Document for Country and UN Delegations
Rio+20, United Nations Conference on Sustainable Development
Coastal Zones: 21st Century Challenges

Context

This milestone document is addressed to each national, supranational, and UN delegation in the context of the Rio+20 Conference. It represents the interdisciplinary collaborative work of more than 200 coastal zone researchers from around the world. The main objective is to highlight (i) the looming challenges facing coastal zones and (ii) their potential solutions from the perspective of the Scientific and Technological Community, as part of the effort to construct and achieve the Rio+20 goals.

Introduction

20 years have passed since the Rio Earth Summit in 1992. 20 years of efforts to better understand, inform, and improve the relationships between our societies and our planet's coastal zones. These efforts have crystallized into tangible outcomes in the form of improvements in environmental culture and international agreements upheld by national and transnational coastal zone plans, protocols, and conventions. While moving forward with these national and international efforts, we realize that the balance between development and stewardship is still shaky, and many more efforts are needed to create a harmonious relationship between the use of knowledge in societies and our planet's coastal zones.

Coastal zones are attractive to humans for both aesthetic and practical reasons. This attraction, however, poses a grave risk to both coastal environments and the people that live in them due to the largely unmitigated growth of human populations in these areas. The majority of our planet's population is concentrated in coastal zones, these narrow spaces that amplify the most urgent and emerging questions of sustainability and development in our world today.

In coastal zones, we clearly see the three major elements of sustainable development (socio-political, economic, and environmental sustainability) threatened due to: world population growth, global economic tenuity, and the increase of environmental degradation. Currently, coastal zones face a bleak future due to growing challenges that stem from hunger, health-related issues, and violent conflicts. These challenges threaten the populations and economies of countries around the globe, and in turn place even greater strain on the critical, limited resources offered by coastal zones. Will nations work together to save these zones that buffer our world? Coastal zones must be included in the next ten-year agenda before it is too late.

Coastal zones accommodate widely-varying and diverse sectors of society, business, administrative entities, and the environment, which makes them ideal for illustrating: (i) the looming challenges facing our societies as well as (ii) their potential solutions. Please find in this compilation document the key 21st century threats to coastal zones, along with the actions and strategies that have been proposed by many in the international Scientific and Technological Community to resolve them.

(i) The Looming Challenges Facing Our Societies

The scientific consensus is that the challenges we face in coastal zones are mostly anthropogenic or amplified by human activities that clearly transgress ethical limits. Due to human development on the shoreline and in river basins, along with offshore and unsustainable industrial activities,
our challenges are:

Red-Flag Challenges Impacting Lives of Coastal Zone Residents:

- Hunger, freshwater availability, malnutrition.
- Wars and other violent conflicts.
- Disproportionate population growth.
- Lack of education.
- Corrupt political and regulatory systems.
- Failing states.
- Global and local economic crises.
- Over-exploitation of marine resources.
- Climate change and its consequences.
- Increase in human migrations.
- Threats to human health from toxins in fish and shellfish, along with pathogens such as cholera and hepatitis.

Challenges in Policy:

- Harmonize the interests of coastal environment users, including local community members, coastal municipalities, regional and inter-municipal planners, and national, transnational, and international stakeholders, through the continuous improvement of economic-legislative instruments and the elaboration and implementation of coordinated strategies for the use of natural, social, cultural, and institutional resources.
- Create participatory policy-making processes that include all sectors of society.
- Integrate research and education into the decision- and policy-making process, and make information readily available and easily accessible for All.
- Rethink economic growth and the flows of energy and materials with respect to the environment.
- Plan sustainable spatial allocation and management for fisheries and aquaculture as well as for energy production and supply.
- Enforce protections for designated coastal and marine areas.
- Prepare for unpredictable human migrations and sustain migrants.

Challenges from Pollution and Climate Change:

- Coastal and sea pollution caused by legal or illegal waste-waters and solid wastes that have been treated ineffectively or not at all; pollution by toxic waste, metals, nutrients, and synthetic-substance contaminants.
- Illegal or little-regulated extraction of natural resources to meet increasing demand.

- Toxic blooms due to pollution.
- Coral reef bleaching.
- Amplified vulnerability of coastal populations, particularly the economically disadvantaged.
- Loss of habitat and loss of biodiversity.
- Irreversible ecological destruction.
- Introduction of invasive species.
- New diseases among organisms.
- Oceanic temperature warming and change in alkalinity.
- Decreasing oxygen levels leading to dead zones, species extirpation, and noxious gas emissions.
- Seawater intrusion in coastal aquifers.
- Floods, erosion, and rising sea-levels.
- Dispelling the assumption that the coast is "safe," and that climate change is a myth.

