

## Coastal Education & Research Foundation, Inc.

---

Coastal Zone under Siege: Is There Realistic Relief Available?

Author(s): Roger H. Charlier and Alexandru S. Bologa

Reviewed work(s):

Source: *Journal of Coastal Research*, Vol. 19, No. 4 (Autumn, 2003), pp. 884-889

Published by: [Coastal Education & Research Foundation, Inc.](#)

Stable URL: <http://www.jstor.org/stable/4299230>

Accessed: 18/01/2012 08:57

---

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at  
<http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



Coastal Education & Research Foundation, Inc. is collaborating with JSTOR to digitize, preserve and extend access to *Journal of Coastal Research*.

<http://www.jstor.org>

# Coastal Zone Under Siege—Is There Realistic Relief Available?

Roger H. Charlier<sup>†</sup> and Alexandru S. Bologa<sup>‡</sup>

<sup>†</sup>Free University of Brussels  
B-1050 Brussels, Belgium  
roger.charlier@pop.kpn.be

<sup>‡</sup>National Institute for  
Marine Research &  
Development “Grigore  
Antipa”  
RO-8700 Constantza 3,  
Romania  
abologa.alpha.rmri.ro



## ABSTRACT

CHARLIER, R. H. and BOLOGA, A. S., 2003. Coastal zone under siege—Is there realistic relief available? *Journal of Coastal Research*, 19(4), 884–889. West Palm Beach (Florida), ISSN 0749-0208.

The coastal zone has been—and is—under siege from several angles for years. The shoreline, in most areas of the world is subject to erosion and regresses. The waters bathing it have been, and continue to be, polluted, mostly anthropogenically, and mainly due to agricultural practices. The coastal zone is, and will be even more intensely, under pressure from a population shift. It is wanted by industry, trade, tourism. These wants and uses are often in conflict with one another, and just as often not sustainable. What can the coastal zone manager and the decision-maker realistically do so that the heritage of mankind be passed on in a tolerable condition? What can be done so that economic development not be stymied and yet such development be sustainable?

**ADDITIONAL INDEX WORDS:** *Health, participation, population shifts, rational management, sustainability.*

## A MULTI-PRONGED SIEGE

“Coastal Zone under siege”, the statement may well be labeled “storming through open gates”. Papers published during the last five years repeat *ad libitum*, if not *ad nauseam*, that the great human migrations of the later 20<sup>th</sup> and of the 21<sup>st</sup> centuries progress inexorably towards the coasts, and primarily the ocean coasts. Truly, this had been forecast more than a decade ago, but downplayed.

Forecasters had variously estimated that more than 50 percent of the world population would be settling in coastal zones, in a 50 kilometer or 50 mile radius, by the early 20-hundreds. The figure was gradually upped to 70, even to 80 percent. Fifty percent of the world’s population is said to have moved to less than six kilometers from a sea and 75% are pronosticated to move there by 2020. Is there a limit to the capacity of coastal zone occupance?<sup>1</sup>

If the concern for the clean-up of Planet Earth remains on the forefront of environmentalists’ thoughts, more practical views have surfaced. Clearly total redress is utopian and mitigated solutions are worked out, for instance the reutilization and commercialization of brownfields.<sup>2,3</sup> Simultaneously the vocable environment has been taking second place to those of sustainability and biodiversity. Another self-evidence, because concentration of large human masses, on a rather narrow band of territory along the coasts, would unavoidably create problems that demand solutions on the short term and planning on the long term<sup>4</sup>. The subject has been taken up, among others by UNESCO for not less than two decades, and

remains a major concern of its “platform for intersectorial action”<sup>5</sup> Shall we be allowed to mention that it has also been studied before in the very site where we now meet,<sup>6</sup> as well as in very remote<sup>7</sup>, developed and developing, areas alike.<sup>8</sup>

## MOVE-IN, CONCRETE-IT, TRY-TO-CURE-IT

France has witnessed for some time what Lewino calls the “calcification of the littoral”.<sup>9</sup> Indeed urbanization is, and has, progressed at a frenzied rate: “Comme des papillons de nuit attirés par la lumière, les Français sont de plus en plus nombreux à venir s’agglutiner en bord de mer, surtout dans le sud. La densité de population est de 2 ½ fois supérieure sur la côte à la moyenne nationale”.<sup>10</sup> The departments of Alpes Maritimes and Var, in the south, and of Morbihan on the Atlantic coast, are the undefeated champions of the concrete users for tourism aims, and there has been an increase of 21% in the acquisition of secondary homes in coastal municipalities. This “tsunami” of people and concrete has enabled authorities to kill off huge real estate projects, put it has not reined in the continued nibbling away of the coastal zone.<sup>11</sup> These conclusions are somewhat disputed by the heads of the Conservatoire du Littoral who claim that the latter is not true and that further coastal zone construction is not on the shore but on a line further inland.

