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ABSTRACT

A comprehensive, international program is proposed to help nations optimize and conserve natural resources. The aim of the program is to increase the overall supply of natural resources available to improve the chances for world peace. The energy and material resources of the world are finite. We must live with and adapt to the concept of finite resources distributed inequitably around the globe. Given these limitations and given the growing demands of the developing and developed nations for energy and material resources, it has become increasingly evident that the availability of and accessibility to resources are crucial factors in determining the harmony, or lack of it, among nations of the world. Middle Eastern domination of oil supplies, Central African domination of cobalt and precious metals, and Southern African domination of cobalt, chromium, and precious metals are three leading examples of limited resource availability that have created sizable tensions and political frictions. This situation is made more serious by strong inflationary pressures, the growing inequity of incomes, and the growing use of resources as political weapons. In discussing conservation as a force for peace, the author recommends three basic resource optimization strategies. We should make and use fewer resource products; make and use simpler, more efficient alternative processes and products; and recycle the raw material and energy content of waste resource products. Efforts at resource optimization to date are examined. (RM)

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Resource
Optimization
and
World Peace

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About the Author

Arthur H. Purcell has served as a member of the US delegation to the first UN Conference on Non-Waste Technology, of President-elect Carter's Science Policy Task Force, of the President's Commission on the Accident at Three Mile Island. He received a German Marshall Fund award to attend the First European Community Conference on Radioactive Waste Management in 1980.

An independent scientist and director of Technical Information Project, Inc., Dr. Purcell has lectured extensively in the United States and internationally and serves as Professorial Lecturer at both American University and George Washington University. A regular contributor to many journals, he has authored 80 publications on resource conservation and related subjects, including his recent book, *The Waste Watchers*.

Resource Optimization and World Peace

Introduction

The energy and material resources of the world are finite. This is a fact with which we must live. While renewable resources pose less severe limits than nonrenewable resources, and while the earth theoretically contains a virtually endless supply of most commodities, we must live with and adapt to the concept of finite resources distributed inequitably around the globe.

Given these limitations and given the growing demands of the developing and developed nations for energy and material resources, it has become increasingly evident that availability of and accessibility to resources are crucial factors in determining the harmony—or lack of it—between nations of the world. Middle Eastern domination of oil supplies, Central African domination of cobalt and precious metals, and Southern African domination of chromium are three leading examples of limited resource availability that have created sizable tensions and political frictions.

A key factor in reducing these threats to peace is a comprehensive international program of resource optimization and conservation.

Resource Problems and International Tensions

Global resource problems cause and abet inequities that create tensions and reduce prospects for peace. The escalating prices and actual and potential shortages of the world's limited material and energy resources increasingly contribute to international tensions — political, socioeconomic, and environmental. The situation is compounded by several factors.

Strong Inflationary Pressures

The prices of energy and material are fueling severe inflation in many developing and developed economies. Every month larger fractions of national budgets are being spent on imported resources. In the past decade the price of oil, the world's basic energy resource, has increased 500 percent faster than inflation. Reductions in expenditures in other areas are inevitable. By 1990 developing nations will be

spending a staggering \$100 billion per year on imported oil alone. Many of these countries must import over 80 percent of their total requirements, virtually all developing nations require substantial supplies of imported energy. The economic dislocations caused by these inflated expenditures, with the accompanying buildup of international debts, are clearly a considerable source of tensions. All the major problems of international resource sharing are compounded by the devastating effects of excessive population growth.

Growing Inequity of Incomes

The continuing price escalations caused by our global resource dilemmas are fueling the phenomena of growing income inequity. The affluent are generally becoming more affluent while the world's poor are generally becoming poorer. The negative implications of this situation on world stability are obvious and critical.

Increasingly Inequitable Distribution of Resources

High prices, shortages, and political conflicts make it continually more difficult for the have and have not economies to share the world's resource base. Inequity of distribution increases the likelihood of militaristic endeavors to secure resources.

