III. Tutorial Papers

MATERIALS ASSESSMENTS FOR THE UNITED STATES CONGRESS

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The Materials Program of the Office of Technology Assessment has been in existence for a period slightly longer than that which separates this Henniker Conference from the previous one held in 1974. Several of the topics discussed at the last conference have since become the subjects of OTA assessments. These include materials information requirements for policymaking, materials conservation, stockpiling, and recycling. The background information and analysis, provided by Henniker III, have proven extremely useful in the development of these projects. A number of the participants at Henniker III have assisted OTA in the initial conceptualization of projects; but as members of the OTA Materials Advisory Committee, they have also provided helpful guidance and critiques during the projects. These points underscore Mr. Daddario's earlier comments regarding the important link between your work at Henniker and the interests of Congress.

Today, I would like to do four things:

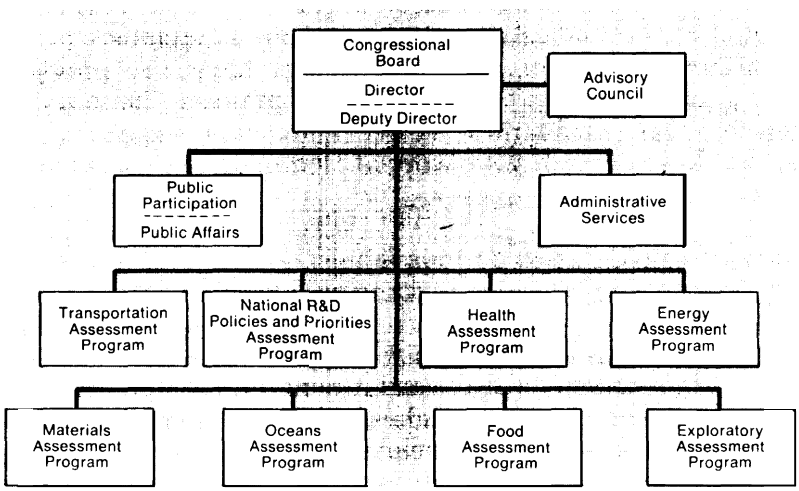
- Describe the OTA organization and its operation;
- Provide an overview of the Materials Program, particularly emphasizing the holistic approach being used to tie together various congressional requests for studies;
- Describe briefly those studies that deal with issues related to materials supply and demand, going into some detail on two studies, Materials Information Systems and Economic Stockpiling. The Task Forces related to the work of the National Commission on Supplies and Shortages will be considering some of the study findings; and
- Provide background for the Task Force dealing with the OTA Materials Program and stresses on the Total Materials Cycle.

OTA Organization and Operation

The function of OTA is to provide balanced, objective, and timely information regarding the possible consequences of applying a given technology. Technology assessment, as initially conceived, was primarily concerned with technical or scientific matters; however, it has since evolved to include any organized, purposeful activity for which the consequences prior to its application must be evaluated or assessed, It is particularly important that such assessments be made before legislative decisions are required and that the assessments present information on alternative approaches for congressional deliberations, This is a very important point: presenting alternative approaches, including that of doing nothing, and providing an impact analysis for each approach. OTA does not recommend any one approach; we merely provide the impact analysis which permits Congress to objectively select one alternative over another.

The OTA consists of a bipartisan Congressional Board, a Director, a Deputy Director, and other employees and consultants necessary for the work of the Office (figure 1). Policies of the Office are set by the Congressional Board which is the oversight body governing OTA.