But besides the building rage, other factors largely contribute, and have contributed, to the degradation; they include the proliferation of yachting harbors, artificial beaches (not to be confused with the artificial nourishment of starved natural beaches), dykes and concrete platforms homed in on the sea, all of which have taken over, on the Mediterranean

shores, 10% of the marine depths ranging between 0 and 20 m.

To be added are the risks due to natural causes: for instance, France has suffered large and repeated floods in Brittany, in the Aude and on the Somme River estuary. If, on Bali, wave attack and natural causes are the culprits of the shrinking of such beaches as Uluwatu and Tanah Lot, and shoreline retreat at Siyut and Lebih, can be ascribed to river mouth shifting, losses of beach width on southern Bali are anthropic generated. Tourism having made spectacular advances on this island, lengthening of the Ngurah Rai airport runway appeared advisable; the 800 additional meters of runway, jetting out into the sea, however, led to serious damage at Kuta Beach. Traditional coral extraction—which has also created problems on the Maldives Islands' coasts—caused gradual reef destruction, and brought about beach regression at Batumadeg, Sanur, Nusa Dua and intensified the process at already damaged Kuta Beach.

Both coral and sand are used for ornamental and building purposes in local construction: removal of river material is the principal erosion cause on Gumbrih Beach. Tourists clamor for rooms “on the beach” which encourages local promoters to site such facilities on the beach: the hotels interfere with the natural maintenance processes. Remedial action is needed immediately.

### SUSTAINABILITY OR DURABILITY

While biodiversity will not be ignored during this seminar, the main focus will be sustainability. What is sustainability? A commonplace citation holds that “the French (always) have a word for it”. They have not failed us in this instance either. Francophones have elected to speak about *développement durable* rather than *soutenable*. *Durable*<sup>12</sup> means that can last for a long time, but not necessarily forever; *soutenable*<sup>13</sup> means that can resist, be kept up, supported, endured, defended. Does it not seem that the question is more to devise approaches that allow reasonable, attainable development, that can endure and be defended? Sustainability is thus what we should strive for and it is of particular meaning for the Black Sea.

The Black Sea is rimmed by countries which, but for Greece and Turkey, were, for at least an entire generation, governed by adepts of the central economy philosophy. The coastal zones were primarily used as hard currency earners. Tourism is but one example, though this lack of foresight was equally true in industrialized countries, Spain for instance. That approach, in itself, is not wrong; but the view of development ignored the most elementary rules of environmental conservation, centered on hard-necked industrialization and unbridled exploitation. The consequences of such policy have affected tourism, industry, port construction, fisheries, not to mention health and human welfare.

The renewability of the coastal zone is a slow process requiring from 100 to 100,000 years (Figure 1).

There is not, in Nature, as there is on a computer, an “undo” key which can re-establish the pre-existing situation. To undo, here, is an arduous, occasionally impossible task; brownfields are a living example that the past cannot be

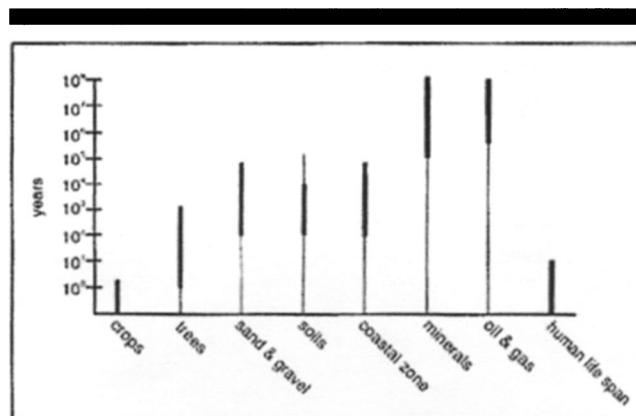


Figure 1. Renewability of natural systems. The coast will renew itself to some extent but in many areas it is being developed in a non-sustainable way and must be regarded as a non-renewable resource.

wiped out and that “accommodations” must be sought, lest the area is to be abandoned forever.<sup>14</sup> We must thus be adamant on the matter of devising a development scheme that is sustainable, even if it encompasses the taking of steps that will be unpopular, politically risky, occasionally unfavorable for some individuals or enterprises, but which will permit economic progress, human well-being and provide happiness in harmony with Nature.

