From this integrated logistics, it is easier to think and view the issue of the territories.

The territorial certification is something revolutionary. It brings the unprecedented possibility of measuring the added value of an area. The territory plus the potential development that it has because of its economic vocations is a highly active that is not released on any accounts. This applies to mini axis, municipalities, states, and the country as a whole. The certification will allow just the valu-

ation of the territory, transforming an intangible estate in a perfectly tangible and quantifiable estate. This is an unprecedented transformation that will enable the design of the large Brazil Project from an integrated strategy that takes into account the calculated value of the economic potentials of each region. If this is not sustainable, nothing else is.

That is how it is configured the second phase of the sustainable development, the stage of the Integrated Landscape Management, together with the territorial certification, as a logistics system defined, and educational projects based on a culture that permeates all other factors. This fourth variable, culture, reflects precisely the transversality of thought and permeates the whole territory. Thus, we are able to establish an axis of integration. It is important to remember that the economy is also culture, since it focuses on key variables such as history and interaction between groups of a given region.

This is precisely why the Integrated Landscape Management means a large and important development since the original model of sustainability. The territory and its people – that were somehow eclipsed on the old concept – rise to the center stage and become central figures in the dismemberment values of a given region. The economy, the environment, the region and its residents are integrated into a symbiosis in pursuit of sustainability. This is the cultural transversality, only permitted by the concept of Integrated Planning of the Territory.

AÇU'S COMPLEX

We believe that the Integrated Landscape Management will repeat the trajectory of its precursor, sustainable development in its main conception. It is beginning to spread to projects developed in Brazil and in the short term will also become an international paradigm. In this country, we have examples of applying this new concept in enterprises in Minas Gerais, especially in the region of Ipatinga.

However, certainly there is not another project in Brazil in which the principles of Integrated Planning are being used in more expressive proportions than the Açu Super-harbor. Located at the municipality of São João da Barra (RJ), when it is completed, Açu will be the largest industrial complex and logistics port in Latin

America. Its area of influence spreads and reaches even to a number of municipalities around which residents are attracted by the possibility of employment.

The Açú project is taking to the North Fluminense region a number of industries that work with cutting edge technology transformed into innovation, resulting in modern equipments and processes. On this side, this technological development will impact the region very positively to generate resources and move the economy. On the other hand, the inhabitants will have to adapt to this technological leap. Many of these people have no proper schooling. It is precisely at this point that the cultural factor comes in to allow the mixture between the economic, environmental and social aspects.

One of the initiatives being developed to fill this educational gap is a museum that will integrate, in a playful way, innovation, technology and culture to local realities. The proposal aims to show that changes in the region have always depended on technological innovation. Each of the passages to a new moment in that area has always been linked to an introducing element of a new applied knowledge. It is a retrospective attempt of education. From the culture of that community, it is possible to highlight the transversality to enable a better understanding of their own surroundings.

