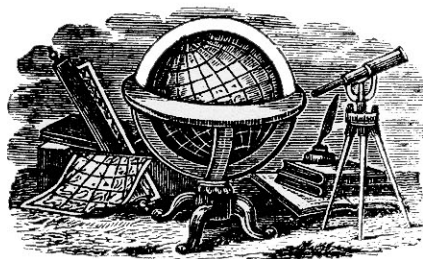


SOVIET GEOGRAPHY: REVIEW & TRANSLATION

OCTOBER 1981



Published by V. H. Winston & Sons
an affiliate of Scripta Publishing Co.

THE PHYSICAL-ECONOMIC CONTACT ZONE BETWEEN LAND AND SEA

V. A. Dergachev
(Odessa branch, Institute of Economics,
Academy of Sciences, Ukrainian SSR)

From: *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva*,
1980, No. 1, pp. 40-45.

Abstract: The physical-economic contact zone between land and sea is conceptualized as a zone of intensive interaction among population, economy and the natural environment. It may be viewed as a boundary zone between territorial production structures on land and aquatorial production structures in the ocean. Its present state is marked by an increase in the density of coastal settlement and in the diversity of economic activity as well as by a deterioration of environmental quality. Conflicts between economic and ecological interests tend to become particularly acute in this contact zone. It is suggested that the zone become the focus of interdisciplinary research, with geography playing a leading role. (For previous articles reflecting growing Soviet interest in seacoast development and maritime activities, see those by V. V. Pokshishevskiy and by O. N. Krivoruchko in *Soviet Geography*, March 1976.)

The development of resources of the world ocean constitutes one of the global problems of today. The Soviet Union is devoting a great deal of attention to ocean studies, which call for collaboration among oceanographers, economists, geographers, mathematicians, physicists, biologists, chemists and members of other disciplines. Such research areas at the boundary between fields of knowledge offer a fruitful basis for new scientific concepts.

The development of oceans involves mainly the development of resources on the continental shelf. The study and development of the shelf would therefore seem to rank in importance with economic problems affecting the world ocean as a whole. However, as has been noted by A. F. Treshnikov, director of the Arctic-Antarctic Institute in Leningrad (Reference 25), there have been few studies either in the Soviet Union or abroad that offer a complex analysis of the process of development of the continental shelf.

The development of the shelf is usually examined in isolation from the development of productive forces in coastal areas, and vice versa. From the point of view of the complex study of oceans, these aspects must be investigated together.

In terms of the concept of active surfaces of geographical structures, the ocean functions through boundary zones. Its active regions, marked by a richness of life and an intensity of natural processes, represent only about 2 percent of the total volume (References 1, 9). Among the main contact zones are: (a) the land-sea littoral

zone, in which the river-sea contact system would be one of the forms of land-sea interaction; (b) the air-sea surface; (c) frontal zones (zones of contact between water masses); (d) the layer of bottom waters at the seabed surface. These contact zones or dividing surfaces have been examined by A. D. Dobrovolskiy, V. L. Lebedev and T. A. Ayzatullin (1, 9, 10).

The natural sciences recognize the outstanding role played by the land-sea contact zone as a zone of intensive chemical interaction (5). The origins of life were associated with the littoral zone (4). In past geological epochs, a surplus of organic matter in the land-sea contact zone gave rise to most of the earth's minerals of sedimentary origin. Marine sedimentary deposits, which include all fossil fuels (oil, natural gas, coal, oil shale), have assumed great commercial significance as the principal reserve of the earth's fuel and energy resources.

While the fossil fuel resources on land served mankind well during the period of the Industrial Revolution, further progress in the world economy will depend on the use of the fossil fuel resources on the continental shelf. As continental fields become depleted, oil and gas production is shifting to the large offshore fields on the shelf. Marine sedimentary building materials (sand, gravel, clay, lime, chalk) are also gaining in significance in connection with the economic attractiveness of the littoral zone.

A set of scientific principles for the 10-year ocean studies program that was drafted by the National Committee of Soviet Oceanographers in the late 1960s said: "The processes of development in the littoral zone of seas and oceans are so specific that the zone should be viewed as a distinctive boundary region differing qualitatively from the land and water areas it separates" (11, p. 797). In ecology, this idea has been reflected in the ecotone concept and in the notion of the boundary effect. From the ecological point of view, the sea-land contact zone is a boundary zone of tension in which the diversity and density of communities tend to grow. The best illustration may be found in limans, the rivermouth lagoons that may be regarded as transitional impulse-stabilized zones between freshwater and marine habitats (19). The littoral zone and the upwelling regions also account for most of the primary production of oceans.

In geomorphology, we have the fundamentals of a theory of shoreline evolution, including the littoral zone of the seas of the USSR (12, 13, 14, 15, 17, 18), and ways have been suggested to optimize human impacts on the littoral zone (23).

