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INTEGRATIVE EVALUATION OF CONTEMPORARY HUMAN IMPACTS ON THE WORLD OCEAN AND COASTAL RESOURCES

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ZINTEGROWANA ANALIZA WPŁYWU WSPÓŁCZESNEJ DZIAŁALNOŚCI CZŁOWIEKA NA STAN ZASOBÓW OCEANU ŚWIATOWEGO I STREF BRZEGOWYCH

W rezultacie wzrostu zaludnienia w strefach przybrzeżnych, rosnącego popytu na żywność pochodzenia morskiego i słodkowodnego, rozwoju przemysłu i urbanizacji w rejonach przymorskich, handlu towarami i usługami pochodzenia morskiego oraz rosnącego zanieczyszczenia wód, uwidoczniła się znaczna rola oceanów w ekonomice światowej. Rosnąca konsumpcja promuje rozwój rynków, handlu międzynarodowego i intensyfikuje transport morski – czynniki zwiększające nacisk na zasoby i środowisko naturalne oceanów i stref przybrzeżnych.

Ekosystemy morskie i przybrzeżne były do tej pory rozpatrywane oddzielnie, a kroki zmierzające do ich konserwacji i zarządzania podejmowane były przeważnie bez uwzględniania istniejących współzależności między tymi systemami. Stąd powstaje konieczność określenia zrównoważonej strategii interakcji człowieka z morzem, wybrzeżem i jego wodami. Te nowe kierunki badan powinny być oparte na podejściu integratywnym i na zrozumieniu form interakcji człowieka z atmosfera, z ekosystemami lądowymi, morskimi i słodkowodnymi. Konieczne są efektywne kroki zmierzające do konserwacji i ochrony dóbr morskich na potrzeby przyszłych pokoleń. Zaniechanie proponowanych działań spowoduje spadek bezpieczeństwa żywnościowego i ekonomicznego, jak również nieodwracalne zachwianie zrównoważonego stanu morskich i brzegowych systemów ekologicznych, szczególnie w morskich krajach rozwijających się.

KEY WORDS: zasoby oceaniczne, globalizacja, środwisko morskie, morskie zmiany klimatyczne, ekosystemy brzegowe, polityka morska

Introductory remarks

Population growth, increased consumption and rapid development of marine technology were the most important factors affecting global marine environmental change during last decades. Deepening world economic integration and international markets stimulated this trend. These pressures on the marine and aquatic ecosystems are measured, between others, by the population increase in the coastal zones, demand for and consumption of food of marine and freshwater origin, urban and industrial development in the coastal areas, trade in environmental goods and services, increasing buying power of the coastal populations and the flow of capital, technology and know-how from industrialized to developing countries.

To understand these impacts we must look at the aquatic and marine ecosystems as integrated systems. Internal links between their different components are complex but it is increasingly evident that human pressures are gaining importance and could be compared with impacts produced by natural causes. The most significant change in the oceans that took place during last decade or so was a continuing decline of the marine living resources. To reverse this trends many countries have undertaken conservation measures but the cycle of resource overuse and reconstruction were usually substantially off-line. The capability to generate sufficient food and other environmental services for population determined the degree of food and economic security as well as marine and coastal environmental health in many states. Globalization and economic reforms became important factors affecting marine environments in countries exporting natural resources, particularly developing coastal states.

This paper addresses frequently missing factor in the up-to-date studies of globalization and environmental change: the impacts of intensifying consumption of marine products in industrialized countries on marine and coastal environments of the developing countries. There is no universal model explaining links between marine environmental deterioration and global trade but it is possible to select a group of key interactions between humans and marine environments.

This interdisciplinary analysis of human impacts on marine and coastal resources includes such factors as international trade, investment and growing demand for food of aquatic origin. The major objective of the study is to determine principal forces affecting past, present and future trends in use of marine resources as affected by recent globalization trends.

The Global Context

In all oceans and coastal areas of the world, the most important factor contributing to the environmental change is the continuing growth of population and increasing consumption. This consumption is stimulated by local demand

for seafood, off-shore energy, sea bottom minerals, the ocean space and international markets through trade, foreign investment and transfer of technology. Global economic integration is an important factor in this trend. From marine and aquatic perspective, the economic significance of population increase, growth in demand and the buying power are expressed in increasing prices of coastal lands, reduced supply per capita and lower quality of raw materials for production of food commodities, increased time costs of extractive operations, growing scarcity of fresh water and higher production costs of commodities for the domestic and international markets.

First: Industrialization brings pollution and quickly shrinking coastal agricultural lands. In Asia, 69% of the coastal ecosystems are threatened by degradation, caused by development, transportation, recreational areas and waste disposal.[1] The world fisheries decline was affected by globalization that, in turn is fueled by increasing flow of capital, materials, information and migration of populations across the borders. These flows are enhanced by technological development and communication.

