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BERNARD P. HERBER*

Mining or World Park? A Politico-Economic Analysis of Alternative Land Use Regimes in Antarctica

THE INTERNATIONAL POLITICS OF ANTARCTICA

Antarctica Before the Treaty

Antarctica, the world’s seventh continent, is the only continent without an indigenous population. This fact, however, has not exempted it from a colorful exploratory history featured by the race to the South Pole by the Britisher, Sir Robert Scott, and the Norwegian, Roald Amundsen, during the summer of 1911-12. To add to its historical intrigue, the continent itself was first sighted by either the American, Nathaniel Palmer, the Britisher, Edward Bransfield, or the Russian, Thaddeus von Bellin-ghausen, in the Year 1820—but no one knows which of the three navigators was actually the first person to set eyes on the continent. Sealing and whaling expeditions had taken place still earlier during the late 1700s in the Southern Ocean waters near Antarctica.

Eventually, seven nations laid territorial claims, in some cases overlapping, to parts of the continent. Since these claims are not widely recognized by other nations, they do not constitute national sovereignty in the traditional sense allowed by the res nullius tenet of international law. Meanwhile, the primary economic use of this frigid and windblown continent, which is 98 percent ice-covered, continued to be sealing and whaling well into the twentieth century. Beginning in the late 1800s, however, scientific research began to grow in importance.

Following the second world war, disputed territorial claims as well as

*The author is Professor of Economics at the University of Arizona. He is indebted to the Federalism Research Centre of the Australian National University, Canberra, and to the Treasury of the State of Victoria, Melbourne, for research support in the form of visiting research fellowships during 1989. However, the analysis and conclusions are solely those of the author.
3. See P. Beck, supra note 1, at 217; Fuchs, supra note 1, at 13.
4. Those nations with Antarctic territorial claims are: Argentina, Australia, Britain, Chile, France, New Zealand and Norway. The claims of Argentina, Britain, and Chile partially overlap.
5. Res nullius holds that land and resources “belong to no one” until national sovereignty over them is established through such activities as discovery, exploration, and settlement.
7. See P. Beck, supra note 1, at 25.
a growing recognition of the potential strategic military importance of Antarctica by the two superpowers, the Soviet Union and the United States, began to threaten the political stability of the region. This situation was exacerbated by the absence of "recognized political authority" in Antarctica—a continent without a government. There were no recognized national property rights to the continent and, hence, there were no sovereign governments to politically manage the continent nor to assign private property rights. In the earlier settlement of the other six continents under the res nullius precept, the appropriation of national property rights had often been accompanied by military confrontation. Would Antarctica follow this historical precedent or would it prove to be an exception?

The Antarctic Treaty and the Antarctic Treaty System

The Antarctic Treaty of 1959 enabled Antarctica to prove an exception to this historical precedent by providing 30 years of peaceful governance (1961-1991). There were 12 original signatories to the Antarctic Treaty (see Table 1). Explicit treaty provisions make Antarctica a continent for peace by prohibiting military activities and nuclear testing. In so doing, the treaty neutralizes possible military confrontation between the two superpowers below the 60th parallel south and, moreover, by placing a moratorium on the contentious question of territorial claims, it neutralizes possible conflict in the same region by any of the seven nations with territorial claims. In addition, the treaty has paved the way for scientific research to become the primary industry of the continent—an outcome which is not an accident since the treaty grew out of a fortuitous amalgam of international diplomacy and science associated with the International Geophysical Year 1957-58 designated by world scientists to study the polar regions of the planet. More recently, the treaty nations have implemented an "informal" moratorium on minerals development in Antarctica.

The Antarctic Treaty is subject to optional review and possible major revision by treaty members after 30 years of operation, which date falls due in 1991. Meanwhile, the treaty-related governance of Antarctica has become known as the Antarctic Treaty System (ATS) through the subsequent adoption of the Agreed Measures on Flora and Fauna in

8. Id. at ch 6.
9. Id.
11. Id. at art. I (1) which provides that "Antarctica shall be used for peaceful purposes only" and at art. V which prohibits nuclear explosions.
12. Id. at art. IV.
13. Id. at arts. II and III.
15. Id. at art. XII (2a).
1964,\textsuperscript{16} the Convention on Seals in 1972,\textsuperscript{17} and the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) in 1980.\textsuperscript{18} An important feature of the original treaty is its "open treaty" provision which makes it possible for any United Nations member to accede to the treaty and, if it establishes a significant scientific research presence on the continent, to receive voting membership as an Antarctic Treaty Consultative Party (ATCP).\textsuperscript{19} Under this provision, 14 additional nations have joined the original 12 signatories as ATCPs, and 13 additional nations have acquired nonvoting membership, bringing the total number of voting nations to 26 and the total number of acceding nations to 39 (see Table 1). However, ATS governance of Antarctica faces an external challenge to its authority.