An analysis of the spatial differentiation of economic development of the world ocean (18) reveals the following economic-geographic zones based on a physical spatial differentiation and the provisions of international law: a physical-economic land-sea contact zone, including its marine component, the continental shelf; the zones of the open ocean, and an islands zone.

The land-sea contact zone is a zone of intensive interaction among population, economy and the natural environment; this is the boundary zone of interaction

between spatial production structures of land and sea. Its present trends are an increase in the density of the littoral population and in the diversity of economic activity and a deterioration of the environment.

This land-sea contact zone includes both the continental shelf and an economic littoral zone. It represents roughly 7 percent of the area of the earth, and the overall length of the shoreline is more than 1.5 million km.

The continental shelf represents the level portion of the underwater border of a continent, whence its other designation, that of continental shoals. The position of the shelf on the continental margins is shown best on maps of seabed relief. The overall area of the shelf is 31 million sq. km., or 7.5 percent of the total area of the seabed. Its mean depth of 130 m is likely to foster intensive exploitation of its mineral resources within the near future. The geological structure of the shelf is usually the same as that of adjoining land areas, and this further supports the idea of treating the shelf together with the coast as a single sea-land contact zone.

The shelf always has been and will continue to be the main fishing zone, including the most productive areas of the world ocean. The shallow (neritic) reaches of the shelf include the spawning grounds of most fish species. The shelf now yields 19 percent of the world's oil and 20 percent of the natural gas. Forecasts generally agree that the share of offshore oil and gas will continue to grow.

The natural littoral zone, or seacoast, is a belt of interaction between land and sea. A number of seacoast types can be distinguished: fiords, skerries, limans (river-mouth lagoons), rias, Dalmatian type, delta type, etc. Even though there are still seacoasts that are economically undeveloped, human impact extends even to Antarctica as a result of air and water pollution. The width of the economic littoral zone will be determined by the territorial-production structure of the marine economy and will depend on relief and the type of seacoast.

The land-sea contact zone is distinguished by great diversity. For that reason, it requires investigation of both its physical (oceanographic, biological, ecological, etc.) and socioeconomic characteristics in their interrelationship.

In recent years, a number of authors have written about the socioeconomic attractiveness of seacoasts (2, 3, 16, 20, 21, 22, 24, 26, 27, 29, 31). An industrial shift toward the ocean has been mentioned, as well as the formation of large industrial port complexes. The land-sea contact zone represents the basic area of development of the productive forces of the marine economy by including those sectors of industry that are associated directly with the use of the natural resource potential of seas and oceans.

In the developed capitalist countries, the industrial shift toward seacoasts is taking place not only because of the scientific-technical revolution in maritime transportation, but also because of growing dependence on the importation of raw materials and fuel from the developing countries. The development of ports, in turn,

has enhanced the attractiveness of seacoasts for industries based on imported oil, coal and iron ore (16).

Of considerable importance in the land-sea contact zone is the use of energy derived from wave motion and the tides and the construction of nuclear power stations and water desalting facilities. In this zone, maritime transportation interacts with railroads, highways and inland waterways. Of particular significance for transport contacts are the mouths of navigable rivers, which often give rise to large industrial port complexes. The land-sea contact zone is an arena for enhancing the biological productivity of seas and oceans through the acclimatization and cultivation of marine species of fish, invertebrates and algae.

The work of Polish and American demographers suggests that man is basically a coastal, rather than a continental, denizen. According to 1961 data, 27.6 percent of the world population lived within 50 km of coasts and more than half of mankind (50.3 percent) lived within 200 km (30).

According to the Massachusetts Institute of Technology, by the beginning of the 1970s, 53 percent of the world population was concentrated within 80 km of coasts, and by the year 2000, 80 percent of the population of the United States is expected to live within an 80-km coastal zone (29). In 1970, there were 89 million people in coastal zones of the United States, including shoreline zones of the Great Lakes. Population growth in coastal areas of the United States was more rapid in 1960-70 than the country average: the population of coastal counties rose by 27 percent, and that of cities within 2 km of the shoreline, by 47 percent (28).

The land-sea contact zone also represents the world's greatest recreation area. The physical environment of seacoasts and the properties of seawater have fostered the development of seaside resorts. Cultural-historical sights and natural monuments on seacoasts make it possible to combine recreation with maritime tourism and enhance the esthetic attractiveness of the contact zone.

The socioeconomic attractiveness of seacoasts can be explained in terms of the growing role of the international division of labor and the expansion of export-import linkages among countries, an increase in the magnitude of human activity on oceans and along seacoasts, and the greater cost-effectiveness of the exploitation of marine resources. The economy of the world ocean cannot be divorced from that of the seacoasts, which also accommodate the social and productive infrastructure for the economic development of seas and oceans.