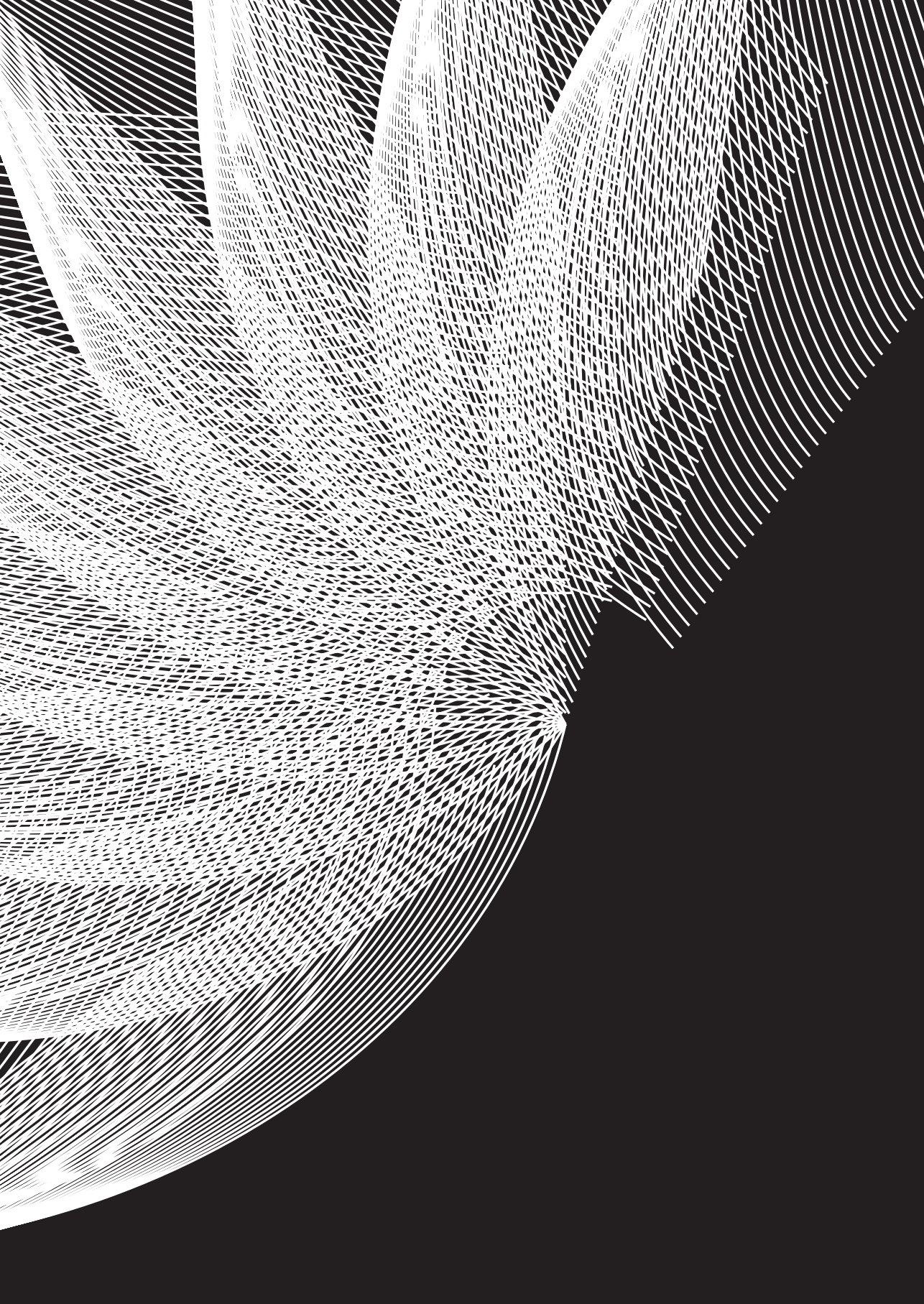
The case of EBX is emblematic. One of the main private groups in Latin America, responsible for what may be the biggest infrastructure project ever conceived in Brazil, found that the Integrated Landscape Management could allow their investments to shut the whole range of sustainability, covering the economic, environmental, social and cultural variables harmoniously. The Açú Super port, as well as other projects developed by companies of EBX within the same concept, will be a demonstration of how the modern view of sustainability leaves behind the micro and embraces an entire territory and population.

All enterprises of EBX are aligned with what is more sophisticated in terms of socio-corporative responsibility. In addition to follow this new and evolving concept of sustainable development, all projects include the certification of the territory, which would allow all companies of the group to understand the *gestalt* of the impact of their investments on a specific region from previously established standards and strict environmental, social, economic and cultural indicators.

Certainly, given the size of its projects and the size of the group itself, the experience of EBX will serve as a propagator of Integrated Planning of the Territory not only for other projects in the country but also abroad.