FIGURE 1.—Office of Technology Assessment



The OTA Congressional Board, figure 2, is made up of six Senators and six Representatives, evenly divided by party, who are appointed respectively by the President Pro Tempore of the Senate and the Speaker of the House. The Director of OTA is a

FIGURE 2.—Technology Assessment Board
1975-1976

Senate Members	House Members
CLIFFORD P. CASE	GEORGE E. BROWN, JR.
ERNEST F. HOLLINGS	MARVIN L. ESCH
HUBERT H. HUMPHREY	MARJORIE S. HOLT
EDWARD M. KENNEDY*	CHARLES A. MOSHER
RICHARD S. SCHWEIKER	OLIN E. TEAGUE**
TED STEVENS	MORRIS K. UDALL

Non-voting Member

EMILIO Q. DADDARIO, **Director,** OTA

● Chairman. 1973-1974
● *Chairman, 1975-1976

non-voting member of the Board. Requests for OTA assessments may be initiated in one of three ways:

- The OTA Board;
- The Chairman of any Standing, Special, Select, or Joint Committee of the Congress, acting for himself, or at the request of the ranking minority member, or a majority of the committee members; or
- The OTA Director, in consultation with the Board.

Congressional committees have first access to OTA Assessments, and are kept informed on a regular basis of the work progress. If appropriate, preliminary results of the assessments are used by committee staffs in their legislative analysis and preparations for public hearings.

OTA Materials Program Strategy

OTA studies are being carried out in response to specific congressional committee requests. These requests generally reflect the jurisdictional viewpoint of the requesting committee, and usually do not take into account the broader aspects of an issue, like the subject of this Conference, materials scarcity. For example, the Interior Committee requests are concerned with such matters as land use, land management, mining, and natural resources—all of which generally relate to material supply. The Commerce Committee, on the other hand, is interested in sub-

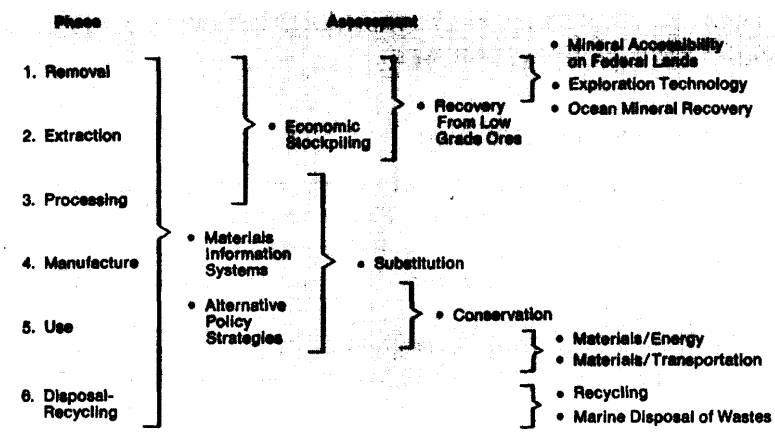
jects which deal with product durability and standards, materials wastage, and substitution—all of which relate to material demand.

In planning the OTA Materials Program, our broad strategy has been to make use of the unifying concept of the total materials cycle in an attempt to tie individual Congressional requests for assessments into a totally integrated approach. The concept of the total materials cycle has been presented in the COMAT and COMRATE reports, and is familiar to most of you; some of you no doubt contributed to its evolution and final development. Using the total materials cycle as an analytical framework permits us to assess policy options bearing on one or more phases of the materials cycle in relationship to those bearing on other phases. Often good solutions to problems turn out to be poor ones in the light of broader overviews of total system elements.

An assessment of the materials implications of future trends in automobiles provides one example of this. Meeting the objective of increased fuel economy will require smaller or lighter weight automobiles. Weight reductions may be achieved with the use of aluminum or plastics, both of which add to the complexities of automobile recycling, The cost increase could result in a decrease in recycling, contrary to resource recovery policy objectives. On the opposite end of the cycle, there are already concerns about aluminum supply and our almost total reliance on foreign sources. Using large amounts of aluminum in automobile construction can only exacerbate this problem.

Figure 3 depicts how congressional requests are considered within the framework of the total materials cycle. The phases of

FIGURE 3.—Conceptual Approach for Conducting Materials Assessments



the materials cycle are numbered one through six, and the individual assessments are identified by brief title. Most assessments cover at least two phases, and two cover the entire cycle.