### TABLE 1
Member Nations of the Antarctic Treaty System: Voting and Nonvoting Members and Original Treaty Signatories

<table>
<thead>
<tr>
<th>Voting Members (Antarctic Treaty Consultative Parties—ATCPs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina – (s)</td>
</tr>
<tr>
<td>Australia – (s)</td>
</tr>
<tr>
<td>Belgium – (s)</td>
</tr>
<tr>
<td>Brazil</td>
</tr>
<tr>
<td>Britain – (s)</td>
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<tr>
<td>Chile – (s)</td>
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<tr>
<td>China</td>
</tr>
<tr>
<td>Ecuador</td>
</tr>
<tr>
<td>Finland</td>
</tr>
<tr>
<td>France – (s)</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>India</td>
</tr>
<tr>
<td>Italy</td>
</tr>
</tbody>
</table>

(s) = Original signatory to the Antarctic Treaty
Total voting members = 26 nations

<table>
<thead>
<tr>
<th>Nonvoting Members (Antarctic Treaty Nonconsultative Parties—nonATCPs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
</tr>
<tr>
<td>Bulgaria</td>
</tr>
<tr>
<td>Canada</td>
</tr>
<tr>
<td>Colombia</td>
</tr>
<tr>
<td>Cuba</td>
</tr>
<tr>
<td>Czechoslovakia</td>
</tr>
<tr>
<td>Denmark</td>
</tr>
</tbody>
</table>

Total nonvoting members = 13 nations

\textsuperscript{19} Antarctic Treaty, supra note 10, at art. XIII (1).
The United Nations and Antarctica

In 1982, a number of developing nations, led by Malaysia, initiated a Debate on Antarctica in the General Assembly of the United Nations which has continued on an annual basis since that time. The debate initially resulted in a consensus between both treaty and nontreaty nations, but the consensus ended with the 1985 debate. The focus of the debate has been two-pronged: (1) a more equal distribution of the world’s income and wealth between the industrial and developing nations of the world, a goal with an eye on the possible future exploitation of Antarctic minerals, and (2) an application of the world common heritage principle (WCHP) to Antarctica as a unique global resource. The latter, in effect, would advocate the internationalization of Antarctica as the “common property of mankind” under the emergent res communis precept of international law. This tenet had been applied earlier in the UN-negotiated Outer Space Treaties of 1967 and 1979, and the Law of the Sea Treaty of 1982. Meanwhile, the treaty nations strongly reject the idea of any significant Antarctic role for the United Nations and, instead, argue that global interests in Antarctica can best be served by the present ATS regime.

ALTERNATIVE LAND USE POLICIES IN ANTARCTICA

Science, Tourism, and Marine Living Resources

Scientific research has been the primary industry of Antarctica under ATS governance though, in effect, the treaty merely formalized a situation that was already in place. This research, which is almost exclusively in the natural (physical) sciences such as climatology, geology, glaciology, and marine biology, is coordinated by the Scientific Committee on Antarctic Research (SCAR), an international scientific body working in close association with ATS. The Antarctic Treaty requires that all research

23. Under a strict version of res communis, all nations would jointly own the property rights to certain unique global natural resources which, in effect, would be global common property resources. Under a less strict version, all nations would enjoy free access to such resources, but would not own them. However, the two versions tend to merge if one disregards any relevant connection between “ownership” and the “right to sell” (dispose of) such resources. Hence, global ownership could exist and would not be voided by the inability of a given nation to sell the resources.
findings be "freely exchanged" between the scientists of the various nations and, in this important respect, the research output may be viewed as an "international public good." 27 There has been a considerable increase in scientific research activities during recent years commensurate with the growth in ATS membership as well as from the expanding research involvement of the original 12 treaty nations. 28 At times, these activities have harmed the Antarctic environment 29 though, generally speaking, it is possible for science as a land use to be consistent with environmental protection. Thus, any fundamental long-term threat to the Antarctic environment would seemingly not be posed by science but, instead, by other land use regimes in the Antarctic.

Possible major land uses in Antarctica of a non-science variety include: (1) the development of mineral resources—a mining regime; (2) the preservation of Antarctica as a world park or nature reserve; (3) the development of a significant Antarctic tourism, an industry that experienced rapid growth in the 1980s; and (4) the significant expansion of the present harvesting of marine living resources in Antarctica's offshore waters. 30 Upon closer scrutiny, the most likely major land use alternatives to science in Antarctica would appear to be those represented by the mining and world park regimes. 31

Mining

Possible development of Antarctic mineral resources is linked to the present science regime through the fact that scientific research has largely provided the information which presently exists regarding minerals deposits in Antarctica. 32 Science has generally given the sort of information

27. Antarctic Treaty, supra note 10, arts. II, III. The nations of the world, and especially the Antarctic Treaty nations, may be considered as "collective consumers" of Antarctic scientific research. This meets the definitional constructs of the economic theory of public goods, as applied within an international setting. For a related discussion, see Herber, The International Public Goods of Antarctica: A New Politico-Economic Regime for the World's Seventh Continent, in Public Finance, Trade, and Development 263-276 (V. Tanzi ed. 1990).