Most of the listed challenges result from human interactions with the land- and seascape. These causes can be constructively mitigated through awareness of the interrelationship between human choices and their impact on the environment. These challenges illustrate three key points on which we must base all potential solutions in order to help society progress sustainably:

> We must take interdisciplinary approaches to solutions,
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> we must connect knowledge with action, and
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> we must work with affected communities to co-construct initiatives that also integrate the limits of the planet.

(ii) Potential Solutions, Priorities, and Views Regarding the Implementation of Practices and Policies that Build upon Successes

Considering coastal zones as dynamic systems of great diversity and variability, below are a range of actions and strategies that could lead to effective solutions for the challenges described above.

Economy and Development Models:

- We need to question the model of development based on unlimited economic growth:
  Can "economic *growth*" be an accurate indicator of "good economic *health*" and sustainable development?
  To what degree do activities in and around coastal areas facilitate development and what manner of development is currently needed?
  Can development be based on sustainability and how can the socioeconomic structure respond to international competitiveness?
- Destructive industries have to be challenged and held accountable for their social and environmental consequences because at present the priorities of the economy come at an enormous cost to the environment.
- The G20 announced the preparation of a charter on "sustainable economics;" we must make explicit *how* such a charter should be implemented from a global-governance perspective.
- Promote the diversification of economic opportunities available to people in coastal communities so

that they do not need to rely solely on fishing as their livelihood (e.g. develop opportunities for ecotourism, recreational eco-friendly fishing for tourists, sustainable aquaculture and/or energy production, etc.)

Global/Local Articulation of Governance:

- Efforts cannot only come from local governments and communities; the challenges are global in nature and must be addressed in a comprehensive way between all levels of governance.
- Improve capacity of local governance and strengthen regional articulation.
- Create strong, trans-boundary connections between the people who live in coastal zones and the large marine ecosystems they inhabit.
- Apply a deliberative approach to governance that concentrates on managing emerging challenges and linking spatial and temporal scales.
- UN Ocean should be supplemented by other trans-governmental and non-governmental networks to provide additional forms of governance.
- The Intergovernmental Panel on Maritime Basins (IPMB) should contribute to providing governance systems with common and reliable information, and promote coherent responses from these systems.

Collaborative Policy Making:

Introduce policies that:

- Make sustainable change trends mandatory by establishing reliable monitoring and reporting mechanisms.
- Protect existing coastal habitats and ecological functions and services.
- Recover fishing stocks and prevent illegal and habitat-destructive fishing.
- Protect natural and cultural resources at all levels - local, regional, national, and international - while keeping coastal communities safe.
- Manage coastal water bodies for the benefit of All.
- Take an integrated approach to sediment management.
- Preserve 100% of the areas where the indigenous peoples of the coasts remain, including the Saami, Chukchi, Siberian Yupiaq, and many others around the world.
- Monitor and control coastal and littoral maritime traffic, industrial activity, and the related hazards of oil pollution, chemical transport, collision, and technical failures.
- Prevent over-population in developing regions and minimize damage in already over-populated areas by requiring thorough environmental impact assessments for potential development in coastal areas.
- Balance urban growth by using space more efficiently and with more awareness of and sensitivity to potential environmental impact, thereby growing more sustainably and with less vulnerability to climate change.

The instruments for the implementation of Integrated Coastal Zone Management (ICZM) are:

- An integrated basin-coast and ocean management approach.
- Monitoring and assessment of socioeconomic and ecological changes and trends.
- Comprehensive analysis of sustainable development indicators and geographic information.

- Financial and legal mechanisms for ICZM implementation.
- Public participation.
- Cross-sectoral and multiregional agreements, and effective transnational consultation systems; connected and collaborative decision-making between all administrative levels from local to global.
- Evaluate the success of integrated coastal management political processes and practices globally; learn from local, regional, and international experiences in ICZM, and adjust lessons to other contexts.
- Improve the articulation between ICZM and adaptation measures.
- Move from theoretical frameworks into realizing necessary actions.
- Involve coastal communities in the policy-making process and integrate local and traditional knowledge with other information used in creating policy.

This is vital, not only to vindicate the legitimacy of policies and management strategies, but also to provide the community the opportunity to express their doubts, to learn how to live in a changing environment, and to make decisions that are compatible with their core values, as well as to rebuild trust and manage social conflict.

- Create respectful partnerships with All societies on Earth, as they can provide crucial observations and knowledge regarding emerging challenges.
- Increase interdisciplinary training and cross-collaboration between tertiary programs and teams.
- Advance data interoperability and spatial data infrastructure for coastal area management.
- Combine natural science data with social science understandings of the places where regulations are to be implemented.
- Natural scientists, engineers, social scientists, citizens, and politicians must recognize their responsibility and role in the process, and collaborate with each other to achieve common goals.