Secondly: Migration from the interior to the coastal areas and aquaculture/mariculture development generate growth of coastal urban centers particularly in developing countries including China and India. It results in additional demand for coastal lands and adjacent water areas. As prices for aquatic food grew and resources were scarcer, producers looked for substitute stocks of fish and other marine organisms or exploited lower quality resources to produce fishmeal for aquaculture industry that in turn frequently took away the land from local, small-scale farmers. As a result, coastal communities and their traditional lifestyles are severely affected and frequently destroyed. Increasing imports of food of aquatic origin and continuation of distant-water operations in the coasts of Africa, Indian Ocean and the Southwest Pacific were another signs of resource depletion and their scarcity in the coastal waters in European Union, Korea, Taiwan and the People's Republic of China. These countries were forced to send their fleets to extract resources available in other regions of the world ocean.

The third consideration: The impacts of globalization on marine resource use and management are still debated with the mixed evidence available so it is requiring further research. However, some argue globalization contributes to the growth of wealth of nations if they specialize in what they can do best.[2] When society's wellbeing grows the environmental awareness and the willingness to conserve and maintain the high quality of the surrounding environmental conditions is also increasing along the lines of Environmental Kuznets Curve.[3]

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[1] World Resources, 1996-1997, A Joint Publication by: The World Resources Institute, The UN Environmental Programme, The UN Development Programme, The World Bank, Executive Summary, 1996, p. xiv.

[2] D. Ricardo, *The Principles of Political Economy and Taxation, Homewood*, IL: Richard D. Irvin, 1967.

[3] J. L. Van Zanden, Tracing the Beginning of the Kuznets Curve: Western Europe during the Early Modern Period, „The Economic History Review", 1995, No. 48 (4), p. 643-664.

Another argument in favor of globalization is that free trade agreements and international organizations lead to removal or decline of subsidies that promote overexploitation of natural resources.[4] The most common concerns about economic globalization focused on impacts of free trade. By stimulating more intensive production and consumption of environmental goods and services free trade contributed to the overexploitation of natural resources (fish, wild animals, forests, fresh water, and lands) that in developing and transition economies could not be managed properly. This problem was exacerbated by the trans-boundary character of the living resources or if property rights were not clearly defined.

The fourth concern was that countries lowered environmental standards to attract investment, leading to a "race to the bottom". Another question was if free trade rules could undermine local environmental legislation and regulations as well as international environmental agreements? The effectiveness of national environmental safeguards and measures was greatly diminished by the heavy burden of proof, lengthy process required, and often weak outcomes.[5] It is also argued that producers and traders very seldom internalized environmental costs and degradation of ecosystems considering their multiple environmental services.[6]

Expanding aquaculture production in artificial ponds generated significant pressures on local water supplies, often competing with agriculture. Fresh water scarcity in China, Korea and Taiwan became the defining characteristic of the next millennium.[7]

Shrinking Marine Living Resources

Under the pressure of globalization, marine living resources of most oceans and seas – with few exceptions – were either fully exploited, overfished, depleted or slowly recovering.[8]

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[4] R. Enriquez Andrade, *Impacts of NAFTA and International Market Demand on Mexican Coastal and Ocean Resources*, in: Kaczynski V.M., Fluharty D. L., *Impacts of Population and Markets on the Sustainability of the Ocean and Coastal Resources of the North Pacific*, Collection of Papers, of the International Conference on Impacts of Population and Markets on the Sustainability of the Ocean and Coastal Resources: Perspectives of the Developing and Transition Economies of the North Pacific, Seattle, 1999, June 3-4.

[5] A. C. J. Vincent, Marsden A.D., Sumalia, U.R., *Possible contributions of globalization in creating and addressing seahorse conservation problems*, Working Paper Series, Working Paper # 2005-04, Fisheries Centre, The University of British Columbia, 2005, p.5.

[6] Organization of Economic Cooperation and Development (OECD), *The Environmental Effects of Trade. Summary*, Paris 2005.

[7] J. Randall, *China's Thirst: A Look at Water Scarcity in the Northern China*, Term Paper, SMA 540: Strategic Planning for Marine Resources, Fall Quarter, 2002.

[8] W. Kaczyński, *Wpływ handlu międzynarodowego na trwałość zasobów morskich i przybrzeżnych w krajach rozwijających się*, w: *Ochrona środowiska a procesy integracji i globalizacji*, red. A. Budnikowski, M. Cygler, Szkoła Główna Handlowa, Warszawa 2004.

Figure 1
Fishing down the food web in marine ecosystems (Source: Pauly, 2007).