29. See Mitchell, supra note 28, at 52.

30. For a discussion of the harvesting of Antarctic marine living resources, see Sherman and Ryan, Antarctic Marine Living Resources, 31 Oceanus, Summer 1988, at 59-63.

31. Nations showing strong "initial" support for an Antarctic minerals development (mining) treaty included Britain, New Zealand, and the United States. However, New Zealand and the United States subsequently modified their positions (as will be further discussed below). Nations showing strong support for the Antarctic world park concept include Australia and France. Nations active in the harvesting of Antarctic marine living resources include Japan and the Soviet Union. The United States is the nation most active in Antarctic tourism.

that formal prospecting would have provided, but not the more detailed and definitive information which could be provided by formal minerals exploration inclusive of drilling, blasting, and similar procedures. An important difference exists, however, between mineral deposit information obtained from scientists and that which would have been obtained via formal commercial prospecting and exploration in that the latter information bestows proprietary rights of ownership while the former does not. In fact, such proprietary rights would be technically impossible to establish under the “free exchange of knowledge” requirement of the Antarctic Treaty.

Existing evidence suggests that many varieties of minerals may be present in the Antarctic including chromium, coal, iron, and uranium on the continent itself, and oil in its offshore waters. In fact, Antarctica is likely to contain minerals similar to those found on other southern hemisphere continents (Africa, Australia, and South America) since some 180 million years ago all of these continents were joined together in a single land mass, or supercontinent, known as Gondwanaland. However, the mining of such minerals as may exist in Antarctica would not be cost-effective at the present time due to the high costs of such mining, given current technology and current world mineral price levels. These parameters, of course, are subject to intertemporal change if technology improves and if world mineral prices increase as the result of growing supply scarcities and/or a rising world demand for their use.

World Park

A much different type of land use for Antarctica is posed by the world park option under which the continent would be preserved in its present pristine state as a nature reserve. Under this regime, the environment and its associated ecosystems would be carefully protected. While tourism would be permitted, it would be carefully regulated and would not itself become a primary land use. Science would continue as an important economic activity, but its activities would be secondary to the fundamental

33. See OTA, supra note 32, at 17-18; Watts, supra note 32, at 180-81.
34. Proprietary information obtained through commercial prospecting and exploration is legally “inaccessible” except by permission of the owner of such information. On the other hand, Articles II and III of the Antarctic Treaty require the “accessibility” of scientific information.
36. Id. at 73.
38. For a comprehensive analysis of the world park option, see Rothwell, A World Park for Antarctica? (July 7, 1989) (paper presented at the 44th Annual Conference of the Australasian Universities Law Schools Association at Victoria University of Wellington, New Zealand).
goal of preserving the Antarctic environment. The recent proliferation of scientific bases would need to be controlled and environmental practices around some of these bases improved. Likewise, the harvesting of marine living resources such as finfish and krill could continue, but with more stringent regulation than experienced to date under CCAMLR. Mining activities would be prohibited under a world park regime.

An Antarctic world park would formalize Antarctica as an "international public good" whose collective consumption benefits would be shared by all citizens of the world through the preservation of the earth's seventh, and only undeveloped, continent in its natural state. In addition, there would be collective consumption of the benefits to be derived from the protection of the global atmosphere and ocean levels which appear to be importantly linked to the Antarctic environment. As observed by a British scientist: "The perspective provided by almost half a century of scientific investigation demonstrates clearly and without ambiguity the integral role of Antarctica in the natural systems of planet Earth." These global social benefits would also take on the qualities of an international public good or, conversely, the prevention of an international public bad in the form of atmospheric warming and rising ocean levels.

Tradeoffs between Antarctic Land Uses

There need be no significant tradeoff between the world park and science land uses of Antarctica. In fact, it would not be stretching the truth to describe Antarctica under the treaty system as an informal or de facto world park since the Antarctic environment and its associated ecosystems have been generally preserved under the present ATS science regime. This does not imply, of course, that science could not reach a level that would threaten the environmental protection goal of a world park regime. However, it does mean that such a level would be sufficiently high so as to allow considerable scientific research to take place before a meaningful tradeoff would become a reality. In this important sense, there is no tradeoff between the world park and science land uses. Moreover, limited tourism could accompany a world park regime without a significant environmental tradeoff.