The Integrated Landscape Management comes on time to consider some of man's greatest challenges, issues for which the original concept of sustainable development has been shown not to be prepared. From the new rules, you can reduce the asymmetry between different countries to promote greater and more productive integration between national states and the private sector, raising the degree of harmony between the interests of the market and of humanity, combining innovation and development, without one being to another obstacle; in short, actually managing economic growth as a tool for social inclusion and environmental protection.

We can no longer waste time and opportunities to change the future. Our actions must be guided by the principle of generating benefits for future generations. The economy cannot be an end but a means for the welfare of society. The human longevity is precisely the main objective of Integrated Landscape Management, sustainable development translated and appropriated for tomorrow.



THE PROGRAM OF INTEGRATED LANDSCAPE MANAGEMENT AT THE TERRITORY OF THE AÇU SUPER PORT

INGUELORE SCHEUNEMANN

LUIZ OOSTERBEEK

ALINE TRISTÃO

TERRITORIAL FRAMEWORK AND THE NATURE OF THE CREATED DYNAMICS

The Industrial Complex of Açú Super port is considered the backyard of oil in the Southeast. Its strategic location provides the service to all the Campos Basin, which accounts for 85% of domestic production of oil. The Project of the Super port involves a wide variety of projects, covering an area of more than 9000 hectares of land, compared to 1.5 times the island of Manhattan, which includes the port, the logistics yard, two thermoelectric, an ore drying unit, an oil treatment unit, the logistics corridor, and the industrial district of São João da Barra. It is not just an industrial project and logistical support, since it comprises also other interventions such as the creation of a Private Reserve of Natural Protection (PRNP of Caruara,) a support for an intervention deep in the network of urban and social services in the region and systemically articulates with the environmental mega-project of the Muriqui corridor. It is a project that involves a huge territorial rearrangement, which is structured involving a very large number of interested parties and intends to establish itself as a reference in the future (Mascaró. and Yoshinaga, 2005).

In the context of a fully globalized economy, the project Açu Super port, which is considered the largest development underway in South America, is assumed as a mega-serve platform for exchanges on a global scale, while fully integrates the resources that flock to it (ore, coal and freight), not just the component distribution, but also production (steel, generation utility companies, shipyard, cement, automobile production, technology center, etc.).

Located in São João da Barra, about 300 km north of Rio de Janeiro, on the northern coast, and at the same distance from Victoria (capital of Espírito Santos), Açu Super port will be the main harbor at the service of production of the State of Minas Gerais, a major producer of minerals in the country and the state located inside the continent.

Sao Joao da Barra, with just over 30,000 inhabitants, is a historic town of maritime trade, through which has been affected by several production growth cycles of this region of the State of Rio de Janeiro, and it is distant about 50 Km from the main city of Campos dos Goytacazes. Campos was the first city in Latin America equipped with public electric lighting, which attests its importance, associated with various economic cycles now in crisis. With over 400,000 inhabitants, one central hospital, several public and private universities and a large polytechnic, Campos makes the urban and communication structure throughout the region (Gomes Filho 2003).

In traditional terms, the area is a combination of activities related to agriculture, fishing, ethanol industry and tourism, being deficient in several indicators: high illiteracy rate, low frequency of higher education, lack of public transport, limited road net, limited range of cultural services, low rate of skilled labor, inadequate medical care network, the crisis of sugar and alcohol production and in general the traditional economic activities. In parallel, it is one of the regions of Brazil that have, increasingly, been favored with the royalties from oil exploration, and where the experience score, with a few years, from creating a large industrial port in Macae. In this city, the fast unplanned growth led to severe disruptions in the quality of life of the resident population, which is reflected in degradation of the housing, services and security, despite the enrichment in absolute terms (Arcadis Tetraplan 2009).

The Açu Super port is installed in an area with an important historical past, in crisis, traumatized by the experience of Macae, and with a global population of around half a million inhabitants. It is also an ecologically sensitive area, depending on the mangrove vegetation that dominates the coastline, and is home to many terrestrial species, in addition to the rich fish fauna, particularly important at the mouth of major river Paraíba do Sul.