The land-sea contact zone contains the most important growth poles of human activity on the surface of the earth. At first, many of these growth poles arose as a result of the development of new regions. Now these growth centers are endowed with particularly favorable conditions for ocean development. The land-sea contact zone is the principal element of externally centered systems—the oceanic and marine economic regions of the world ocean.

The land-sea contact zone represents a complex natural system that functions as one of the main ecological filters of the earth. Natural processes within the contact zone play an important role in the global energy-exchange system and in the circulation of matter in the biosphere. At the same time, the contact zone is highly sensitive and vulnerable to outside impacts induced by human activity. As a huge accumulator of industrial and household wastes, the land-sea contact zone is becoming the principal outpost in the fight against the pollution of seas and oceans.

The conflict between economic and ecological interests becomes particularly acute in the land-sea contact zone. For example, any projects for the regulation of streamflow, the territorial redistribution of water resources and the transformation of drainage systems must consider the ecological impact of such measures in the land-sea contact zone. In the capitalist countries, the zone is a arena of acute conflict between private and public interests and between various types of users of coastal areas.

Problems of development of industry, transportation, agriculture, environmental protection and the combining of residential and recreational areas call for a complex approach to the development of the land-sea contact zone. It is no accident that some coastal countries have worked out full-fledged programs for the utilization of resources in the contact zone. The United States has enacted legislation for coastal management, with a view to resolving the problem of the three E's—economy, energy and ecology. An official definition of coastal zone has been worked out. It is defined as a zone of maximum concentration of marine-based activities; the space along the coast represents a unique region in the physical-geographic, ecological, industrial and socioeconomic sense (20). The Coastal Society of the United States, which was founded in 1975, defines the coastal environment as a priceless and nonrenewable natural resource, a source of industrial raw materials and energy, of food and recreation for millions of people (3, 31).

The natural-economic contact zone of the seas of the USSR has no analogs on earth. Its basic parameters are: a total shoreline length (including islands) of 111,000 km; a continental shelf area of 6 million sq. km., including 3.4 million sq. km. with depths of less than 50 m; a coastal urban population of 20 million.

Major maritime economic centers are situated on the periphery of the contact zone of the corresponding maritime regions near the intersection of the land and sea boundaries of the Soviet Union (Leningrad, Odessa, Murmansk, Baku, Vladivostok). This is due to several factors: foreign trade ties; noneconomic functions such as defense; the exploitation of oceanic resources such as fisheries. Each of these coastal centers has satellite ports that perform one of the "maritime" functions of the main city: Kronshtadt (naval base outside Leningrad); Il'yichevsk (outer port of Odessa); Severomorsk (naval base outside Murmansk); Neftyanyye Kamni (off-shore oil town near Baku); Nakhodka (foreign trade port for Vladivostok—Editor, S.G.).

The economic development of the seas is associated with the process of migration to coastal areas. From 1960 to 1975, the population of the Soviet maritime cities grew by 46 percent. Large cities on seacoasts that are getting priority in development become the cores of new industrial port complexes.

The Soviet five-year plan now envisages the development of a number of territorial-production complexes in continental regions. And this is quite legitimate since the USSR is the world's largest nation. In our view, however, an increasingly large portion of investment will be allocated in the future to the land-sea contact zone of the USSR as greater use is made of the fuels and energy resources and the biological, and chemical resources of seas and oceans, and industrial port complexes will become major growth poles. In effect, there is likely to be a "renaissance" of many maritime centers because of the concealed potential of their economic-geographic situation. The large-scale mobilization of marine resources will spur the development not only of territorial production complexes, but of industrial port complexes, which will play a key role in enhancing the cost-effectiveness of social production as a result of an economically rational spatial organization of the nation's maritime economy.

The need for coordinating economic activities in the seas calls for an economic regionalization of seas (based on the ecological state of the environment) and for a rational organization (zoning) of the land-sea contact zone: the delimitation of industrial, residential, recreational, fishing, biological reclamation and research-preserve zones.

In conclusion, it should be stressed that the land-sea contact zone must become an object of study for interdisciplinary investigations. Geography, by virtue of being concerned with natural and economic spatial systems, would have to play a leading role in such complex research.

Bibliography

1. Ayzatullin, T. A.; I. A. Suyetova; K. M. Khaylov. "Boundary surfaces and the geography of oceans." *Vestnik MGU, geogr.*, 1976, No. 3.
2. Anuchin, V. A. *Osnovy prirodopol'zovaniya. Teoreticheskiy aspekt* (Fundamentals of Nature Management; the Theoretical Aspect). Moscow, 1978.
3. Zenkovich, V. P. "The Coastal Society of the United States," *Izv. AN SSSR, ser. geogr.*, 1978, No. 5.
4. Bernal, John. "The origin of life in the littoral zone of oceans," in: *Okeanografiya*. Moscow, 1965.
5. Vernadskiy, V. I. *Biosfera* (The Biosphere). Leningrad, 1926.
6. Vinogradov, K. A. "On the problem of contact zones in the sea," in: *Problemy morskoy biologii* (Problems in Marine Biology). Kiev, 1971.
7. _____. "The development of research on the contact zones of the southern seas," in: *Biookeanograficheskiye issledovaniya yuzhnykh morey* (Biooceanographic Studies of the Southern Seas). Kiev, 1969.
8. Dergachev, V. A. "Aquatorial differentiation in the economic development of the World Ocean," *Visnik Akademii nauk URSS*, 1978, No. 9 (in Ukrainian).