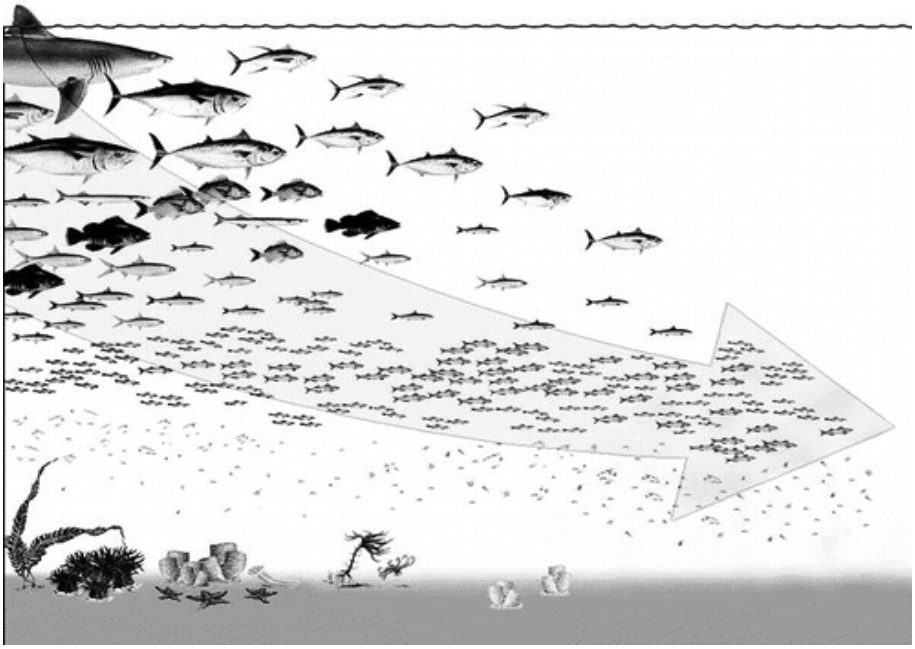


Figure 2
Destruction of mangrove forests to build shrimp ponds in Estuary of Rio Chone, Ecuador,
Status of mangroves in 1976/84 and in 1999

Source: Santa Maria, Guillermo, 2001.

Many ocean areas have seen a marked decline in the quality of landings.

Fishing down marine food webs (figure 1[9]) means that the fisheries (blue arrow), having at first depleted the more vulnerable large fish at the top of various food chains, must target small fish and end up targeting very small fish and invertebrates, including jellyfish. In some parts of the world, the fisheries have indeed gone all the way down, and jellyfish fisheries are on the rise.

The bottom invertebrates at the lower left part of the graphs disappear because of trawling, which leaves large mud beds in its wake.[10]

Given the increasing demand for seafood in the world markets, pressures to continue overexploitation of the marine resources particularly in developing and transition economies will remain strong because most of them are slow to control the growing harvesting capabilities of their own and foreign fleets operating in their coastal areas. There is an urgent need for energetic and immediate actions to reverse these trends.

With greater growth rates and higher buying power, coastal populations consume more marine and coastal resources (seafood, fresh water, timber, land) than people living in the interior. Higher consumption generates growing market demand, increased trade and shipping activity all contributing to more intense pressure on coastal and ocean resources. As these tendencies remained unchecked, they contributed to increased urban and industrial pollution and local microclimate changes that lead to deterioration in the quality of coastal land and water ecosystems.

Considering the trans-boundary character of many ocean resources and international trade linking producing and consuming/importing countries there is a need to elaborate collaborative, regional resource conservation measures based on broad consensus between coastal states.

Links Between Marine and Coastal Land Environments

A fundamental problem in current environmental management was that there were outdated perceptions that severely underestimate aquatic ecosystems.[11] Water is often seen as a technical issue of water supply and sanitation, dam building, and irrigation or aquaculture development. The marine and coastal ecological systems, which include coastal lands and water, coastal landscape and vegetation, rivers, estuaries, bays, fiords, beaches, mangrove forests – have been considered separately so far in various studies and policy measures. Environmental conceptualization grew out of biology, which left little room for

[9] Daniel Pauly, et al., „Science" 2003, No. 302, p. 1359, www.sciencemag.org.

[10] Daniel Pauly, *The Sea Around Us Project: Documenting and Communicating Global Fisheries Impacts on Marine Ecosystem. AMBIO*, „Journal of the Human Environment" 2007, No. 36 (4), p. 290-295.