On the other hand, a more fundamental tradeoff would occur between the world park and mining land uses of the continent. Extensive Antarctic minerals development, inclusive of both formal exploration and actual mining activities, would by its very nature directly disrupt the environment. Since the primary purpose of a world park regime is to protect the

39. See note 27 supra.
environment while the primary purpose of a mining regime is to interfere with the environment by extracting minerals from it, there is a generic tradeoff involved between these two land uses. This does not mean, of course, that limited mining could not occur within a park area, a condition that is found throughout the world, but it does mean that the environment directly suffers when this takes place. It is true that the tradeoff becomes a matter of "degree"; yet, clearly, both world park and mining cannot co-exist as "primary" land uses without a significant encroachment on each other.

**FROM THE PRESENT SCIENCE REGIME TO A MINING REGIME: AN EVALUATION**

**Cost and Price Considerations**

As observed above, existing technology and world minerals prices would not allow profitable mining to take place in the Antarctic. However, since these parameters are subject to change, it is appropriate, for future reference, to presently evaluate the implications of mining as a major land use. Moreover, it is important to point out that even though profitable mining is not now feasible, minerals exploration may presently be cost effective given the appropriate acceptance of risk and the time-discounting of future economic returns by commercial firms and the governments of the nations in which they are based. In fact, the apparent willingness of some governments to subsidize formal mineral exploration for political reasons makes such activity very much a current possibility. Moreover, since formal mineral exploration entails blasting, digging, and other actions directly harmful to the environment, the world park goal of environmental protection could be directly affected by exploration even before the actual occurrence of mining.

**The ATS Minerals Treaty**

Meanwhile, the treaties which comprise the Antarctic Treaty System ignore the question of mineral development. Instead, the issue has been addressed by ATS only through the existing informal moratorium on such activities. However, during 1982, ATS began to negotiate a formal minerals treaty intended to fill this void which, to that point in time, was a quite understandable treaty gap given the considerable obstacles standing in the way of profitable Antarctic minerals exploitation. Subsequently,

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43. The pursuit of "long-run" economic returns, as underwritten by government subsidies, may justify investments which otherwise would be unprofitable in the "short run."

44. This information was concluded from a series of personal interviews conducted by the author with persons relevant to the Antarctic minerals question.
after six years of intense negotiations, ATS adopted the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) in June 1988.\textsuperscript{45}

CRAMRA provides an elaborate framework for possible Antarctic minerals development as it would evolve through the three sequential development stages of prospecting, exploration, and mining. It contains detailed provisions intended to protect the Antarctic environment in the event of mineral development.\textsuperscript{46} Proponents of the convention, in fact, argue that it is a "pro-environment" document since it establishes various thresholds which must be crossed before actual mineral development can occur.\textsuperscript{47} In this regard, they contrast CRAMRA with the marine living resources convention, CCAMLR, which imposed regulations on economic activities after they were already taking place. Meanwhile, opponents of CRAMRA counterargue that it is nothing but a "sophisticated mining code" which, as its primary thrust, pursues the development of Antarctic minerals while treating the environment as a secondary consideration.\textsuperscript{48}

Arguments for an Antarctic Mining Regime

Regardless of whether one agrees with the proponents or opponents of CRAMRA concerning its appropriate characterization, it is useful to consider the major arguments offered in support of the minerals treaty.\textsuperscript{49} One such argument claims that the convention would provide an orderly framework for mineral development, thus averting a possible politically destabilizing global land race for Antarctic minerals with accompanying military confrontations. This argument suggests that it would be impossible, without serious political consequences, to convert the present informal mineral moratorium into a formal prohibition of all mineral development activities such as would be required by a world park regime.


\textsuperscript{46} \textit{Id.} at arts. 2, 4, 10, 13, 15, 34, 38, 49, plus numerous other articles.

\textsuperscript{47} For analyses in support of the ratification of CRAMRA, see L. Kimball, Testimony Before the Subcomm. on Oversight and Investigations, Merchant Marine and Fisheries Comm., U.S. H. Rep. (March 14, 1990) 101 Cong, 2d Sess; Scully, \textit{The Antarctic Mineral Resources Negotiations}, 31 Oceanus, Summer 1988, at 20-21. In addition, various arguments in support of CRAMRA which are presented below were concluded from a series of personal interviews conducted by the author with persons relevant to the Antarctic minerals question.

\textsuperscript{48} For analyses in opposition to the ratification of CRAMRA, see J. Barnes, Testimony Before the Subcomm. on Oversight and Investigations, Merchant Marine and Fisheries Comm., U.S. H. R. (March 14, 1990) 101 Cong, 2d Sess; Rigg, Hemmings & Mathias, \textit{Protecting the Antarctic Environment by Limiting Human Presence and Activities: The Case for a World Park}, Pacific/Asia Offshore Mechanics Symposium, Seoul, Korea (June 24-28, 1990). In addition, various arguments in opposition to CRAMRA which are presented below were concluded from a series of personal interviews conducted by the author with persons relevant to the Antarctic minerals question.