Inefficient, Environmentally Disruptive, and Potentially Dangerous Use of Resources

Global resource difficulties are sowing the seeds for long-term problems by shifting attention to short-term goals. The most telling example of this is worldwide deforestation which has already reached crisis proportions in some nations. As long as fuelwood is more readily available than alternative energy forms, this deforestation will continue. With deforestation will come increased devastation of national environments and heightened anxiety and frustration by those who inhabit these environments.

The double-edged legacy of nuclear power development is another prominent example. The less we conserve traditional energy sources the greater the likelihood of nuclear power development. Increased nuclear development presents two threats. 1) The possibility of nuclear accidents with widespread casualties and even international conflicts from radioactive releases and 2) the possibility of increasing nuclear weapons development through adaptation of nuclear power technology.

Other important examples of inefficient, environmentally disruptive, and potentially dangerous uses of resources are.

1. Increased stripping of agricultural lands for coal and other solid fossil fuels
2. Pressures to produce biomass energy crops instead of food
3. Increased health threats from the manufacture and use of toxic substances
4. Increased dangers of transporting nuclear and hazardous wastes across international borders.
5. Increased international pollution conflicts such as those caused by acid rain and river salinity.

Growing Use of Resources as Political Weapons

As resource inequities and the dislocations they engender mount, it is inevitable that resource commodities will become powerful political weapons. Just like conventional weapons of war, the proliferation of these weapons works directly against the interests of global peace.

Obstacles to Development

The world's resource problems are most devastating to the least developed nations, they throw further obstacles into the paths of development. The slower such development proceeds, the faster tension increases among the peoples of these nations.

Every day the world's resource base is strained by the net addition of over 180,000 human beings. The challenge posed by this population growth is of enormous magnitude. Every year the world's resource base must be shared by an additional 60 million people. This represents an addition of one new medium-sized nation annually in need of furnaces, automobiles and trucks, shoes, farm equipment, food, and the countless other products that must be squeezed out of the world's limited resources. The inequities of population growth fall hardest where shortages already exist.

The spectre of armed conflict rising out of international resource tensions is very real. A major issue in the debilitating war between Iran and Iraq has been control of key energy-producing areas. The United States has hinted broadly that it will take strong measures to ensure its access to Saudi

Arabian oil. The bloody Nigerian civil war in the early 1970s was fought over control of Biafran oil fields. The destruction by Israeli war planes of a French-built Iraqi nuclear power plant came about because of suspicions that this facility could be used for making nuclear weapons. The National Strategy Information Center, a conservative, defense-oriented think tank based in Washington, sees a growing possibility of a resource war over critical materials, especially cobalt and chromium. Events of the past decade lend credence to this suggestion. When Cuban troops invaded the Shaba province of Zaire in 1978, the mining of cobalt, an essential material for steel making, was halted for months. Because of the Shaba's position as a prime supplier of cobalt, the world price of the metal rose over 700 percent. Repetition of this type of event could well lead to a military counteroffensive aimed solely at reopening a material resource supply line.

The traditional solution to avoid conflicts over resources has been the concept of *resource independence*. If, it is argued, a nation can eliminate its dependence on others for basic resources, it can obviate the pressure for military involvement to assure such resources. The resource independence concept, like any other self-sufficiency idea, has some obvious validity. But total resource independence comes at a very high cost in economic, environmental, and sociopolitical terms. For example, the economic cost of producing synthetic fuels as substitutes for oil are projected to be very high, even for a resource-rich nation such as the United States. In the early 1970s the Nixon administration launched a major effort, titled "Project Independence," to develop scenarios to achieve energy independence in the United States by 1984. A major component of the plan that was developed was synthetic fuels from coal, the plan ultimately was deemed unworkable, however, largely because of its economic costs.

The environmental costs of resource independence can be massive and irreversible. Synthetic fuels are again a good illustration. In order for the United States to supplant its current oil reliance with synfuels, major stripping and desertification of coal-rich agricultural lands would be necessary, and major diversions of agricultural water would be required to mine and process the coal into synfuels.

The sociopolitical costs of resource independence entail,

perhaps, the greatest expenditures in the long run. Resource independence promotes isolationism. The less a nation needs to trade with other nations for its resources, the less interest and incentive it has to maintain peaceful relationships with members of the international community.