9. Dobrovol'skiy, A. D., and V. L. Lebedev. "The geographical structure of the ocean," *Zemlya i Vselennaya*, 1977, No. 2.
10. _____ and _____. "Distinctive approaches to a physical-geographic regionalization of the World Ocean," in: *Geography of Oceans. International Geography*, Moscow, 1976.
11. Zenkevich, L. A., et al. "Scientific principles for a 10-year program of research on the World Ocean," *Okeanologiya*, 1968, No. 5.
12. Zenkovich, V. P. *Osnovy ucheniya o razvitiy morskikh beregov* (Fundamentals of Shoreline Evolution). Moscow, 1962.
13. _____. "Development of littoral zone theory in the USSR," in: *Voprosy istorii fizicheskoy geografii v SSSR* (Problems in the History of Physical Geography in the USSR). Moscow, 1970.
14. Kaplin, P. A. *Noveyshaya istoriya poberezhnyy Mirovogo okeana* (Recent History of Seacoasts). Moscow University, 1976.
15. _____. *Razvitiye beregovoy zony morey i okeanov v poslednyikovoye vremya* (The Evolution of the Littoral Zone of Seas and Oceans in Postglacial Times), summary of doctoral dissertation, Moscow, 1970.
16. Lavrov, S. B., and S. S. Sal'nikov. "The industrial shift to the sea and the formation of industrial port complexes," in: *Geografiya okeanov* (Geography of the Oceans). Leningrad, 1975.
17. Leont'yev, O. K. "The coastal zone of seas and oceans," in: *Razvitiya nauk o Zemle v SSSR* (Development of the Earth Sciences in the USSR). Moscow, 1967.
18. Lymarev, V. I. *Osnovnyye problemy fizicheskoy geografii okeana* (Basic Problems in the Physical Geography of Oceans). Moscow, 1978.
19. Odum, Eugene P. *Osnovy ekologii*. Moscow, 1975 (translation of the third edition of: *Fundamentals of Ecology*. Philadelphia: Saunders, 1971).
20. Pisarev, V. D. *SShA i Mirovoy okean. Ekonomiko-politicheskiye tendentsii osvoyeniya* (The United States and the World Ocean. Economic-Political Tendencies of Development). Moscow, 1977.
21. Pokshishevskiy, V. V. "Theoretical aspects of the attraction of seacoasts for settlement and the derivation of a measure for that attraction," *Izv. VGO*, 1975, No. 1 (*Soviet Geography*, March 1976).
22. Saushkin, Yu. G. *Ekonomicheskaya geografiya: istoriya, teoriya, metody, praktika*. Moscow, 1973.
23. Saf'yanov, G. A. *Beregovaya zona okeana v XX veke* (The Coastal Zone of Oceans in the 20th Century). Moscow, 1978.
24. Slevich, S. B. *Shel'f: osvoyeniye, ispol'zovaniye* (The Continental Shelf: Development and Use). Leningrad, 1977.
25. Treshnikov, A. F. "The resources of the continental shelf in the service of mankind." Foreword to: S. B. Slevich, *Shel'f* . . . , op. cit.
26. Shapalin, B. F., and D. S. Stratula. "Development of raw material resources in the World Ocean and the formation of industrial complexes on the seacoasts of the Soviet Union," in: *I s'yezd sov. okeanologov* (First Congress of Soviet Oceanographers). Abstracts of Papers, Vol. II. Moscow, 1977.
27. _____ and _____. "Economic basis for the formation of production complexes in the coastal zone of the World Ocean," in: *Ekonomicheskiye problemy Mirovogo*

- okeana (Economic Problems in the World Ocean). Abstracts of Papers. Odessa, 1977.
28. Platt, R. H. "Coastal hazards and national policy: a jury-rig approach," *J. Amer. Inst. Planners*, 1978, No. 2.
29. Spilhaus, Athelstan. "Engineering, ecology and use of the sea," *Nat. Fisherman*, 1973, No. 13.
30. Staszewski, J. "The distribution of man on the globe," *Geografia Powszechna*, Vol. 2. Warsaw, 1963 (in Polish).
31. *Time-Stressed Coastal Environment: Assessment and Future Action*. Seattle, 1977.
-