\textsuperscript{49} See Kimball, \textit{supra} note 47; Scully, \textit{supra} note 47.
A second argument in support of Antarctic mineral development under CRAMRA is that the convention would enhance the long-run supply of strategic minerals at a time of future world demand for them. It is predicted that the time will come, probably during the first part of the 21st century, when many exhaustible natural resources will be in short supply relative to a growing global demand for them to sustain the production and consumption activities of a continuing industrial age. Moreover, it is assumed that industrialization will have spread, by then, to most or all nations of the world. Furthermore, this growing demand would be reinforced by a continuing rapid rate of world population growth. Opponents of CRAMRA counterargue that it is unwise to make available additional supplies of energy-producing fossil fuels, such as petroleum and coal, since these minerals directly contribute to the greenhouse warming problem associated with the global atmosphere.

A third argument supports the extension of ATS authority in Antarctica based upon its proven ability to govern the continent effectively. The reasoning goes that ATS has earned the right to continue, and expand, its governance by filling an existing void in the treaty system, namely, the need for a formal position on mineral exploitation. Relatedly, the treaty system membership includes virtually all of those nations which possess the economic resources required to undertake the costly exploitation of Antarctic minerals. Allowing these nations to establish an organized framework for such development, it is argued, is consistent with the goal of efficient resource use.

Thresholds to Antarctic Minerals Development

If the primary Antarctic land use were to change from science to mining, the thresholds which must must be crossed before such a transition could become a reality assume considerable importance. These may be classified into underlying economic thresholds as well as into those thresholds directly directly imposed by CRAMRA.

1. Economic Thresholds

   (1) Actual Proof of Mineral Deposits: Formal prospecting and exploration would be required to definitively establish the presence of commercially viable quantities of important mineral resources in Antarctica and its offshore waters. The present evidence, acquired primarily as a by-product of scientific research, falls well short of the amount of information required for serious mining activities.

50. Demographic policies could be directed toward a reduction in the rate of global population growth. For global population growth rate projections, see Under the Sun: Is Our World Warming?, National Geographic, October 1990, at 75.

51. See Barnes, supra note 48.
(2) Cost-Effective Mining: If the presence of significant mineral deposits is established, the matter of developing these deposits in a profitable manner becomes a second major economic threshold which must be crossed. Cost-effective mining would have to meet a market test set by the parameters of technology, on the supply side, and by the global need for the minerals, on the demand side.

2. Thresholds Imposed by CRAMRA

(1) Ratification: There are a number of complex conditions set for the ratification of CRAMRA. These are:

(a) ratification by 16 of the 20 ATCPs which adopted the convention in 1988; 52
(b) ratification by 11 of the 14 developed nations adopting the convention; 53
(c) ratification by five of the six developing nations adopting the convention; 54 and
(d) ratification by all seven territorial claimants, each of which has adopted the convention. 55

(2) Post-Ratification Institutional Thresholds: There are several major institutional thresholds to mineral development which would apply after the ratification of CRAMRA. These are:

(a) the opening up of a claim area for possible mineral activities. This would entail the creation of a Commission consisting of all current ATCPs (presently, 26 nations). 56 The vote to open a claim area would utilize the consensus voting rule which has been the standard voting rule used by ATS. 57
(b) the approval of minerals exploration in the claim area. This decision would be made by a Regulatory Committee to be created for each claim area. 58 A Regulatory Committee would consist of ten ATCPs including the nation(s) which may hold territorial claim(s) to that area. Four of the ten members must be territorial claimants. The Soviet Union and the United States would be members of each Regulatory Committee and would be joined by four additional developed nation members. Three of the ten nations must be developing nation ATCPs. The vote to approve exploration would utilize a relative unanimity voting rule, with

52. See CRAMRA, supra note 45, at art. 62.
53. Id.
54. Id.
55. Id. at art. 62, The Final Act.
56. Id. at art. 18.
57. Id. at art. 22. Consensus voting allows a motion to pass if no one formally opposes the motion. Thus, an abstention does not count as a veto, a factor which makes consensus voting somewhat less restrictive than absolute (complete) unanimity voting.
58. Id. at art. 29.
at least seven of the ten members required to vote for approval, including a simple majority of both the claimants and nonclaimants and at least one developing nation.\textsuperscript{59}

(c) the approval of mining in the claim area following the minerals exploration stage of development. This decision, to be made by the Regulatory Committee, would utilize the same relative unanimity voting rule used for the approval of minerals exploration.\textsuperscript{60}

Additional important features of CRAMRA are: (1) subsidies by sponsoring nations to companies undertaking exploration and mining are not prohibited by the Convention, and (2) claimant states are not given direct veto power in the Commission and Regulatory Committees over mineral development activities in their claim areas. Both of these issues were intensely debated during the negotiations leading up to the adoption of CRAMRA and, quite possibly, may bear importantly upon whether or not it is subsequently ratified.