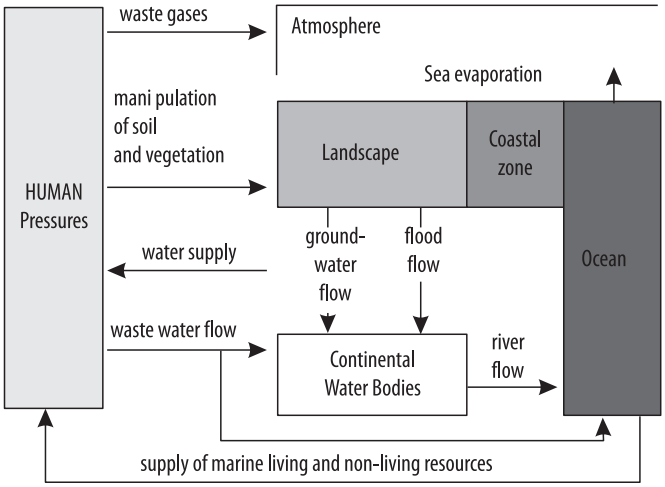
[11] M. Falkenmark, *Human Dimensions of Freshwater: Time to Overcome Water Blindness and Bridge the Science/Policy Gap*, „ IHDP Updat" 2001, No. 1, p. 1-3.

geo-science and socio-economics. Finally, ecosystem theory was developed in the temperate zone with primary stress on energy and nutrients. Since water was plenty, there was no need to focus attention on limiting its use. However, food and environmental security are closely linked through water cycle and aquatic living resources particularly as it is seen in a longer-term perspective.

There is a need to determine a sustainable strategy of human/sea/land/water interaction: what should research address during the next 25 years and how should it be organized today in order to reach this goal? The new agenda should be based on an integrative approach and understanding of the ways in which humans interact with the atmosphere, land, terrestrial ecosystems, water systems, and marine ecosystems (figure 3), and of the linkages in the water cycle that "cascade" down to watersheds and to coastal and marine ecosystems.[12]

Figure 3

Resource and water cycle model and key human interactions with the coastal marine ecosystems and the ocean



Source: Land Ocean Interactions in the Coastal Zone, 2002.

What is needed is a new way of viewing – through sea and freshwater lens – the relationships between human society and the water and landscape on which it is based. It leaves us with a key question of relevance for the marine scientific community: how should our research assist in moving towards the socio-ecological future that we all are jointly dependent on.

[12] Land-Ocean Interactions in the Coastal Zone – LOICZ, *Focus 4, Science Objectives and Scope of Land-Use and Land-Cover Change Implementation Strategy*, „International Human Dimensions Program Report" 2002, No. 10, p. 29-30.

Large Marine Ecosystems

Addressing links between the coast and oceans a new partnership has been developed of the United Nations Environment Program (UNEP) and the US National Oceanographic and Atmospheric Administration (NOAA). The joint initiative incorporates NOAA's Large Marine Ecosystem (LME)[13] assessment and management approach, using LMEs as operational/ management units for translating the Regional Seas Program into concrete actions.

This assists countries in Africa, Asia, Latin America & the Caribbean, and Eastern Europe to restore and sustain resources, coastal environments and linked watersheds.

Studies of LMEs include fish and fisheries, and the influence of land-based sources of pollutants and disruption of the nitrogen while satellite data provide estimates on LME primary productivity.[14]

Some 80% of the pollution load in the oceans originates from land-based activities (municipal, industrial and agricultural wastes, run-off, and atmospheric deposition). These contaminants affect the most productive areas of the marine environment, including estuaries and near-shore coastal waters.

The health, and in some cases the very survival, of coastal populations depend upon the health and well being of coastal systems such as estuaries and wetlands. To support the Global Program of Action for Protection of Marine environment from Land-Based Activities (GPA) a UNEP/GPA office was established in The Hague, Netherlands. One strategic direction for GPA/Regional Seas in the coming decade is to promote ecosystem-based management. LMEs provide a flexible approach to ecosystem-based management by identifying driving forces of ecosystem change. Since 1984, NOAA has been supporting the development of LME assessment and management strategies, in partnership with the International Ocean Commission (IOC), the International Union for Conservation of Nature (UICN) and United Nations agencies.[15]

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[13] Large Marine Ecosystems (LMEs) are regions of ocean space of about 200,000 km^2 or greater. They encompass coastal areas from river basins and estuaries out seaward to the break or slope of the continental shelf (e.g. Yellow Sea LME), or out to the seaward extent of a well-defined current system (e.g. Guinea Current LME). Some, like the Black Sea LME, are semi-enclosed geographical areas. LMEs are defined by ecological criteria including (1) bottom depth contours, (2) currents and water mass structure, (3) marine productivity, and (4) food webs. LMEs are located within the Regional Seas areas. LMEs annually produce LMEs annually produce 95% of the world's marine fish catch.

[14] United Nations Environmental Program and National Oceanic and Atmospheric Administration, Regional Seas Programme Linked with Large Marine Ecosystems: Assessment and Management. Brochure, 2004.