Legislation and Regulation:

- Coordinate states and sectors related to coastal activities under adaptive regulations.
- Improve and reinforce legal frameworks controlling coastal activities based on the commons property principle.
- Define coastal zones in both spatial and temporal dimensions, since coastal dynamics cast legal uncertainty on how coastal zones are determined.
- Make good practices mandatory for stakeholders; hold elected politicians accountable for their promises.
- Better integrate the use of research and science-based information into current regulatory and legislative frameworks.
- Create quality assured data sets that are relevant to policy actions.

Communication: Information, Education, and Awareness:

- Eradicate illiteracy using curricula that include consistent environmental awareness components and also create a proactive public that is well informed about environmental issues so they can truly contribute to and benefit from the policy-making process.
- Promote public awareness of the socio-ecological values of coastal resources and ecosystems, and

create demand for data integration across land/sea boundaries and between ecological and socioeconomic spheres.

- Develop a coastal information repository as a way to promote integration of and facilitate access to coast-related information.
- Improve the competence of and resources for local and regional coastal zone authorities.

Knowledge and information must be shared, promoted, reused and refined in order to:

- Promote the active dissemination of information.
- Empower and stimulate citizens in their search for better understanding of coastal environments.
- Support society in developing a critical approach to environmental challenges and sustainable development.
- Improve the connection of publicly funded research to the public domain, and develop realistic, sustainable, and feasible policies

Research:

- Generate baseline data for coastal ecological and social processes that researchers can measure against, and conduct long-term studies that identify past and present evolutionary trends of the coast.
- Develop and establish an integrated oceans monitoring network, and create inter-operable open-access databases that can provide reliable data on a user community's defined goal(s), including coastal zone vulnerability assessments on multiple spatial and temporal scales.
- Develop and establish integrated monitoring and forecasting systems that provide coastal managers and policymakers with critical coastal state indicators in order to ensure the safety of coastal communities while assuring the preservation of natural coastal dynamics.
- Take into account the social and human dimensions of uncertainty.
- Study in greater depth the interconnectedness of natural systems to better understand the health of coastal and oceanic ecosystems.
- Better understand the interaction and environmental impact of various pressures and stressors on coastal zones; distinguish between internal processes and external pressures, and provide methods for combined pressure assessment.
- Identify and quantify the human-induced stressors acting on coastal ecosystems and populations.
- Develop interdisciplinary approaches to research and develop strategies based on social sciences methods to appropriately incorporate all levels of stakeholders and citizens into the research process.
- Develop innovative techniques for mapping, assessing, and restoring ecosystem functions and services.
- Evaluate the success of integrated coastal management political processes and practices at all levels: local, regional, national, and international.
- Encourage the scientific development of new sustainable, useful technologies.
- Use marine resources intelligently to develop new, sustainable medical and pharmaceutical products.
- Better understand what sustainable economic development will look like, particularly in situations where a population's needs and economic growth must co-existence with the conservation of the coastal environment.
- Bring together competence and synergy to develop an ecologically-sustainable aquaculture in order

to protect the biodiversity and environment of the ocean, along with providing a safe and sustainable source for human food.

- Improve treatment plant performance; increase general use of new biodegradable materials.
- Combine infrastructures like offshore wind energy facilities and aquaculture installations.
- Governments, for-profit companies, and other organizations must provide the funding required for the sustainable-development research and monitoring that are needed to make informed long-term policy decisions.

(iii) Conclusion: A Reflexive Framework that Turns Reflections Into Actions

The challenges we face in coastal zones are mostly anthropogenic or amplified by human activities that clearly transgress reasonable limits. We highlight the fact that any initiative to truly help societies progress sustainably must integrate the limits of the planet, be co-constructed with the affected communities, and take a holistic ecosystem approach in order to improve ecological and social resilience in the face of increasing natural and anthropogenic pressures.

Note

This document represents the inputs provided by the authors as part of the effort to construct and achieve the Rio+20 goals. The material the authors submitted was coded, synthesized, and condensed to create this document. The process was completed during a simultaneous workshop in Paris and Lima, and validated by the participants through five iterations of revisions, beginning with the first draft and ending with this last and definitive version of the document. While this document communicates the most significant concerns of the authors as a group, it is not a consensus document. This document enables us: (i) to establish our inputs for the Compilation Document and (ii) to propose this adapted material to each national, supranational, and UN delegation in the context of the Rio+20 United Nations Conference on Sustainable Development from the perspective of the 21st century challenges facing coastal zones and our societies.

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