The project will create tens of thousands of direct jobs and is estimated to attract up to one million new residents to the region throughout its growth process by 2025. Challenges and expectations are therefore very large.

The Açu Super port Complex offers an opportunity to design an innovative strategy in the field of territory management, which with this dimension is a pioneer in the world. The program was set to grow not only economically but also in the areas of social equity and the environment, using culture as a guiding principle of the growth process, which led to a paradigm shift. It is important to understand that environmental legislation, which fits the constraints of projects, based on the principle of mitigation and compensation of its negative impacts (translated in the known principle "polluter-payer"), based on a vision that sees that the preservation of the environment (assumed as a static component) and economic growth (assumed as dynamic aspects) as being, at root, contradictory. This contradiction is no longer supported by many experts in the considered areas, but it remains the conceptual basis of the legislation, which explains its limitations. Expressions such as "polluter - pays" principle, even if generated by the proper intention of disseminating socially and environmentally responsible practices, illustrate this dichotomous understanding which is positioned as reactive and not proactive.

The project of territorial management stems from an ongoing target set by the EBX Group, that is, not only to install a port complex, industrial and logistics, meeting obligations in the social and environmental spheres, but to contribute to building a new operating model for sustainable development (Scheunemann and Oosterbeek 2010).

In this new model, we start from the understanding that a complex like the Açu, with its size, has a dynamic that forces to restructure the whole territory, to ensure a new equilibrium that is sustainable. The actions in the environmental or social spheres should not be, therefore, only the compensatory measures: they are part

of the project itself, although the dimensions in which the group companies and associated companies, besides articulating with each other must articulate with a large number of stakeholders, and in the first instance with the Government. This means that the scale of intervention and responsibility goes far beyond the Açu or the municipality of São João da Barra. It incorporates even more than the immediately surrounding counties, such as Campos dos Goytacazes or São Francisco de Itabapoana. Therefore it was decided to integrate now, the group projects in the industrial component and logistics, with projects in the spheres of urbanism or the project of Muriqui corridor. The relationship of these projects allows the group to act in a "real" territory, in a dimension that gives it the potential sustainability (Micarelli 2002). It is a complex challenge and requires from companies a degree of a new and crucial articulation and integration, since without it the dispersion of efforts will have two kinds of negative consequences: companies will waste resources and reduce their profit margins on the one hand and will induce dispersion and conflict in the area (affecting the quality of life for its residents and, thereby, also generating new difficulties for enterprises).

THIS PROJECT FACES SEVERAL DIFFICULTIES

First, it is the fact that companies do not compete for the overall management of the territory, but the scale of intervention and building solutions for different problems and even dilemmas, is in many cases (housing, human resources, health, safety, etc.) supra- municipalities. However, in Brazil there are no public governance structures with this scale, because the existing ones are either too small (local, municipal) or too large (state, federal government).

The second is that the region faces problems of low-skilled resources and insufficient critical mass, which is urgent to be supported in its building process. Not training the resident population, besides generating problems in recruiting manpower, provides dynamics of social exclusion and resentment, if jobs that are generated are absorbed mainly by workers who are migrating to the region.

These first two problems of territorial governance and human capital, then extend into difficulties either endogenous (disruption of traditional economic activi-

ties, insufficient load capacity of existing infrastructure for the rapid influx of people and goods) or exogenous (competition with other regions, international crisis).

HOW TO FACE, AT THE SAME TIME, ALL THESE DIFFICULTIES?

Strategic axes and scales of integration

The project Integrated Management of Açú aims to go beyond legal obligations with regard to social and environmental intervention in the territory, building new models and practical applications of territorial management, beyond the dichotomous view of economy and environment and reducing the behavior of human groups to their socioeconomic position. For that, notions of contradiction was incorporated (to recognize the contradiction as something positive and generator dynamics, and not as something to overcome) and the dilemma (understand that a land management program aims to not seek a dynamic equilibrium in the face of problems - that would be solvable - but face dilemmas, the contradictions that result).