Thus, it is apparent that any possible transition of the present science regime in Antarctica to a mining regime would be a complex undertaking. Furthermore, this issue should be viewed in relationship to still another major land use option, that is, an Antarctic world park.

\textbf{FROM THE PRESENT SCIENCE REGIME TO A WORLD PARK REGIME: AN EVALUATION}

\textbf{Characteristics of a World Park Regime}

The present science regime possesses many of the essential characteristics of an Antarctic world park. However, these features are derived as secondary effects accruing from the primary use of Antarctica for science. There is no formal prescription for land use in the form of a world park on the continent. An Antarctic world park would make such status "formal" and would include the following features:\textsuperscript{61}

1. Explicit prohibition of mineral development inclusive of both formal exploration and mining activities.
2. Strict protection of the Antarctic environment and its associated ecosystems.
3. Continuation of substantial scientific research, but with increased monitoring and regulation of environmental performance around scientific bases as well as restrictions on the number of such bases.
4. Continuation of tourism, but with strict controls over the number of

\textsuperscript{59} Id. at art. 32, The Final Act.
\textsuperscript{60} Id.
\textsuperscript{61} For discussions pertinent to an Antarctic world park, see Rothwell, supra note 38; Rigg, Hemmings & Mathias, supra note 48. See also, Brown, New Proposal—The Natural Park, paper presented at the Colloquium on the Antarctic and the Environment: Future Prospects?, (Egmont Palace Brussels) (October 9-10, 1990).
tourists, the types of tourism, and the impact of tourism on the environment.

5. Continuation of the harvesting of marine living resources, but with improved regulation and monitoring of such activities by CCAMLR or by an equivalent body if a non-ATS world park regime is established. Special care would be taken to protect all marine species from extinction as well as to preserve the balance among the different species including the highly nutritious small fish, krill, which exists in large quantities in Antarctic waters.

6. Continuation of the ban on nuclear testing and nuclear waste dumps.

7. Continuation of the ban on military activities and, thus, a continuation of the use of Antarctica for "peaceful purposes only."

Alternative Antarctic World Park Regimes

Present global realities suggest that there are two primary choices for the political governance of an Antarctic world park, namely, the Antarctic Treaty System and the United Nations. Although theoretically a co-governance regime involving major inputs from both institutions could be formed, ATS has given no indication to this point in time that it is willing to relinquish any of its historic governance authority established under the Antarctic Treaty.

Under an ATS world park regime, the treaty system would serve as a "global trustee" for the nations of the world in its administration and management of the park. Among the names suggested for such a park are "Antarctic World Park" and "Antarctic Nature Reserve/Land of Science." Such titles would be consistent with the continuation of ATS as the primary governing body for Antarctica. Meanwhile, if a UN World Park regime should prevail, that international body would arrange the administrative plan under which Antarctica would be governed which, quite likely, would entail a number of existing international institutions as well as the establishment of a specific new UN body to coordinate management efforts. Among the existing institutions which might become part of a UN Antarctic world park organization would be the United Nations Environmental Program (UNEP), the International Seabed Authority (ISBA), the International Whaling Commission (IWC), and such ATS-related bodies as CCAMLR and SCAR.

Arguments for an Antarctic World Park

The primary arguments in support of the world park concept may be associated with the economic theories of "international public goods."
This approach focuses upon the global collective consumption of both important goods/benefits and bads/disbenefits related to Antarctica. On the one hand, the benefits received by world citizens from the preservation of the world’s only undeveloped continent in its natural undeveloped state may be viewed as a welfare-enhancing international public good. On the other hand, the loss of global welfare which may occur if the Antarctic environment is seriously damaged may be viewed as an international public bad which destroys international public goods in the forms of a pure global atmosphere and stable global ocean levels.

Regarding the latter, there is considerable scientific evidence suggesting an important ecological link between the “Antarctic” environment, on the one hand, and “global” atmospheric, climatic, and ocean level conditions, on the other. In fact, both may be viewed as integral parts of a fixed quantity international common property resource—the global atmosphere and environment—which is subject to a “tragedy of the commons” sort of overexploitation. Such overexploitation would be expected to result due to the zero price for use of the atmosphere in the absence of exclusionary property rights. Furthermore, Antarctica serves as a major empirical testing ground for the conduct of research studies related to these phenomena including the high profile greenhouse warming and ozone depletion issues.