Resource independence comes at high social costs, even in the most affluent nations. The resource-poor countries must make large sacrifices to achieve such independence. Two graphic examples of this sacrifice can be found in Albania and the People's Republic of China (PRC). Albania is virtually resource independent because of its strong inwardly turned policies which have fallen just short of being xenophobic. Albania has shown the world that a few well managed resources can go a long way, it has also demonstrated, however, the austerity that resource independence can foster. Mandatory two-year work programs, exceedingly limited transportation facilities, and low per capita incomes are the continuing social costs of that nation's resource independence policies. The PRC has until recently been isolated from most of the world and by necessity has been a resource independent nation. Its leaders, however, have come to realize that the relatively low standard of living in the PRC can be significantly raised by ending this isolation, joining the world community, and sharing its resource base. In the not too distant future, the PRC will probably become a significant exporter of several basic natural resources, including coal and titanium, and will be able to use this foreign exchange to obtain other less abundant resources.

While the goals of the resource independence concept are basically sound, in practice the concept has only limited viability. The resources of the world are too inequitably distributed and the resource needs of our peoples are too universal to enable more than a few specialized regions to be resource independent. The resource base of the world must be shared and nations must incorporate this sharing into their commercial and economic policies. In order for long-term peaceful sharing to occur, however, effective international programs must be developed to ensure that resources are used as efficiently as possible.

Conservation as a Force for Peace

The economic principles of development have traditionally argued strongly against conservation. The logic has been

produce more, consume more, and thus make more capital flow. The flaws in this logic are becoming quite evident. Inflation of resource prices (which has driven overall inflation), diminishing supplies of strategic resources, and growing costs of treating health problems related to unchecked resource use, all have contributed to serious economic dislocations in developed and developing countries.

If inefficient use and suboptimal management of global resources add to world tensions, then increasing efficiency and optimizing resource use should reduce such tensions. The most direct way to accomplish this is through comprehensive programs of global resource conservation. Conservation makes more resources available to more people and enhances the possibility of improving worldwide living standards. In this way conservation can become a viable force for peace.

Elements of Resource Conservation

Conservation is a generic term encompassing technological, economic, and sociopolitical strategies aimed at optimizing resource use. Conservation does not mean doing without. On the contrary, it means doing the same or better with less—performing the same function or making the same goods with less energy and material. By definition, conservation implies the process of making resources available on a wider basis by increasing the productivity of individual resource units. Properly managed conservation programs lead to more resources which in turn mean more markets and more jobs.

Of the several standard approaches to conservation, only one requires an economic cutback of resource use. Most are geared primarily toward technological means of resource optimization, that is making the best use of given resources. The term optimization connotes a comprehensive conservation approach.

There are three basic resource optimization strategies. All include both technological and nontechnological components.

1. Make and use fewer resource products. A resource product can be defined as any final form or end use of a resource. Plastic bottles, fuel oil, internal combustion engines, and even food for human and animal consumption and water for irrigation or sanitation purposes are resource products.

Mandating the production and use of fewer of these and countless other resource products is an effective conservation strategy, it has, however, negative economic and social implications. This strategy runs counter to economic growth principles and is generally considered a last resort. Fortunately, there are other resource optimization strategies which, when properly executed, complement growth and increase resource productivity.

2. Make and use simpler, more efficient alternative processes and products. Webster's first definition of simplicity is "absence of complexity in form or structure." Simplicity is a vital concept in resource optimization. If less material, energy, and other resources are used resource products are less complex, and resource benefits are greater. Using less material and energy to make a given product, substituting more abundant resources for scarce ones, and developing renewable to replace nonrenewable resources are all basic components of this key strategy. Two simple examples are packaging and automobile parts. Packaging is a tremendous usurper of natural resources. While some packaging is necessary to protect products and prevent contamination, packaging can too often be excessive. Several years ago a leading paper manufacturer in the United States designed and produced a one pint milk carton that served the same function as the traditional carton but had a higher center of gravity. The redesigned container conserved 31 percent of the paper, 16 percent of the plastic, and about 10 percent of the energy needed to produce the original container.