### CULTURE AND THE COAST

It is common knowledge that western science, and thinking, based upon empirical research, clashes with the traditional views of ecological interactions, which is guided by a body of knowledge based upon close co-existence with Nature (Figure 2). Thence, how do we enroll the autochthonous wisdom and know-how, make it co-exist with modern know-how, stop the loss of indigenous knowledge? That knowledge, the traditional specific vocabulary represent remarkable strategies of sustainable management.

Coastal ecosystems show themselves, now unusually adjustable, then of exceptional fragility. All coastal zone components are of course linked and can thus either be influenced or else exert an influence, as a result of happenings on land or way offshore. The increase in the number of various activities in the coastal zone has resulted in a use-rivalry of the resources among, especially, industry, human settlement and recreation centers.

An African view put the situation in a nutshell at a conference not long ago<sup>15</sup>: to attain a sustainable development, it held, in the littoral area, one must save its ecological and operational potential; this is not possible through integrated management alone: populations must learn which steps lead, or a *contrario*, do not lead, in the direction that will maintain the ecological equilibrium. There is thus a need to sensitize all parties involved in coastal exploitation, management and planning. This requires an assessment of the practical and economic interests represented by the call for local initiatives of sustainable development. The interdisciplinary research

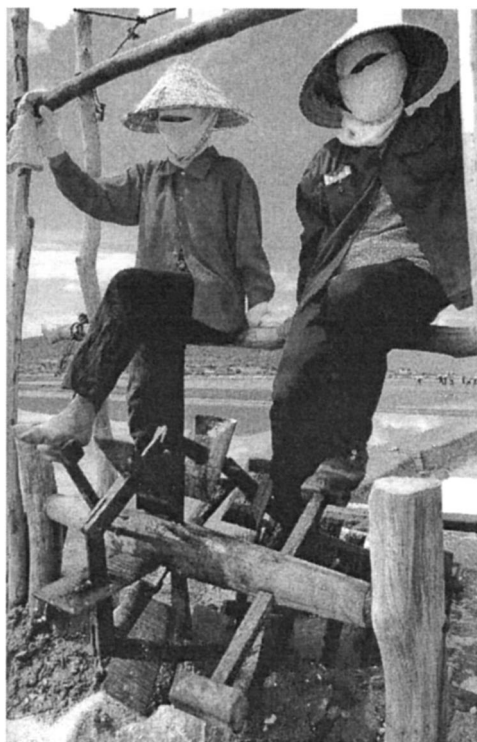


Figure 2. Example of salt extraction.

methods, combining western and local paradigms of knowledge, will allow utilization of local knowledge systems and to apply them to the coastal zones' sustainable development.

Another need is to inform the local inhabitants by all possible communication means results of research. They should be allowed to express themselves thence mixing their reaction to the doled out information and their own knowledge. Any program should insure that the immediate, *viz.* short term, interests are duly taken into account in the long term plan. An author just praised President Chirac's wisdom in catering to the immediate needs and not those of the distant future (*"Les petits matins"*, Paris, Ramses 2002). In politics perhaps wise, but not in development. An intensive sensitization effort must be made and focuses upon specific interests groups. Summarizing, efforts must aim at:

- Resolving conflicts
- Net(-work)s organizing
- Planning and development specialization
- Rally communities to the undertaking
- Embody the cultural component
- Make an environmental impact assessment
- Train the instructors in
  - Communication
  - Research
  - Discussion leading
  - Expertise and counsel providing

Of course, changing habits that are secular is not always

an easy task, even if some timid efforts at communicating are made. The matter of fisheries in Europe is a horny question.<sup>16</sup> The current European fleet of fishing boats counts nevertheless some 100,000 units, mostly Spanish, a fleet already trimmed once by 40% in 1986, about 29%. The vessels are for more than 85% older than ten years. They bring in about 8 million metric tons of sea products a year, representing a basic value of 9 million Euros. In order of increasing numbers of boats Spain ranks first, followed by Italy, the United Kingdom, France, The Netherlands and Portugal.