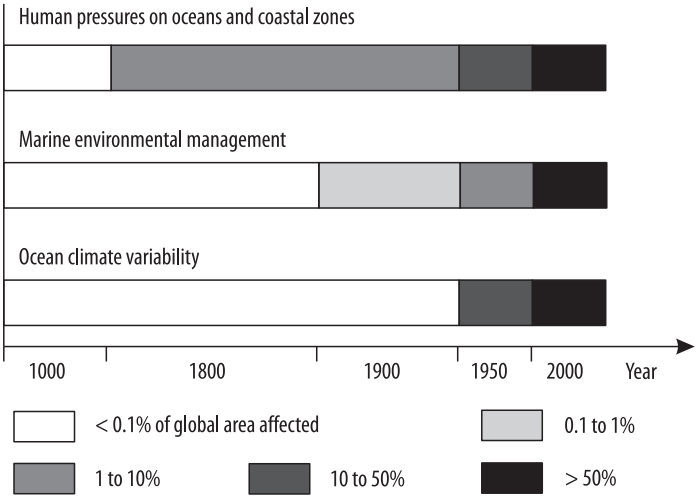
[15] A.M. Duda, K. Sherman, *A new imperative for improving management of large marine ecosystems*, "Ocean & Coastal Management", 2002, No. 45, p. 797-833a.

Human-Induced Global Marine Environmental Changes

The growing progress in research on climate change and oceanographic variability allowed us to better assess and more precisely predict their impacts on socio-economic well being of human societies. On the other hand, our understanding of climate changes caused by the growing population and anthropogenic interventions in the marine environment are still incomplete and frequently underestimated. However, studies reveal that direct human impacts have already affected marine and coastal ecosystems much faster than climate change.[16] Figure 4 reflects historical perspective of changes caused by natural and human-generated factors and attempts to manage coastal and ocean resources in historical perspective. It demonstrates that presently human pressures and interventions in the marine and coastal environment affect over 50% of the global ocean ecosystems. Human activities inflict harsh and often irreversible damage on the marine environment and its critical to marine and coastal resources.

Figure 4

Occurrences of major human pressures on aquatic resources at the global scale and related environmental management associated with recorded ocean climate variability



Source: Adopted after Crutzen and Stroemer, 2000.

Because of intensifying use of these resources the environmental deterioration and resulting climate changes are inevitable. The question is where, when and how much these changes will affect coastal societies and their economies in the following decades?

[16] W. Salomons, R.K. Turner, L.D. de Lacerda, S. Ramachandran, (Eds.), *Perspective on Integrated Coastal Zone Management*, Springer Publishers, 1999.

The interaction between the Anthroposphere, i.e., the Earth System components, created or regulated by humans, such as planted forests, aquaculture water bodies, fields, cities, mines, reservoirs, irrigation schemes or industries, has now reached a state where human forcing is equal to natural forcing. This current geological epoch is termed by Crutzen and Stroemer (2000) as Anthropocene[17].

In all countries or regions where population is increasing – and this includes China, India, Indonesia, Pakistan, African countries, Latin America and the U.S. – the growth is higher in the coastal areas than in the interior of the country. Rapid urbanization and industrialization of the coastal zones are linked to the increasing density of population. This is caused more by migration of people to the coastal provinces than by the natural increase of the coastal population. Incentives to move to the coastal areas include: more favorable local economic conditions, greater job opportunities for new migrants, better living standards and more favorable climate. In many countries these incentives are stronger than the risks of moving to the coastal areas, even if they are exasperated by storms, cyclones, hurricanes and tsunamis.

Urbanization of the coastal zone results in air, water and land pollution, deterioration of coastal ecosystems, decline of biodiversity, and depletion of fresh water and marine living resources. Through local and international markets, trade and transportation links, trans-boundary character of many ocean and fresh water resources and movement of capital, the impacts of growing demand for and consumption of marine and fresh water resources are transferred to other countries and significantly amplified. An example of such links is growing migration of African populations to the coasts, movement of Asia/Pacific workers to the Russian Far East as well as the exports-driven overexploitation of marine resources in this region's coastal waters.

[17] Anthropocene is a newly proposed term for the present geological epoch in order to illustrate the growing impacts of human activities on Earth and atmosphere during the last centuries. Anthropocene would take over from Holocene which has been the term for the postglacial geological epoch of the past ten to twelve thousand years. The new term has been proposed by the two scientists Crutzen Paul J. and Stoermer Eugene F. Examples of the worldwide influence of mankind on the Earth System include urbanization that has increased tenfold in the past century, that humanity has transformed 30-50% of the land surface, and that in a few generations mankind is using up the fossil fuels that were generated over several hundred million years ago – before the time of the dinosaurs. The level of the greenhouse gases carbon dioxide and methane in the atmosphere has increased by more than 30% and 100% respectively. "Mankind will remain a major geological force for many millennia, maybe million years to come", say Crutzen and Stroemer. They propose the latter part of the 18th century as the starting date of the Anthropocene. "We chose this date because during the past two centuries, the global effects of human activities have become clearly noticeable". (http://www.igbp.kva.se//uploads/nl_41.pdf)