Included in this strategy is the rapidly developing field of renewable resources — those which can be rapidly replenished through natural processes. Solar energy, alcohol, natural rubber, and biomass are all examples of renewable resources. It is generally advantageous to substitute a renewable for a nonrenewable resource, provided the renewable resource production can keep pace with the demand for it. For solar energy this is no problem since there is considerably more sunshine perpetually available than can be utilized. For forest products, however, unplanned use of this renewable resource is resulting in severe deforestation problems in many parts of the globe.

A well-managed renewable resources program for forest and other biomass products can foster substitutions, such as paper for plastics, that are favorable to resource optimization.

Advocates claim, in fact, that well-managed programs of biomass resources are the most effective way to prevent the feared greenhouse effect. There is much evidence pointing to the fact that global use of nonrenewable coal and oil resources is creating a sizable buildup of carbon dioxide in the atmosphere, this will eventually form a thick enough layer to trap so much heat in the lower atmosphere that the earth becomes a greenhouse with devastating environmental impacts, including the melting of icebergs and consequent flooding of heavily populated coastal areas. Biomass resource programs would entail large-scale planting, harvesting, and use of high-growth biomass crops in such a manner that the carbon dioxide consumption of the growing crops would roughly equal the carbon dioxide releases of biomass combustion in energy processes. The net result would be little change in the earth's atmospheric carbon dioxide levels.

Natural rubber is a simple example of the beneficial substitution of a renewable resource for a nonrenewable resource. Natural rubber, a renewable resource, is generally superior to synthetic rubber, a nonrenewable resource. Currently, only about 20 percent of world rubber production includes natural rubber. The economies of the Asian and Latin American developing nations that are producers could be greatly aided through increased use of natural rubber. At the same time, an important resource optimization strategy would be practiced in the annual manufacture of millions of tires.

The most dramatic example to date of resource optimization through substitution has been the advent of smaller, more energy efficient automobiles. Countless millions of tons of steel and barrels of oil have been conserved through the substitution of small, efficient automobiles and trucks for larger, inefficient ones.

Inherent in this strategy are efforts to produce and use more durable and repairable resource products, to use resource products longer, and to reuse waste products and product components in alternative applications.

Durability and reparability are two vital characteristics of resource longevity which can be greatly improved through resource optimization efforts. Material resource products can, through appropriate redesign and processing, be made considerably more durable and repairable. Throwaway products

are unaffordable-luxuries in a resource pressed world and must make way for more resource efficient, long-lasting products. In this category, a resource optimization strategy that arouses much controversy is the concept of mandatory deposits on consumer products ranging from tires to beverage containers. A system of returnable beverage containers requires only about half the energy resources of a throw-away system. In the United States alone, this accounts for roughly 35 quadrillion BTUs of energy per year, or enough to run the entire country for nearly two days.

The rationale behind the deposit system is that consumers will have economic incentives to avoid discarding used products and losing their deposits, when products are returned to recycling centers, deposits will be refunded and resources will be conserved. While the deposit system has important resource optimization potential, it also arouses formidable political opposition by manufacturers who see it as an unacceptable means of limiting new products. Fortunately, such resource optimization can be accomplished through less controversial technological means.

One vital area of this strategy, which will require considerable global attention, is that of corrosion prevention. Every year the world loses billions of kilograms of materials to corrosion. It has been estimated that as much as 20 percent of the annual production of steel is used solely to replace corroded materials. This single area of resource optimization represents an important potential contribution to increasing the global resources base.

Even in cases where only limited improvements can be made in durability and reparability, however, the simple resource optimization strategy of using products longer can be implemented. Most material resource products are converted to waste well before their useful lives have ended. The extent to which products are discarded prematurely generally depends on the economic affluence of the user. In economically deprived parts of the world products are often used beyond their useful lives, in most societies, however, products are often discarded in advance of their service periods at a tremendous global resource cost. Increasing product lives can conserve significant resources, ranging from oil to water to steel. This strategy requires scientific approaches, practices, and maintenance procedures which resource optimization systems can delineate.