The economic and social impact of fishing is considerable. The industry is subsidized to the tune of 1,1 million Euros by the European Union which represent a "gift" of approximately 14,000 Euros per year per ship, with Italy capturing the lion's share and using a third of its money to build new boats! This aid is studded with inanities: thus between 2000 and 2006, the European Union's Commission pays out 650 million Euros to decommission boats and with the other hand provides 839 million Euros to build new ones!

More than 250,000 fishermen were involved between 1990 and 1998, a number which doubles when considering the overall business. For each seaman employed, 5 persons are put to work on land. The number represents a loss of 66,000 jobs compared to earlier times.

The European Commission alarmed by prognoses of disasters, wants the fishing fleets reduced by another 40 to 50%. If indeed the overfishing is not terminated, the resources will have been brought down to nil by 2008, like in China or Canada. The Canadians overfished for twenty years, to watch their fishing resources dwindle to nothing and their efforts at repopulation are not a roaring success: fish remains rare.

And yet, how to explain this to the population of a town like Vigo that exists on fishing?

## TIME FOR CHANGE

Though it has been advocated for some time, change is slow in coming, and yet, its time is now. It is true, however, that the capacity of a country to make a transition to a sustainable development is, in a large measure, a function of its institutional and professional endogenous capacity<sup>17</sup>. A changeover to a sustainable development approach necessitates the creation and the new utilization of a pricing policy, economic instruction, access to the internal markets and an increase in regulation.

Indeed such a transition requires a far more efficient utilization of resources and a sense of responsibility regarding the fall-outs of this utilization upon environment and economy. Thence, the need to give environment and resources a more realistic economic value. Which implies, on governments' side, an integration of the environment and development at political, planning and management levels; they must efficiently utilize the economic instruments and the prodding, encouragement, of the market.

Taking an example relevant to the Black Sea coastal regions, and even particularly to Romania with its touristic and thalassotherapeutic interests<sup>18</sup>, the use of marine resources to pharmaceutical, touristic and recreation ends could be reinforced taking into account a sustainable littoral zones plan-

ning. Which in turn should encompass participation of fishermen, women, local population<sup>19</sup>, local communities, and include small-scale vulgarization and training for fishermen, and initiation to aquaculture. This is also pertinent for and applicable to insular establishments which are similarly threatened by fisheries, navigation, tourism, accumulation of polluting industrial and urban wastes, but also from farming and forestry<sup>20</sup>.

An example more often encountered in developing countries is provided by common-owned animals. Such status is an open invitation to habitat destruction as local population will take advantage of such status to utilize illegal techniques. Among these are the use of dynamite, chemical substances, dragnet fishing intensification, seine fishing, drifting nets use, trawlers, capture of not-aimed-for species, and not-selective fishing.

Similarly outdated and probably of negative influence for a sustainable development is the traditional marine tenure and empowerment of resource owners. Though the Maori communities living contiguous to marine resources had sophisticated systems for the use, control and conservation based on their social and economic structures, this traditional method has been displaced for some time by modern-day methods of resource management. Many obstacles had to be overcome and solutions found to promote the legitimate interests of the traditional resource owners, and even to protect them against inroads of non-Maori inhabitants.<sup>21</sup> The same tradition exists elsewhere as in the Cook Islands, Fiji and Kiribati and has occasionally led to conflicts with "modern" government legislation.<sup>22</sup> On the other hand an example to be stimulated is the use of algae, which are in some areas a nuisance, for food and feed<sup>23</sup>, possibly as waste-water cleaning agents.<sup>24</sup>

Coastal regions' ecosystems are among the most complex, and the most productive, of the Earth, the site of resources of major importance, especially where food security is concerned. The degradation of that zone leads to the lowering of local, populations' life quality, hence the urgent attention required for its management and development. Indeed erosion, and deforestation, are first line culprits in biodiversity reduction and fresh water shortage. Native economy ails due to overexploitation of living resources and construction works along coasts, neither of which, in the past, have taken into account ecosystems interactions, water table pollution, nor the non-advisability of monocultures.