The strategic objective of the program that EBX is implementing with the guidance of the Institute Bio-Atlantic (Brazil), the Polytechnic Institute of Tomar and the Earth Institute and Memory (both in Portugal) is to help structure, alongside the industrial project and logistical support, an integrated territorial dynamics, involving several cities and numerous interested parties, to form a territory with highly competitive rates for their business quality, social and environmental. This dynamic, which is part of an understanding of the challenges now facing the humanity in the face of globalization (Santos 2007) can only exist if it can recognize that the various stakeholders, which implies in recognizing and protecting its diversity, building connection processes between the former territorial matrix and a new sustainable matrix that integrates them (Oosterbeek, Scheunemann, Tristão et al. 2010).

It is intended to integrate the four structural dimensions of the ILM (economic, social, environmental and cultural) in a dynamic and sustainable process that allows growth to generate real development. The project considers three main areas of action: the process of ILM at intra-specific level (the port, industrial district and

logistics corridor, the plan of accommodation, the ecological corridor of Muriqui), inter-specific (regional integration) and supra-specific (in its supra regional articulation). It is this dialectic of multiple levels that will assert the territorial capital of Açu Complex (production capacity, quality of life, preservation of natural endogenous factors, cultural diversity, and social equity).

At the intra-specific level, the ILM will seek to promote a growth in mosaic, avoiding the creation of crowns of decreasing quality and increasing entropy (as normally occurs in the relationship between urban decline and suburban peripheries - vd. Costa 1998). The more than doubling of the region's population will tend not only to structure itself as an "urban axis" between Campos and Sao Joao da Barra and São Francisco de Itabapoana (which will strengthen the construction of the bridge provided on the Paraíba do Sul, planned by the State Government for 2012), but also integrate with Macae, structuring a multi-polar urban network. At the regional level, it will seek to promote the factors of mobility and continuity solutions between urban and rural areas, to strengthen cohesion and to avoid creating ghettos or spatial discontinuities (which would be favored in a model of concentration in one area or neighborhood.) On the supra regional plan the ILM on the one hand promotes self-sustainable networking, and globalization on the other hand, being against dynamic of protective isolation and strengthening territorial competitiveness factors. Core problems of sustainable development, such as fluctuations in the labor market, the depopulation of vast territories that came with urban concentration, or lack of endogenous critical mass, are addressed in this articulation of scales.

Here assumes a central role the integration with the Ecological Muriqui Corridor- CEM, project developed for 2 years by IBio with the support of enterprises of the EBX Group.

The CEM is a region located in the Serra do Mar mountain region of the State of Rio de Janeiro. The corridor may, in the future, be connected with the State Parks of the Three Peaks and Desengano (biological reserve of the Union), covering an area of almost 400 000 hectares, making this one of the largest forest restoration projects in the world. As an objective it is intended to connect the last remains of well preserved forest of the Atlantic Forest. This region encompasses 09 municipalities, among them, Macabu Conception, St. Fidelis, St. Mary Magdalene, Trajano de Moraes, Macae, New Fribourg, Casimir de Abreu Bom Jardim and, in particular,

including the Campos Goytacases, one of the municipalities considered as directly involved with the complex of Açu Super port.

However, at the neighborhood between CEM and Açu Super port can be observed a strong interrelationship and interdependence among these, indicating that it should be treated as a single territory. Interface vectors can be identified between the Ecological Corridor of Muriqui and the Açu Super port, in the line of ecosystem, economic and social services. The CEM is considered as a provider of supply of additional and emergency water that will be demanded by the enterprises at the Açu Super port by regulating the microclimate, especially rainfall, and the abatement of carbon emissions through forest restoration. The demand for food in the region is increasing and will reach its peak in 2025 when the completion of the logistic-Port-Industrial complex requiring an organization of producers in order to constitute CEM supplier of food, reactivating the economy, now depressed. The same can be said for the tourism and leisure services intensifying the latent activity in the sector. Otherwise, the Açu Complex, because of the demand for workers, it has already been causing exodus of skilled workforce of CEM, as well as the dramatic increase in population tends to cause division of land in this mountainous region in search of land for housing, especially considering the mild microclimate of the mountain region.