Resource products, however, no matter how carefully and scientifically maintained and used, will eventually reach points of deterioration that preclude further use. At this juncture resource products can be dismantled, salvaging usable or rebuildable components and discarding others, put into alternative service, or discarded in whole form.

The first option includes *remanufacturing*. This emerging industry has begun to play an important role in utilization of secondary resources. Products ranging from telephones to automobile parts to vending machines are manufactured with reclaimed components.

The second option, putting products into alternative service, is an old resource optimization method which only recently has received technical attention. One example of putting products into alternative service is creating offshore reefs using discarded tires. Studies have shown that tire reefs increase fish breeding activities and have no measurable negative effect on marine ecology.

The third option is simply to discard waste products. Fortunately, there exists a long established technology to recover resources from discards.

3. Recycle the raw material and energy content of waste resource products. Over 10 billion tons of resources enter the global waste stream from municipal, industrial, agricultural, and mining sources. Only a small fraction of these resources are recovered and put back into useful form through recycling. Recycling is the resource optimization process of returning waste or secondary resources to the production cycle. Recycling conserves vast amounts of energy and material and reduces the environmental impacts of using virgin resources. Recycling secondary aluminum, for example, requires only 5 percent of the energy needed to produce aluminum from virgin sources. For each ton of secondary iron and steel recycled, approximately 20 tons of virgin ore are conserved. Similarly, poisonous sulfur dioxide emissions can be reduced up to 99 percent through aluminum recycling and over 10 percent through steel recycling.

Energy, as well as material, can be recovered through recycling. About 80 percent of municipal wastes are organic. These can be combusted with an average heat value of over 10 million joules per kilogram, up to 5 percent of total nation-

al energy budgets could be met simply through recovering the heat value of municipal wastes. A barrel of oil is conserved for each four tons of waste substituted as an energy source.

Recycling is a vital resource optimization strategy which has been globally implemented on only limited scales. The United States recycles only about 6 percent of its secondary materials, the figure is higher for developing nations.

There are a number of obstacles to increased recycling that are institutional and economic, as well as technological, in nature. The world's production systems have generally been designed to use virgin resources. Fiscal policies have traditionally made exploitation of virgin resources relatively more attractive than utilization of secondary resources. From a thermodynamic standpoint recycling is often much more difficult technologically than is use of virgin resources. The benefits of recycling, however, dictate that this potential resource optimization strategy should be fully developed.

Resource Optimization to Date

Perhaps the most dramatic worldwide example of technologically based resource optimization is redesign of automobiles and trucks to lighter weight, more efficient vehicles. Another important example is recuperation of industrial process heat. By installing simple systems, many industries — large and small — have been able to cut energy use dramatically.

These examples are only representative of the resource optimization that can and must take place globally. Today little more than the tip of the resource optimization iceberg has been uncovered. Considerable efforts will have to be made to achieve the level that will be necessary for promoting long-term world stability. Such optimization is, nevertheless, achievable. The World Bank has projected that up to 30 percent—a very significant figure—of the developing world's energy needs could be conserved by 1990 through concerted resource optimization efforts.

A Fundamental Resource in Crisis

Global resource health rests on its most basic commodity—water. The outlook for water—the resource that covers two-thirds of the earth and is essential to all biological and

commercial processes—is critical. Only a comprehensive program of global optimization of this irreplaceable substance can avert severe problems in the near future.

Global water contamination accounts for a staggering 30,000 deaths per day from waterborne disease. Four-fifths of the illness in the world is related to poor water and sanitation. Fifty percent of the inhabitants of the developing world, together with an estimated 15 million people in the United States, lack access to safe drinking water.

The tensions emanating from this situation are heightened by the strategic economic importance of water. In many parts of the world dissension continues to build where energy development interests and agricultural interests are competing for limited water supplies.

Recognizing the crisis potential in water resources, the United Nations has begun a major program to resolve world water problems by 1990. In an unprecedented session on November 10, 1980, the UN General Assembly devoted a full day to launch the United Nations Decade on Water. The goal of the decade is to marshal every available effort to achieve "clean water for all" by 1990. If this laudable objective is to come even close to realization, vigorous resource optimization programs for water will have to be developed on a worldwide scale.