Biological diversity is one of the primordial sources of natural capital<sup>25</sup>. It is a capital with a growth potential; it is a capital of *sustainable* advantages that can contribute to a *sustainable* development thanks to new food and drugs, besides several other products; it plays in the environment and sustainable development vital roles, even devoid of economic value, yet crucial for the future of humanity. The decline of biodiversity is largely a consequence of anthropic activities and establishments; these include destruction of habitat, excessive agricultural expansion (including polderization), pollution, introduction of inappropriate vegetal and animal species.

## DEGRADATION & SUSTAINABLE DEVELOPMENT

Physical and ecological degradation have steadily worsened in the coastal zones as human concentration increased, economic activities multiplied, recreation areas became more numerous and accommodated more customers, industry concentrated, and as they became centers of maritime transportation. Yet, these zones are fragile and require responsible and competent management.

Though sectorial and discipline-gearred approaches affect all administrative geography levels they are not a safe path towards sustainability and resolution of user conflict. Poor use of soils, fertilizers, anti-parasites campaigns, deforestation, incompetent management of watersheds, port and recreation areas expansion contribute to further deterioration. As long as coasts were thinly populated, man's use of marine resources, including fisheries, did not exert undue constraint upon the zone. Increased demand, particularly for food, and introduction of newer methods impoverish stocks and reserves. Competition is keen between traditional and industrial fishing. Emphasis should be placed on the management of several species and on diverse methods which take into account the relationships between species, an important fact in maintaining biological diversity and the ecological integrity of high seas and coastal ecosystems. Therefore an integrated and sustainable coastal management encompasses prognosis and safe administration. A holistic approach is thence necessary.

## ACTION NOW

It is especially important for coastal zones in closed and semi-closed seas, such as the Caspian, Azov and Black seas, to adopt an ICZM and to insure a sustainable and multi-sectorial rhythmic utilization which promotes sustainable and ecologically rational exploitation.<sup>26</sup> But it remains gainsaid that this cannot be attained without cooperation of and participation in all facets of planning. That is where the role of education and training is paramount<sup>27</sup>. The possibility for the public at large to dispose of precise and opportune information is an essential ingredient of efforts aiming towards sustainable development.

Growth can be revitalized by a sustainable approach, while failures in the developmental system lead to ecological problems. It is one of these well-known truths, but consistently ignored, that development and environment and influences by human occupance variations, critical factors which weigh upon consumption habits, production, life style and long term sustainability. Prior to World War II no Frenchman would consider on his plate *colin*, let be on his restaurant menu, and herring was the "steak of the poor". Today these are delicacies at home and out, and by no means inexpensive.

The protection of the marine environment against the deleterious effects of land- and sea-bound human activities ranks a high priority to safeguard the options of sustainable development, to preserve marine ecosystems, to protect human health, all the while allowing the rational development of marine resources whether biological or not.

## A CLOSING WORD

Not only should we suppress practices that are destructive for the environment in coastal regions, and *ipso facto* on small islands, we should rehabilitate, where and if we can, damaged areas, through such approaches as the *Conservatoire du Littoral* in France, or purchases by NGOs as in the United States, and the Mediterranean Action Plan<sup>28</sup>.

The 21<sup>st</sup> century ought to be the time of storing placards, banners, slogans and flag-waving discourses, and much rather of action, solutions, and factual concern for the generations that will follow ours. Yet, not only must the outlook be towards sustainability, it must also be realistic, if you prefer financially sustainable. The money manna is not inexhaustible and providing remedies that are not affordable has little sense. As said in the preamble to this Seminar: inexpensive, budget-able proposals and sober plans are needed. Only those will help relieve the siege of the coastal zone.