Significant global greenhouse warming and ozone depletion and, possibly, Antarctic environmental damage as well, would be expected to warm the Southern Ocean waters off Antarctica and, thus, reduce the ability of these waters to absorb some of the “excess carbon dioxide” which is the primary cause of greenhouse warming. Accordingly, still


65. See Bentley, supra note 64. See also Budd, The Antarctic Treaty as a Scientific Mechanism (Post-IGY)—Contributions of Antarctic Scientific Research, in Antarctic Resources Policy, supra note 1, at 117-120; Hemmings, Hay & Towle, Environmental Science: Coming of Age in Antarctica, Proceedings of the Antarctica 150: Scientific Perspectives/Policy Futures Conference, Auckland, New Zealand (September 8, 1990); L. Kimball, Southern Exposure: Deciding Antarctica’s Future 2-4 (Nov. 1990); Scientific Committee on Antarctic Research (SCAR), The Role of Antarctica in Global Change (Apr. 1989).

greater greenhouse warming would likely occur since it is estimated that up to 30 percent of the world’s excess carbon dioxide is presently absorbed by the cold waters of the Southern Ocean. If this “large absorption sink” should be diminished at a time when rapid deforestation of tropical rain forests, which also absorb large quantities of excess carbon dioxide, is also occurring, the combined effects would almost certainly lead to further greenhouse warming of the global atmosphere. While expert scientific opinions differ as to the severity of the global threat posed by greenhouse warming including the time frame for such a threat, there is nonetheless sufficient evidence to suggest considerable caution in relationship to those factors known to contribute to such warming.

Furthermore, scientists point out that temperatures increase more rapidly in the polar regions of the globe than at the middle latitudes, thus making the polar regions relatively more important to the causation of global climates and, in the case of Antarctica, to global ocean levels due to its enormous amount of ice (the continent is 98 percent ice-covered). A significant rise in the water level of the Southern Ocean, resulting from such causal forces as global warming and possibly from environmental damage caused by Antarctic mining, would tend to cause a large rise in ocean levels throughout the world. A significant rise in global ocean levels would be catastrophic since much of the world’s population lives along coastal plains.

Hence, if the hypothesis that a uniquely important environmental link exists between Antarctica and the rest of the world is valid, the protection of the Antarctic environment as a world park would in itself constitute a significant international public good. This public good would yield considerable welfare to the global community by helping to prevent significant international public bads related to the atmosphere, climates, and ocean levels. The critical question herein for the economist is to evaluate the risks of “waiting to see” if this scientific hypothesis is correct versus the costs of “taking the present steps” necessary to internalize such potentially significant future international public bads.

All of this points to the need for a systematic effort to assess the comparative benefits and costs of the alternative mining and world park land uses of Antarctica. While this would be an extremely difficult task,
especially in the need to estimate relevant non-market benefits and costs, a major effort should be made to undertake the study. The distribution among nations of these benefits and costs, both market and nonmarket, is a further complicating factor—especially in a world without sovereign international government to assign national property rights. The economic concepts of public goods and bads as well as the closely related concepts of positive and negative externalities, as extended to a supranational setting, should also be an integral part of such analysis. The same can be said for the theory of alliances. The overriding efficiency rules of the economist, which point to an efficient land use equilibrium where marginal social benefits equal marginal social costs, would provide the theoretical benchmark for this much needed benefit-cost study. The primary obstacle to attaining such a study, it seems, is the question of who would organize and pay for it in the disaggregated world social choice arena.

A MINING OR WORLD PARK REGIME IN ANTARCTICA: IS THERE AN INTERMEDIATE SOLUTION?

Both the mining and world park options for primary land use in Antarctica were considered at the October 1989 biennial meeting of the Antarctic Treaty System in Paris. Advocates of an Antarctic World Park had made considerable progress during the several months prior to the meeting in gathering support for their approach. In particular, this success resulted from a joint position taken by the Governments of Australia and France against the ratification of CRAMRA and, in its place, for a ban on mining accompanied by the establishment of an ATS world park or nature reserve on the continent. Since both Australia and France are "territorial claimants" in Antarctica, a failure by either nation to ratify the convention would block its ratification. Subsequently, a number of other treaty nations, including Belgium, India, Italy, and West Germany, moved toward—if not to—an endorsement of the world park approach.

As a result, momentum toward the ratification of CRAMRA was slowed and, significantly, treaty members agreed at Paris to hold a special session to consider a comprehensive environmental protection convention (CEPC). This was in addition to another special session to further consider CRAMRA.

76. See CRAMRA, supra note 45, at art. 62, The Final Act.
and, especially, to refine its minerals development liability provisions. Both meetings were held in Santiago, Chile, between November 19—December 6, 1990.

Meanwhile, during February 1990, the early momentum toward the ratification of CRAMRA had been further slowed by another event. Although heretofore along with Britain and the United States among the leading supporters of the convention, New Zealand decided to terminate its consideration of ratification. Like Australia and France, New Zealand as a territorial claimant is required to ratify the convention in order for it to come into force. Later, during October and November 1990, just prior to the special Santiago meetings, the United States position in support of CRAMRA was significantly modified by congressional legislation. While circumstances such as these make the eventual ratification of CRAMRA appear unlikely, the Santiago meetings resulted in neither a formal mining moratorium nor a comprehensive environmental protection convention. However, these matters will be discussed further in a forthcoming ATS meeting to be held in Madrid, Spain, during April 1991.