In the presentation of this analysis EBX led to the understanding that the CEM should be treated as a coverage area of the Complex of the Açu Super port, for this reason the company requested IBio, which is developing both the project ILM Açu Super port as CEM project, to redimension this second one in order to consider this region as it will be covered by the Super port of Açu Complex, in order to treat it as a single territory for the purpose of the project, which is now done.

Thus, the sustainability of the territory is wide:

- made possible by the scale of the area to be intervene;
- supported by the dynamics of the enterprise Açu Super port venture;
- structured from a multiannual program for awareness and empowerment that overcomes the welfare;
- and guaranteed by the dynamics of governance that must be induced in partnership.

There were identified in the mission of ILM in the EBX, six-axis of strategy to be articulated:

- Local development;
- Business ethics and relationship with the Government;
- Air emissions;
- Environment, health and safety;
- Biodiversity;
- Awareness, education and training.
- Actions of training, periodic internal meetings, public forums for debate and pilot projects are the main tools of such organizational integration.

STAKEHOLDERS AND RESPONSIBILITIES OF THE COMPANIES

The Integrated Landscape Management in the region Açú Super port involves a very wide range of stakeholders with unequal (sometimes scarce) traditions of collaboration, with often divergent agendas and with a strong capacity for representation.

The ILM is a process, not a specific policy, and it starts at first from the strengths of the reality to face the difficulties. If the lack of coordination is a problem, the existence of divergent agendas is an excellent opportunity, with its integration, to enhance complementarities for development. And the ability to self-representation of stakeholders is a crucial asset, which will be strengthened.

In the area of government there are several municipalities, with dimensions and unequal resources, it is evident the need for regional coordination, supra municipal, that in some sectors of activity (tourism, and health) is beginning to occur, but still insufficiently. In the side of civil society organizations, the reality is quite different between the municipalities, but there is in any case, a great number of entities and local leaders, whose articulation quickly allow a greater expression. In the business sector, there is a very expressive productive tissue, even in the context of a transition economic model, which also benefit from greater integration of local and supra-municipal nature (process also involving other important supra-region-

al actors such as FIRJAN - Federation of Industries of the State of Rio de Janeiro). Finally, it must be stressed the role of a very significant number of individual actors or leaders, who, by their reputation and knowledge, are essential in a strategy of ILM.

The starting point has, thus, a great potential for articulation, although the process of structuring a dynamic of ILM has always to overcome uncoordinated operation habits and mistrust, which must be seen as natural.

In this context, firms linked to the entrepreneurship of Açú Super port, and in particular the EBX group, have a nuclear responsibility: for its economic and social weight as promoters of an undertaking of this magnitude, because of its role in the environmental sphere and its integrated nature with a systemic vision of the territory, they are the main inducer of ILM, provided they assume this mission. It is therefore crucial that companies in the EBX group, and each of its employees, stand as an engine tuned and cohesive, otherwise it will be the companies themselves, for their decisive weight in the restructuring of the territory, to maximize the territorial disintegration. It is not, and should not be, the company's responsibility for global territorial management, that is the mission of the government, supported by the dynamics of governance, involving the different stakeholders in logic of ILM. But it is the responsibility of companies to support and set good examples for such dynamic integration.

In the process of stakeholder involvement in the dynamics of ILM, involvement and training of every citizen is essential. In the region of the Açú Super port, given a set current population of about 500,000 people, there is an ongoing training program, including training of trainers, who in 2011 reached about 1,000 people, in 2012 will reach 10,000, in 2013 another 100,000 and the other in 2014. This is the time estimated for the involvement of overall population and all stakeholders.