## LITERATURE CITED

- <sup>1</sup> ANONYMOUS, 1997. *UNESCO on Coastal Regions and Small Islands—Titles for Management, Research and Capacity (1980–1995)*. Paris: UNESCO [CSI Info Series] 21p.
- <sup>2</sup> CHARLIER, R.H., 2000. From green to brown: is brownfield use taking a risk?. *Environmental Management & Health*, 11(1), 16–20; Charlier, R.H., 1999. Land use: brownfields. A viewpoint: *International Journal Environmental Studies* 54, 3, 283–292; Charlier, R.H., 2001. Continental thrift. *Brownfield News*, 3, 5, 21; Kronich, E., 1997. Brownfields in the classroom. *Brownfield News*, 1, 6, 9–12; Nuyens, D., 2002. Het beleid aangaande brownfields ontwikkeling. *Proc.Study-day April 23, 2002, KVIV-Antwerp, Belgium* [no pp. nb.] Paper #1 Van Aerschot, W., 2002. De herontwikkeling van brownfields beleidsaanpak in het buitenland. *Proc. Study-Day April 23, 2002, KVIV-Antwerp* [no pp. nb.] Paper #3.
- <sup>3</sup> (KVIV=Koninklijke Vlaams[ch]e Ingenieurs Vere[n]iging, Royal Flemish Society of Engineers)
- <sup>4</sup> ANONYME, 2000. *Développement urbain durable en zone côtière: Actes du Séminaire International tenu à Mahdia, Tunisie en juin 1999*. Paris: UNESCO, 225p.; Anonymous, 2000. *Wise Coastal Practices for Sustainable Human Development—Results from an Intersectorial Workshop and Preliminary Findings of a Follow-up Virtual Forum*. Paris: UNESCO, 126p.
- <sup>5</sup> ANONYMOUS, 2000. *Reducing megacity impacts on the coastal environment. Alternative livelihoods and waste management in Jakarta and the Seribu Islands*. Paris: UNESCO, 64p.; Special parliamentary committee on urbanization and social development [Papua-New Guinea], 2000. *Policies and Strategies for Managing Urbanization in Papua New Guinea*. Port Moresby: Government Printing Office.
- <sup>6</sup> BOLOGA, A.S. and CHARLIER, R.H. (eds), 2000. *Using Today's Scientific Knowledge for the Black Sea Area's Development Tomorrow*. Constantza: Romania, Editura DaDa, 184p.; Charlier, R.H. & Charlier, C.P., 2000. Sustainable multi-use and management of the coastal zone. In: Bologa, A.S. & Charlier, R.H. (eds), 2000. *op.cit.*, pp. 109–132; Frangopol, P.T., 2000. The Black Sea relevance in the next millennium's sustainable development. In: Bologa, A.S. & Charlier, R.H. (eds), 2000, *op.cit.*, pp. 25–34; Parkhomenko, A.V.; Subbotin, A.A., and Gubanov, V.I., 2000. Estimation of the state and several approaches to eliminate the negative influences of ecopolis on the coastal zone. In: Bologa, A.S. & Charlier, R.H. (eds), 2000, *op.cit.*, 77–86.
- <sup>7</sup> P.E.X. VAN HERWERDEN, L. and BALLY, R., 1989. Shoreline utilisation in a rapidly growing metropolitan area: the Cape Peninsula, South Africa. *Ocean & Coastline Management* 12(2), 169–178; Vigneaux, M., 1987. L'exploitation de la zone côtière: ses perspectives et ses risques pour l'environnement: *Act. Coll. "Mer & Littoral, Couple à risque"*, Biarritz. Paris. La Documentation Française, pp. 299–310.
- <sup>8</sup> Special parliamentary committee on urbanization and social development [P-NG], 2000. *Policies and Strategies for Managing Urbanization in Papua New Guinea*. Port Moresby: Government Printing Office.
- <sup>9</sup> LEWINO, F., 2002. Ecologie: la France se dégrade. *Le Point* 1549 (mai 24), 70–71.
- <sup>10</sup> "As night butterflies in quest of light, Frenchmen are ever more numerous to come and squeeze in along the shores, especially in the south. The population density is 2½ times higher on the coast than is the national mean".
- <sup>11</sup> INSTITUT FRANÇAIS DE L'ENVIRONNEMENT, 2002. *Rapport sur la Loi Littorale*. Paris: IFEN.
- <sup>12</sup> *Durable: de nature à durer longtemps; durabilité: (durability) période d'utilisation d'un bien. (Dictionnaire Larousse: Paris, Larousse, 2000)*
- <sup>13</sup> *Soutenable: (sustainable) qui peut être supporté, enduré; soutenir: (figurative meaning of to sustain) défendre, résister (Dictionnaire Larousse: Paris, Larousse, 2000)*
- <sup>14</sup> see note 2 *supra*.