Now, the strongest supporters of CRAMRA appear to be Britain, Japan, and South Africa. These events suggest that an early answer to the question of Antarctica’s future land use should not be expected. Yet, could this delay lead to an eventual compromise resulting in an “intermediate” regime possessing both substantial mining and substantial world park characteristics? The answer appears to be no since, as observed earlier, these two land use regimes trade off significantly against each other. That is, it is impossible to have simultaneously both “extensive mining” and a “meaningfully protected environment” in Antarctica.

Thus, if a compromise is to be found, it will likely not be in the form of a synthesized mining/world park land use regime but, instead, in the timing of and the informational background for the land use decision. It

78. See CRAMRA, supra note 45, at art. 62, The Final Act.
79. Congress passed important legislation related to United States Antarctic policy during late October 1990 and the President signed it into law on November 16, 1990. The Conte bill (HR 3977) prohibits United States companies from carrying out any minerals activities in the Antarctic, including prospecting. The legislation also calls on the Secretary of State to negotiate a mining ban within ATS and to negotiate an agreement that gives the region “special protective status as a land of science dedicated to wilderness protection, international cooperation, and scientific research.” In addition, the Gore-Owens Joint Resolution (S.J. Res 206) which also passed during late October 1990 calls for a new international agreement for the full protection of Antarctica as a global ecological commons. However, the Bush administration opposes a “permanent” ban on Antarctic minerals activities, Arizona Daily Star (Associated Press), Nov. 17, 1990, at A3.
81. See Cousteau, supra note 80, at 23.
82. See New Scientist, supra note 80, at 18.
is possible to "buy time" in the short run so that a more efficient long-run land use decision may be made following a more detailed evaluation of the benefits and costs of the comparative regimes. This effort could also entail the collection of additional scientific information regarding the magnitude of the environmental link between Antarctica and global atmospheric, climatic, and ocean level conditions. Moreover, Antarctic science could continue to make its significant contributions to the understanding of global environmental problems such as greenhouse warming and ozone layer depletion.

During the interim, ATS would be able to continue negotiations for a comprehensive environmental protection convention as well as to further consider CRAMRA. In the meantime, the de facto world park, which now exists in Antarctica as an adjunct to the science regime, would continue in effect, including the "informal" moratorium on mineral development activities. Or, as noted above, a "formal" moratorium could be placed upon such development. ATS could also take additional steps: (1) to improve environmental performance at those scientific stations which are presently not adequately protecting the environment, (2) to improve the effectiveness of its controls over the harvesting of marine living resources, and (3) to regulate the activities of tourists so as to diminish the threat of tourism to the environment.

If the evidence gathered during the interim should substantiate the hypothesis that a significant linkage does exist between the Antarctic and global environments, the benefit-cost case for a world park regime would likely win out. This position would be reinforced by the unique qualities of Antarctica as a locus for global environmental research. If the evidence should not strongly support the environmental value of Antarctica as compared to the opportunity costs of foregoing mineral development, a go-ahead for the latter may be the appropriate course of action. However, it could still be argued that even "partial evidence" of a significant link between the Antarctic and global environments would justify the choice of a world park regime, given the important global consequences of being wrong about such a linkage accompanied by Antarctica's value as a unique scientific location. Following this line of thought, only clear evidence against such a link would justify the selection of a mining regime.

Furthermore, there remains the distinct possibility that the eventual Antarctic land use decision will be caught up in the growing global momentum toward the institutionalization of an "international law of the

83. The claim by some ATS nations that a continuation of the informal moratorium on minerals development cannot be effectively sustained appears dubious. For example, the treaty system has successfully maintained its moratorium on the delicate question of claims to sovereignty since its inception.
84. See Cousteau, supra note 80, at 23.
atmosphere to deal with the problems of greenhouse warming and ozone depletion. Indeed, a short-run timing compromise, under which both the mining and world park regimes are "put on hold" until further benefit-cost evidence is gathered, should make possible enlightened international social choice decisions regarding these important matters. If these complex supranational decisions should ultimately support the establishment of an Antarctic world park, the Antarctic Treaty System would be available as the logical choice to serve as the global trustee for administering such a land use regime at the bottom of the earth.

POSTSCRIPT

On October 3, 1991, the voting members of the Antarctic Treaty System adopted a formal 50-year ban on minerals development in Antarctica. This ban, which appears as a protocol to the Antarctic Treaty, now awaits ratification.

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85. For a discussion of the proposed international law of the atmosphere, see Hensen & Hively, supra note 68, at 324-26. For a discussion of global environmental policy in general, see Brundtland Commission, supra note 69, at 303-38. See also Stone, Tax Nations to Repair the Earth, L.A. Times, Aug. 25, 1989, at 7.