The Resource Optimization for Peace Concept

In December 1976, delegates from 36 nations gathered in Paris to launch a new, integrated approach to global resource optimization. The occasion was the First United Nations Conference on Non-Waste Technology. At this major gathering the idea of nonwaste technology (NWT) as a long-range resource conservation strategy was detailed. NWT principles were set forth and recommendations were generated for an informal international framework for resource optimization programs. The recommendations of that mid-1970s conference are highly pertinent to the resource problems of the 1980s.

NWT can be defined as a fully integrated approach to maximizing resource productivity and minimizing resource waste and misuse. It includes energy and material conservation, effluent control, and environmental pollution abate-

ment NWT is based on technological criteria. It is designed to mitigate complex political and socioeconomic factors in resource optimization efforts and concentrate on technological solutions

While the NWT concept may seem obvious, the fact remains that even today, many years after the UN conference on NWT, only limited efforts are being made globally to place resource optimization programs in unified frameworks palatable to wide audiences. Today well-intentioned resource optimization programs often operate independently of each other. Moreover, little attention is directed toward meshing overall resource optimization goals with objectives of reducing political and socioeconomic tensions. As a consequence, these programs not only are failing to achieve their resource potentials but are making only minimal contributions to enhancing long-term prospects for international stability and peace.

One internationally oriented group that has conducted small but effective programs for resource optimization is Volunteers in Technical Assistance (VITA). It is based in the United States but spends most of its limited budget in the developing world. VITA projects are aimed at maximizing resource productivity at the local level.

The 1981 United Nations Conference on New and Renewable Sources of Energy (UNCNRSE) in Nairobi made an important contribution to the field of resources development. This gathering brought together experts from many nations to develop cooperative international strategies for developing and augmenting supplies of energy resources vital to the world's well-being. UNCNRSE contributed to international recognition of renewable resource optimization needs. In the words of one conference official, UNCNRSE "put renewable resources on the map."

The World Bank has recognized the key role that resource availability will have on the future state of world order. Since 1978, the Bank has committed several billion dollars to energy projects and is considering the establishment of a special Bank affiliate to concentrate solely on energy resource development. This affiliate would have vastly expanded economic resources at its disposal.

The latter two efforts are aimed at development of resources,

a vital component of overall global resource strategies. It is essential, however, that conservation-oriented resource optimization efforts parallel these development programs. *Resource optimization* can generally achieve increased resource sharing goals in a shorter period than resource development. In the long-term, resource optimization will make it possible to maximize the useful life and availability of developed resources.

International Resource Optimization for Peace Centers

It is essential that the results of the UN conference on NWT, UNCNRSE, on-going World Bank projects, and other international endeavors be focused into comprehensive mechanisms to foster substantive global resource optimization. Such mechanisms should:

- Coordinate major and often fragmented resource optimization efforts now being conducted worldwide into viable and efficient programs.
- Enhance the complementary concepts of conservation and development
- Possess strong technological components for addressing questions of resource optimization having minimal non-technological aspects.
- Possess sophisticated political and socioeconomic components for addressing nontechnological aspects of resource optimization problems:
- Have strong financial bases of support
- Include expertise of established international organizations familiar with resource issues
- Take into full account regional needs and constraints in resource optimization

A group of international Resource Optimization for Peace (ROFP) centers are proposed to develop and maintain these mechanisms. The centers would be based in regions possessing common resource optimization needs and would focus on the regional resource optimization problems most directly related to international tension reduction. They would function in two modes which can be termed *technological* and *interdisciplinary*. The technological mode would include scientific and technical assistance, training, information dissemination, and related services for resource optimization projects. The interdisciplinary mode would identify and

engage in planning and development for resource optimization programs with substantive political and socioeconomic components.

The technological mode would include developing systems to recover and recycle critical materials, designing remanufacturing systems for waste products reutilization, establishing energy from waste programs, and implementing waste heat recovery systems for industries whose geographic locations or other factors make them particularly vulnerable to energy supply disruptions.