CREATION OF THE TERRITORIAL MATRIX

The core element for the ILM is the territorial governance, linked to the concept of competitiveness of territories. This is to ensure coordination between different stakeholders in a process in which the institutional and administrative barriers accentuate trends towards disintegration.

The two structuring processes, the formation of human capital and construction subsidiary of scenarios and visions of the future, are to be structured within the Açú Super port from a program that aims to involve the entire population. To this end, the teams IBIO-IPT-ITM are doing training for ILM not only the staff, but all workers of the enterprise and the general population, as stated. This training is done in a manner appropriate and differentiated to the recipient, from meetings at the working place to a postgraduate course, but always without exception. One purpose of formation is the training of those involved as multipliers, together their neighbors, relatives or colleagues. In parallel, there was, already, a first seminar on foresight, and other similar initiatives will follow, which contains in its formation the same overarching principle.

The construction of a ILM dynamic is based essentially, however, by the organic strengthening of the area. To this end, discussion forums started with themes around the four axes, at first, that were seen as more urgent: culture and education, health, traditional economic activities, and territory. These forums are actually working groups, socially heterogeneous, seeking to build projects feasible in the logic of autonomy and cooperation on the powers, business, political or otherwise.

The logic of the discussion forums is to call people, regardless of their institutional affiliations, based on their skills and wills. All forums results are condensed in studies, projects and other documentation, which are organized in a resource center of the territory, which was designated as the "Knowledge Center" in Sao Joao da Barra. The Knowledge Center is a space that centralizes all academic or other knowledge, available on the territory. It is also a space where meetings (such as the forums), exhibitions and debates over the territory occur. The Knowledge Centre, involving people connected to the municipal government, non-governmental organizations, businesses and education, is also an embryo supporting the future governance of the territory, which will structure basis, no longer personal but institutional. The Knowledge Centre, besides being a project promoter, is a facilitator of relationships, contributing to the building of trust between the protagonists of the various entities.

Although the Knowledge Center can gather people with different interests and frames, the region has a great diversity of identities and interests, from the cut between the "highland" and the "lowlands" to the ethnic divisions, social, ideological

and others. The strategy of ILM does not dissolve this diversity, but reinforces it, through the infra-structuring of the territory with a network of "memory spaces" which are bonds that at the same time promote the diversity and specificity of each group and also, the connection with others groups, thereby consolidating the territory as a network of spaces, places (Levi and Segaud, 1983).

The memory spaces are places of self-representation of identities, bringing together the cultural dimension to the economic activities. They are structured around objects (archaeological, ethnographic) and knowledge that constitutes the core of the identity of each community, and at the same time is the basis to generate new dynamics of innovation in the economic sense (the upgrading of craft by design, opening of new business based on old activities such as fishing and rural tourism).

Knowledge Center, Memory Spaces, discussion forums, training and institutional dialogue are essential tools of ILM in Açú. Together they build a dynamic of trust among stakeholders, real-enhancing territorial governance.

INTEGRATING PROJECTS AND INTERNATIONALIZATION OF THE TERRITORY AND ITS GLOBAL LOCATIONS

The project Açú Super port assumes a medium and long term vision in a highly competitive region, which encompasses more than a dozen municipalities and includes not only the industrial and logistics project, but also the urban restructuring and mobility, and several conservation units (RPPN, ecological corridor of Muriqui). It is the vision of a region with high GDP and HDI, with balance and quality between the aspects of economic growth, social equity and environmental preservation, valuing diversity and cultural identity. It is an integrated view of different interests and stakeholders with often conflicting agendas, but they will gain in building strategic convergences.

To measure the progress of integration, we developed a measurement system that monitors the territory and that culminates in certification of the territory. This certification is the complement of territorial measurement strategy for integrated management (Scheunemann, Carvalho and Pimenta 2011).

The project, thus, takes a vision of Integrated Landscape Management for Sustainable Development, as proposed by IBIO, IPT and the ITM, which is implemented through a policy of sustainability (Scheunemann 2009) based on four pillars: economic (engine of the enterprise), social (including health and safety), environmental and cultural (especially in awareness and foresight axes).