- <sup>15</sup> SAGNIA, B.K., 1998. Cultures, sociétés et tourisme. *Conférence pan-africaine sur la gestion intégrée et durable des régions côtières (Maputo, Mozambique)*, 153–157.
- <sup>16</sup> GUBERT, R., 2002. La bataille de Vigo. *Le Point* 1549 (24 mai), pp. 72–75.
- <sup>17</sup> For example: Stepanov, V.N., 2000. Econo-ecological, socio-political problems and prospects of institutional transformations in the Black Sea region. In: Bologa, A.S. & Charlier, R.H. (eds), 2000, *op. cit.*, pp. 55–64.
- <sup>18</sup> CHARLIER, R.H., 2000. The shrinking playground. In: Bologa, A.S. & Charlier, R.H. (eds), 2000, *op. cit.*, pp. 133–146; Charlier, R.H. & Chaineux, M.-C.P., 2000. Health tourism, tool for development: thalassotherapy: *op. cit.*, 147–166.
- <sup>19</sup> CARSWELL, C., 2001. Tourisme and culture and the sustainable use of marine resources. In: *Oceans in the New Millennium: Challenges and Opportunities for the Islands*, G. R. South et al. (eds). Proceedings IOI-PIM XXVII, Suva / Fiji, 8–12 November 1999, Ed. DaDa, Constantza, Romania, pp. 139–146.
- <sup>20</sup> RADCHENKO, V.N. and ALEYEV, M.Y., 2000. National knowledge and international approaches towards estimation of coastal zone problems in Crimea: the need for implementation of ICZM ideology to achieve sustainability. In: Bologa, A.S. & Charlier, R.H. (eds), 2000, *op. cit.*, pp. 162–174.
- <sup>21</sup> BARRETT, T., 2001. Empowerment of Resources owners in New Zealand, with specific reference to Maori fishing rights. In: *Oceans in the New Millennium: Challengesw and Opportunities for the Islands*, G. R. South et al. (eds), Proceedings IOI-PIM XXVII, Suva / Fiji, 8–12 November 1999, Ed. DaDa, Constantza, Romania, 131–134.
- <sup>22</sup> TEBANO, T., 2001. A case study on marine tenure systems in Kiribati: Will they ever be able to sustain our inshore marine resources. In: *Oceans in the New Millennium: Challengesw and Opportunities for the Islands*, G. R. South et al. (eds), Proceedings IOI-PIM XXVII, Suva / Fiji, 8–12 November 1999, Ed. DaDa, Constantza, Romania, 135–138.
- <sup>23</sup> CHARLIER, R.H., 2001. Algae for food and feed: *International Journal Environmental Studies* [in press]; Black Sea Environmental Programme, UN Publications New York, 167p; Zaitsev, Y.P. & Mamaev, V.O., 1997. *Black Sea Biological Diversity. Ukraine*. Black Sea Environmental Series, UN Publications New York, 208p.
- <sup>24</sup> CHARLIER, R.H. and MORAND, P., 2002. Can algae blooms be put to use for waste-water treatment? *International Journal Environmental Studies* [in press].
- <sup>25</sup> SCHUSTER, C., 2001. The convention on biological diversity. In: *Oceans in the New Millennium: Challengesw and Opportunities for the Islands*, G. R. South et al. (eds), Proceedings IOI-PIM XXVII, Suva / Fiji, 8–12 November 1999, Ed. DaDa, Constantza, Romania, 275–286.
- <sup>26</sup> BOLOGA, A.S., 2001. Destruction of biodiversity—A case study of the Black Sea. In: *Oceans in the New Millennium: Challengesw and Opportunities for the Islands*, G. R. South et al. (eds), Proceedings

- IOI-PIM XXVII, Suva / Fiji, 8–12 November 1999, Ed. DaDa, Constantza, Romania, 249–254; Khomakhidze, A. & Mazmanidi, N. (eds), 1988, *Black Sea Biological Diversity. Georgia*. Black Sea Environmental Programme, UN Publications New York, 167p; Zaitsev, Y.P. & Mamaev, V.O., 1997. *Black Sea Biological Diversity. Ukraine*. Black Sea Environmental Series, UN Publications New York, 208p.
- <sup>27</sup> CHAINEUX, M-C. P. and CHARLIER, R.H., 1999. Strategies in environmental education. *International Journal Environmental Studies*, 56, 6, 889–905.
- <sup>28</sup> CHABASON, L., 2001. Recent developments within the Mediterranean Action Plan: The establishment of the Mediterranean Commission on Sustainable Development. In: *Oceans in the New Millennium: Challenges and Opportunities for the Islands*, G. R. South *et al.* (eds), Proceedings IOI-PIM XXVII, Suva / Fiji, 8–12 November 1999, Ed. DaDa, Constantza, Romania, 109–110.