Interdisciplinary mode activities might include organizing deposit systems for products, planning substitution schemes for alternative material and energy processes, and lifestyle modification planning for resource optimization. The centers would function on a first come first served basis. They would be established and directed by a board of governors which would include resource optimization experts, a UN representative, an international financial expert, non-governmental organization representatives, and regional leaders.

It is proposed that the World Bank serve as a major funding source for the centers, with the United Nations and other international organizations contributing financial assistance. The Bank, as noted above, has expressed a strong interest in establishing one or more affiliates concerned strictly with resource issues. It would appear that directing this interest toward ROFP centers would be an ideal matching of this interest to global needs.

The model that VITA has demonstrated for providing direct assistance in resource optimization would be a useful one to incorporate in the actual functioning of the centers. VITA minimizes the dissipation of funds, concepts, and time by providing assistance primarily in the form of on-site personnel rather than in the form of grants or contracts. VITA is able to minimize actual program costs by making full use of the large corps of volunteers worldwide who can provide capable assistance.

The ROFP centers are envisioned as independent organizations with strong participation and support from established groups. Chief among these, of course, is the United Nations. The vast capabilities, human and financial resources,

and established international networks of this premier organization could be of immense assistance to the centers. Keeping the centers independent, however, would obviate the need for the United Nations to take on the added responsibility of administering the centers, at the same time, it would facilitate more rapid resource optimization decision-making processes that could prove crucial to defusing peace-threatening tensions

The UN Environment Programme (UNEP), UN Development Programme (UNDP), and the Department of Technical Co-operation for Development (DTCD) are three UN focal points of particular relevance to development of ROFP centers. UNEP has extensive expertise in measuring and assessing environmental implications of resource development and use. UNDP's mission includes promoting efficient and environmentally compatible technological development. DTCD, including its Division of Natural Resources and Energy, is part of the UN Secretariat and serves as a central policy-influencing force in the United Nation's efforts to improve global resources. The activities of all three organizations are complementary to the ROFP process.

An ongoing linkage between UNEP, UNDP, DTCD, and the central ROFP structure would be a basic feature of ROFP center establishment. This linkage would facilitate the matching of capabilities with resource optimization needs and would serve to prevent overlapping and duplicate efforts. To strengthen the linkage, ranking representatives from these three groups would serve and play leading roles on the board of governors.

US Policy Initiatives and Recommendations

It is in the best interests of the United States to put itself squarely behind the ROFP process. Such support would increase global stability, enhance the image of the United States in international relations, and extend opportunities for exporting resource optimizing technologies.

The prominence of the United States in the world community dictates that its support of this peace-enhancing concept can add significantly to ROFP viability. At the same time, such support can measurably enhance the image of this country in international relations. US support of ROFP also has extremely important potential domestic economic

benefits, since it can lead to numerous opportunities for the increased export of resource optimizing technologies and systems. The current administration has recognized the benefits of US support of programs aimed at improving the global resource picture. In his address to the UN/CNRSE, US delegation chairman Stanton Anderson stated

Our rationale is threefold. First, more abundant energy supplies lessen international economic and political tensions. Second, increased availability of overall energy resources is indispensable to the healthy economic growth of all countries. Third, new and renewable energy sources create markets for new technologies and services.

How can the United States help the world and itself accrue the benefits of a comprehensive ROFP program? A number of policy initiatives must be undertaken by both the president and Congress. These include.

1. Generating definitive support for ROFP centers. A statement of support by the chief executive would be sufficient to launch US participation in the ROFP process. The Congress and the president would then have to work together to develop economic programs which would directly aid establishment of ROFP centers, as well as contribute in a more indirect manner to global resource optimization programs.

The former category might include such initiatives as specific recommendations to the World Bank on establishing funding mechanisms for ROFP centers and programs. The latter would consist of aid and loan programs to nations seeking assistance in resource optimization. Currently, the US Agency for International Development (AID) is carrying on work in this area, there is a strong need for increased activity, sufficiently broadened to envelop ROFP objectives. The United States can also provide incentives for domestic development of techniques and systems, including appropriate technological activities that can usually be generated at low cost on small scales.