Ecosystem/Policy Inertias

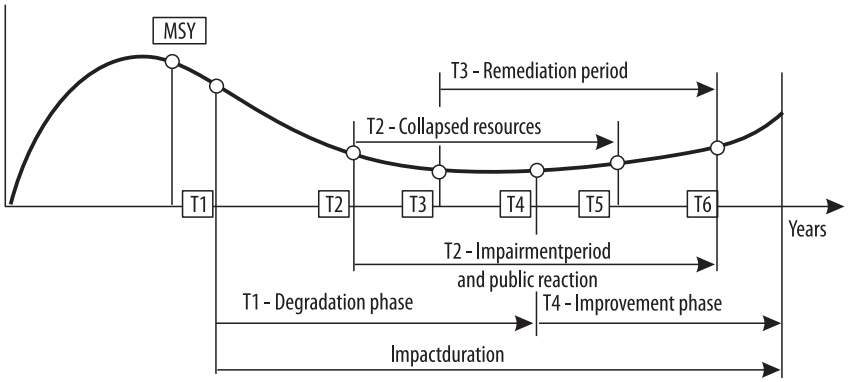
However, the timing of human pressures on the resources (both with local and international consequences) and responses undertaken nationally and regionally show a combination of both Earth system and Anthroposystem inertia as the cycle of resource overuse, conservation and reconstruction measures are usually substantially off-line.

The marine ecosystem's reaction, following the depletion or remediation action, usually takes much longer than reaction to depletion or contamination. Human time constraints (change of state detection, awareness of environmental impacts, identification of social implications, policy and remediation lags) should also be considered.

Societal responses following the degradation of the marine ecosystem are complex. The historical evolution of these responses, i.e. detection of the problem, countermeasures and environmental management, are schematically presented in figure 5.

Figure 5

Degradation of marine living resources, public awarenss and policy/ecosystem inertia



MSY Maximum sustainable yield of the wild living resources
T1 Detection of resource depletion, „alarm bell ringers", specialized institutions
T2 Development of public a wareness until depletion is brought to political agenda
T3 Policy lag - debates until remdiation is determined and implemented (several years)
T4 Ecosystem reaction to policy and management/conservation measures (inertia)
T5 Technical-financial lag needed to implement decisions
T6 Duration of remediation measures

Source: Mebeck, 2000

Regarding the increase of human pressures, the description is still largely hypothetical and must be further studied and verified for various regions and stages of human development and environmental attitudes. The social and individual perception of marine system degradation and of its related risks (biodiversity loss, overfishing or pollution) is the first stage of environmental

concern. The sewage collection system in the first cities of the Indus valley some 5000 or 6000 years ago provides early evidence of environmental perception/ regulation of early urban impacts.

The development of modern environmental concern related to aquatic systems generally resulted from concern about hygiene. For example, the great cholera outbreaks in London and Paris in the mid 1800s led to the collection of urban sewage and to the beginning of water quality monitoring in the late 1800s.

When fully documented, the timing of pressures and their environmental impacts – particularly human impacts and human responses shows a combination of both natural marine ecosystem and anthroposystem inertias. The natural inertia of marine ecosystems in showing signs of major commercial stock depletion or collapse of the whole ecosystem are occurring when the fishing down the food chain from predatory big aquatic animals (tuna, cod, hake, haddock, flat fishes, and other) species is moving to smaller animals, or by improved fishing techniques that tend to mask declining yields of traditionally harvested stocks. The marine ecosystem reaction, following conservation measures, usually takes much longer than its reaction to depletion or contamination. In addition, human time constants (change of state detection, awareness of environmental impacts, identification of social impacts, policy and remediation lags) should also be considered. These added reaction times are schematized in Figure 5 for marine living resources depletion and recovery cycle limited by regulatory measures or environmental indicators.[18]

The full degradation/ improvement cycle can be presented in five phases, namely:

1) T1-T2 detection of changes of environmental state and their potential impacts on aquatic biota, human health, and other valued environmental components by "alarm bell ringers", i.e. individuals, groups or specialized institutions;
2) T2-T3 development of societal awareness concerning environmental and human impacts among local, regional and now global actors (citizen groups, NGOs, media, etc.) until the issue is brought to the political agenda;
3) T3-T4 policy-lag resulting from the debate between societal actors, economic actors, institutions, coastal zone management agencies, local to international political actors (for shared coastal resources) until regulation and remediation is determined;
4) T4-T5 technical-financial lag necessary to enforce or implement these decisions;
5) T5-T6 duration of regulation or remediation measures until a new set of environmental decisions are implemented, usually after few decades.