In the current phase, considering the needs of the area, in close discussion with all stakeholders and especially with the government, five integration projects were prioritized: agriculture (activities in rural areas), transit (mobility in a rapidly expanding territory), memory (going through the whole territory and all communities), education (basic integrated citizenship supported in ILM) and digital media. These projects were selected because they allow, realistically, the achievement of concrete progress, faster, and with a strong multiplier effect. The Knowledge Center is the place where these projects will be built with all stakeholders, making clear the contribution of each and avoiding gaps and redundancies. By early 2012, several spaces of memory have been created (the first in the colony of fishermen Z2), the actions of transit promoted by the city hall or by businesses (due to PBAs) began to be efficiently coordinated (with the active involvement of important individual assets and allowing integration with network memory spaces and schools), an important project for schools (which also link to the memory spaces) had its beginning in São João da Barra and Campos dos Goytacazes, and a integrated program for intervention in rural areas, combined with the project Muriqui, is being prepared.

The experience of just over one year of actions in Açu Super port under the logic of ILM, with these instruments, demonstrates that it is possible to quickly involve stakeholders with no tradition of cooperation, enhance complementarities between divergent agendas, enable the population to perform more rational and critical in the territory and promote a integrated global dynamic of governance.

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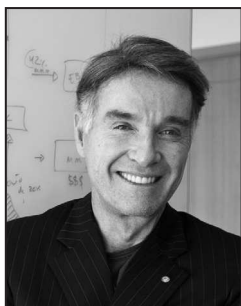
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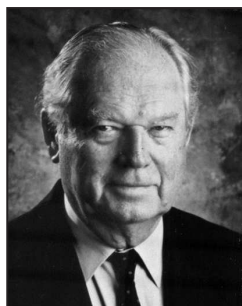
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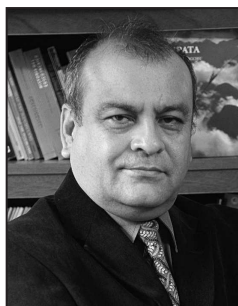
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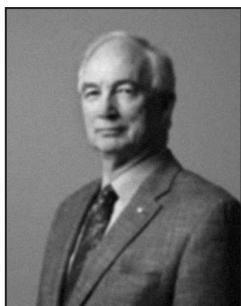
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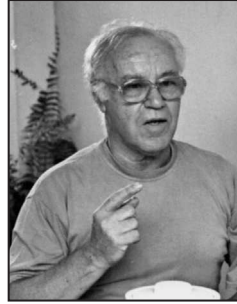
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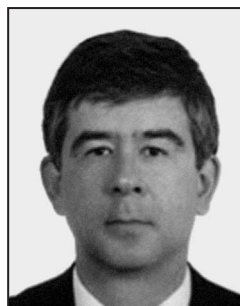
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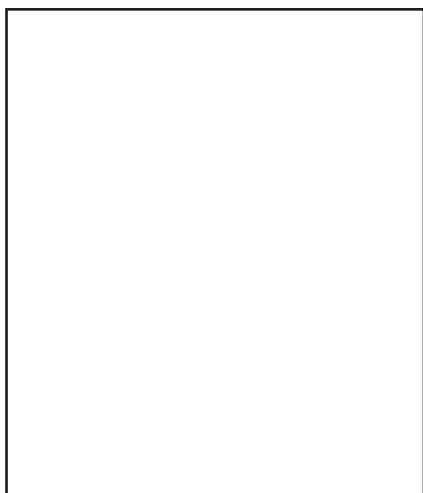
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SELO FSC

PRINTER	<i>ZIT Gráfica</i>
1 ST EDITION	<i>June 2012</i>
PAPER CORE	<i>Pólen soft 70g/m²</i>
PAPER COVER	<i>Cartão 250g/m²</i>
TYPOGRAPHIC	<i>Apex Sans and Proforma</i>