2. Vigorously implementing recommendations of the First UN Conference on Non-Waste Technology. This conference called for member nations to identify government activities and administrative jurisdictions most amenable

to development of NWT principles and practices. Through this basic effort, the United States could develop an improved assessment of its overall capabilities in the ROFP process.

3. Assuring nonrestrictive import and export policies on resource-optimizing materials, products, and systems. The free international flow of resource-optimizing components will allow the greatest possible optimization of natural resources. This applies to commerce ranging from the import of energy-conserving automobiles to the export of scrap materials for recycling. Interest groups have pushed strongly for restrictions on these and other import/export issues that directly affect global resource use. The cause of global resource optimization will be best served, however, through free trade in resource-optimizing commodities.
4. Developing strong participation mechanisms for the United Nations Decade on Water. The United States has a crucial stake in global optimization of water resources, and it can play a pivotal role in helping work toward this end. The United States can meet this responsibility through significantly increasing its assistance programs in water and through ensuring that water issues receive strong emphasis in ROFP center development.
5. Continuing and expanding the practice of assuring environmental safeguards of resource-consuming exports. Whether it is a nuclear power technology or a manufacturing process for organic chemicals, many of this country's resource-intensive exports carry widespread potential environmental impacts, ranging from localized pollution to poisoning to — in the case of nuclear power — the possibility of weapons development and use causing large-scale destruction. All these are clearly tension-producing. As recognized specifically by the Carter administration, the United States has a grave responsibility to take adequate steps to minimize potential misuse.
6. Balancing policies directed toward resource independence with those of international resource sharing. The United States must, in its quest to reduce its vulnerability to resource supply interruptions, refrain from policies which insulate itself from international commerce and which preclude total access of vital natural resources by other nations.

7 Increasing and improving programs in information flow and technical assistance. AID has upgraded its support of new and renewable energy resource programs from \$36 million in fiscal year 1981 to \$78 million in 1982. This sum still falls far short, however, of what is needed. In the information area, the United States has tremendous resources which should be streamlined and coordinated to increase their usefulness to the international community. AID's Energy Assistance Policy Paper points specifically to problem areas in developing global resource programs which US assistance can help resolve, specifically.

- Lack of basic resource knowledge.
- Lack of adequately trained personnel.
- Lack of appropriate technology.
- Lack of comprehensive energy planning and management.
- Lack of sufficient financial resources.

8 Creating economic incentives for sharing of new resource optimization technologies. Every day new technologies are developed in this country that could be fed directly into the global ROFP network. Incentives to the private sector for sharing these technologies too often are lacking, particularly in the early stages. Federal tax and investment policies can enhance the sharing process.

James Stromayer, US coordinator for UNENRSE and a longtime advocate of global resource assistance programs, has made a key observation which could well summarize the objectives of US policy initiatives in the ROFP process. As Ambassador Stromayer succinctly stated, "We very badly need [to develop] a definition of *national* interest that embraces *international* interest."

Resource Optimization and the Future

The next few years will determine whether the world community will have enough energy and material resources to develop peacefully. If, by the end of this decade, we do not have well established international programs to ensure that the globe's limited resources are managed optimally, the outlook for future world stability will be clouded. A growing number of recognized analysts have, in fact, begun talk-

ing of the possibility of resource wars. Establishment of a worldwide peace-oriented resource optimization program can, however, significantly diminish this possibility.

In a speech to UNCNRSE, United Nations University Rector Soejatmoko accurately pointed out that the world's ability to enhance the self-reliance of developing nations is a key factor in survival of the world as a whole. ROFP centers can play an important role in facilitating such self-reliance and thus be an important part of global survival strategies.

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Demand for the world's finite resources is increasing. Dr. Purcell discusses the relationships between the inequitable distribution of limited resources and growing tensions among nations. As he states, "... it has become increasingly evident that availability of and accessibility to resources are crucial factors in determining the harmony — or lack of it — between nations of the world."

To diminish the possibility of resource wars and related threats to peace, Dr. Purcell proposes "... a comprehensive international program of resource optimization and conservation aimed at increasing the overall supply of resources available." The Resource Optimization for Peace program which he suggests would facilitate self-reliance and could thus be a significant global survival strategy.

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