[18] M. Meybeck, *Water Cycle: Integration of Earth System and Human Dimensions in Continental Aquatic Systems, Universite de Paris*, in: International Human Dimensions Program Newsletter, 2001, No. 1. Art. 8.

Globalization and human security in developing countries: Marine policy considerations

With intensification of international economic relations and globalization the question arises how far these new tendencies affect the sustainability of the natural environments, food and economic security and in developing countries? There is a general consensus that developing countries export more food products of marine origin to than import from the industrialized countries[19] and this trend is continuing to intensify particularly in terms of the value of products. In 1976 developing countries traded 2.5 million tons worth $2.9 billion of marine fish and fish products and in 2000, 13.2 million tons worth $28 billion were traded.[20] Currently 50% of the traded value of marine products originates in developing countries[21], up from 34% in the early 1980s.[22] However, few details on what fish are being traded between what countries, and how the benefits of trade flow between developing and developed countries are reported.[23]

Marine environment and population welfare or security linkages have been analyzed from several perspectives. Conventional view of security focusing on protecting the sovereignty of nation-states over the 200-mile Exclusive Economic Zone were expanded to non-conventional threats such as the depletion and degradation of natural resources including coastal and marine and most recently, impacts of international trade and exports of fish and seafood products to developed country markets. Scientists expanded discussion further arguing that the protection of vital environmental processes covering transboundary areas of resource distribution rather than the country borders and integrity of nation-states should be the focus of security studies. Others argue that the most important aspect of national security should be replaced by comprehensive human security, which includes economic security and food security and other aspects of human well being within the context of secure nation-states (Global Environmental Change and Human Security, 2000).

Despite remarkable increases in food production in developing countries, food insecurity remains a chronic problem for more than 800 million people worldwide. Estimated food increases through to 2010 are expected to reduce the food insecure population to less than 700 million by 2010 but the rate at which

[19] Food and Agriculture Organization – FAO. State of Fisheries and Aquaculture. Rome, FAO, 2002a.

[20] Food and Agriculture Organization (FAO), FISHSTAT Plus. Universal software for fishery statistical time series. Version 2.3. Fisheries Department, Fishery Information, Data and Statistics Unit. [retrieved from http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp, accessed April 19, 2004].

[21] Food and Agriculture Organization – FAO, *State,* op. cit.

[22] G. Kent, (1987). Fish, Food and Hunger: The Potential of Fisheries for Alleviating Malnutrition. Westview Press, London. p. 201.

[23] D. Pauly, R. Watson, J. Alder, *Global trends in world fisheries: impacts on marine ecosystems and food security*. Philos. Trans. R Soc. Lond. B Biol. Sci. v. 360 (1453), 2005, January 29.

food insecurity is declining has begun to slow down.[24] The causes of chronic and temporary food insecurity are complex and highly variable on a country and regional scale. They include: growth of population and consumption, rural depopulation, poverty and inequitable distribution of wealth, depletion of natural resources, wars and civil strife, replacement of food crops for exports, and inequitable access to advanced food production technologies.

It is possible to define food security as the extend to which the food production keeps pace with population growth, ensuring a reliable supply of basic food products and programs to promote national food self-sufficiency.

In many regions such as Africa and most Asia economies, the expanding demand for animal protein cannot be satisfied by agricultural production. In Asia/Pacific there is a growing interest to develop further coastal mariculture and aquaculture production. Expansion of fish farming puts new demands on shrinking water, grain reserves and marine fish that are needed to produce feed for the aquaculture.

Preference for food of marine and aquaculture origin in the Asian societies is very high. This is the most important factor contributing to the intensification of fisheries by these economies. In the future, there will be growth in the market demand for aquatic protein. Japan has become the largest importer of seafood in the world. The People's Republic of China is undergoing a transition period from its position as a net exporter to a growing importer of seafood. Consumption of aquatic protein in PRC will affect both regional resources and international markets, particularly fishery industries in economies-suppliers of seafood to China[25].

International trade, free flow of capital, change in consumption patterns, along with increased demand for aquatic resources in importing markets, has had a powerful effect on marine and coastal environments in marine resource exporting countries. In the Russian Far East, where the population is declining and its buying power is low, free market reforms and newly created export opportunities have led to uncontrolled use and overexploitation of the coastal forests and marine living resources. To the extent that the Russian Far East is integrating with the markets of the North Pacific, it is sharing the benefits of this region's economic growth, as well as the negative implications.

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[24] M. Brklacich, Preliminary Assessment of the Natural Hazards: Electronic Map and Assessment Tools Information System (NHEMATIS) as an Educational Tool: Final Report. Prepared For Emergency Preparedness Canada, Ottawa 2000.

[25] In the newly industrialized countries, fast food service provision is rapidly expanding and there is a growth in the consumption of processed foods; in Europe and North America, markets for organic foods and long-distance imports are growing fast. These trends might affect the demand during coming decades in many industrialized and transition economies. To answer some of questions related to these trends there is a need to explore the early stages of the FCPs-chain, especially problems of sustainability in the food producing sectors (agriculture, mariculture and fisheries). However, changes on the other end of the chain, in consumption habits and their dependency on economic and demographic changes are less understood.

These include unequal benefits from foreign trade between sectors, communities, as well as local and central governments; lack of enforceable resource management principles; distortions in trade practice; and transboundary environmental problems particularly with Japan and the United States. Water pollution on the China-Russian border areas and Russian radioactive waste disposal in the Sea of Japan are particularly acute.

Population increases and the growth in the consumption of marine and coastal resources by swelling numbers of affluent consumers have caused shifts in demand for marine and aquaculture production, transportation of goods and marine tourism. Although the Asia/Pacific nations consume more agriculture meat products compared to fish, fish consumption as a share of total protein increased, with China and South Korea experiencing a near tripling in fish as the share of total protein consumption. An increased share of fish in the total animal protein intake was also witnessed in Canada, the U.S. and Mexico. Japan is the largest and most influential seafood importing market in the world. In 1995 Japan imported US$ 17.8 billion worth of seafood products from across the globe, and Russia, starting from 1992 became a major supplier of fish to this country. This huge demand for seafood stimulates illegal Russian exploitation of coastal resources resulting in severe depletion of many commercial stocks and massive, uncontrolled exports of seafood from the Russian Far East waters. The yearly value of these exports is reaching US$ five billion and is caused by ill-conceived institutional reforms, poor law enforcement and an unfavorable business environment in that country.[26]

It is argued that enhanced by trade liberalization, the flow of marine resource-originated products and services might have a negative effect on the societies of developing countries and transition economies, where the valuation of these public goods does not reflect the real costs and benefits generated by such a trade. The reason: factors outside the market are not properly priced in these countries. The failure of developing economies to reflect a true resource value is the norm rather than the exception. Without corrective policy measures, the most likely consequences of an increased demand for such common property resources as fish, coastal lands and forests, water and air will be further degradation of marine and coastal environments and welfare losses in developing and transition economies of the region. In Mexico and Russia, the perception is that the international trade involving natural resources is likely to benefit only a few at the expense of the majority, with negative consequences for future generations of these countries as well.

[26] A. Vaisman, Trawling in the mist, Industrial fisheries in the Russian part of the Bering Sea, Traffic International, Cambridge, U.K., 2001, p. 52.

Conclusions

The impact of globalization on the marine and coastal environments is still debated but some argue that it leads to removal or decline of subsidies that promote overexploitation of marine resources. Globalization contributes to the growth of welfare of the society so its willingness to conserve and maintain the high quality of the surrounding environmental conditions is also increasing. On other hand, the globalization, in particular free trade could lead to the overexploitation of ocean and coastal resources. Also international trade organizations such as North American Free Trade Agreement, General Agreement on Tariffs and Trade and World Trade Organization could undermine local environmental legislation and international environmental agreements. Management of marine and coastal resources proved to be a very difficult task as any successful scheme must be managed in integrated manner considering whole national and trans-boundary ecosystems. This requires international cooperation and consensus – two uneasy tasks for marine resource planners, managers and conservationists. From historical perspectives human interventions in the marine environment are recorded during last thousand years but effort to manage these resources are undertaken during 150-200 years only. Globalization creates additional demand for marine living resources, off-shore oil and gas, marine minerals, coastal resources (lands, waters and mangrove forests) and marine environmental services including these used by the marine tourism and recreation.

With few exceptions marine living resources are either fully exploited, depleted or slowly recovering. The timing of human pressures on these resources and responses undertaken nationally and regionally are usually substantially off-line. The marine ecosystem reaction, following conservation measures, usually takes much longer than its reaction to depletion or contamination. In addition, human time constants (change of state detection, awareness of environmental impacts, identification of social impacts, policy and remediation lags) should also be considered. Marine environment and population welfare or security linkages have been analyzed from several perspectives. Conventional view of security focusing on protecting the sovereignty of nation-states over the 200 mile exclusive economic zone were expanded to non-conventional threats such as the depletion and degradation of natural resources including coastal and marine and most recently, impacts of international trade and exports of fish and seafood products to developed country markets. It is further argued that the protection of vital environmental processes covering trans-boundary areas of resource distribution rather than the country borders and integrity of nation-states should be the focus of security studies. Others argue that the most important aspect of national security should be replaced by comprehensive human security, which includes economic security and food security and other aspects of human well being within the context of a secure nation-states It is argued that enhanced by trade liberalization the flow of marine resource-

originated products and services might have a negative effect on the societies of developing countries and transition economies, where the valuation of these public goods does not reflect the real costs and benefits generated by such a trade.