I would now like to present some details of the assessments which relate to the long- and short-term views on raw materials policy in the United States. The long-run view is concerned with whether or not the supply of materials, at reasonable prices, will be sufficient to support economic growth over an extended period, and what steps, if any, should be taken to improve the U.S. position. The short-run view is concerned with immediate problems of supply and demand and ways to avert or mitigate them. For both sets of materials-related problems, a distinction should be drawn between what results, both good and bad, can be expected from the workings of the present system and those which could be expected from direct actions of the Federal Government.

Furthermore, while the focus of each assessment is primarily upon U.S. materials strategy, the analysis takes into account the complex interrelationships between US. policies and various other national policies around the world. The various assessments represent different approaches to the issue of scarcity: some apply to supply; others, to demand.

In sum, materials problems have complex roots, and actions designed to deal with them need to be considered on a truly systems basis, taking into account the interactive manner in which the total materials system influences, and is influenced by, other systems-like foreign policy, domestic policy, environmental changes, demographic trends, the world economy, and so forth.

Ideally, materials should flow through all stages of the materials cycle in order to supply adequate amounts of materials and energy for the basic requirements of nutrition, shelter, and health, while sustaining a dynamic economy with minimum waste and environmental impact. The flow of materials should be continuous, and there should be continuity in prices as well.

Many factors affect materials flow through the economy, and the United States has relied primarily on the marketplace to provide materials at what are loosely termed reasonable prices. However, there are growing concerns that new, and quite different, problems may not be dealt with by relying solely on market adjustments. These problems may be described as stresses which perturb the equilibrium prices and flow rates of materials at any point in the materials cycle. As you look at these examples in figure 4, it is obvious that some of the stresses perturbing the cycle are foreign in origin and others are domestic. The quadrupling of bauxite taxes is an example of the former; the increased costs associated with meeting new environmental

and health regulations, the latter. The coupling of energy and materials flows is yet another type of stress which has both foreign and domestic origins.

FIGURE 4.—Stresses on the Materials Cycle

- Worldwide Increase in Population and Demand for Materials
- Adverse Actions by Foreign Governments
- Internal Difficulties in Producing Countries
- Depletion of Concentrated Resources
- Decrease in Rate of Mineral Discovery
- Increase in Energy Costs
- Long-Term Trend in Mineral Industry Investment
- Environmental and Safety Requirements
- Government Regulation
- Other

Developing suitable policy alternatives which will be both timely and effective requires an analysis of when the impacts of the various stresses might be expected (figure 5). On the one hand, short-term stresses like embargoes require quick actions if adverse impacts are to be avoided or alleviated. On the other hand, long-term materials stresses, like the depletion of reserves or the increasing world-wide demand for materials, require different types of policy responses. For the short-term stresses, it is especially important to maintain an up-to-date information base 'regarding potential situations affecting materials supply/ demand, e.g., the developments regarding the Law of the Sea

FIGURE 5.—Policy Alternatives To Relieve Stresses

- Supply Oriented Options
  - —Assist Domestic Production
  - —Expand Mineral Exploration
  - —Improve Access to Federal Lands
  - —Improve Access to Foreign Supply
  - —Promote International Trade Agreements
- Demand Oriented Options
  - —Encourage Conservation
  - —Encourage Substitution
  - —Tax Concessions
  - —Demand Management
  - —Export Controls

Conference or the less-developed countries' proposal at UNCTAD IV for indexing the prices of basic commodities to the cost of manufactured goods. For the long-term stresses, a carefully formulated program of materials research and development, coupled with investment incentives, should be considered.

Identifying the stresses, their anticipated impacts, as well as possible alternative policies and decision mechanisms for averting or relieving them, is essential in order to maintain a smooth, though probably a redistributed flow, of materials through the total materials cycle– and hence a health economy, Moreover, both Government and private sector roles must be properly balanced in considering these alternative policies.

Assessments Related to Supply and Demand

I would now like to illustrate how these previous comments apply to the structuring of the overall materials program by discussing some of the details of several assessments. Five selected assessments are illustrated in figure 6: two relate to supply phases of the cycle, two relate to demand phases of the cycle, and one covers both supply and demand elements of the materials cycle. Also shown are the principal stresses, which to a large extent prompted the requests for these assessments.

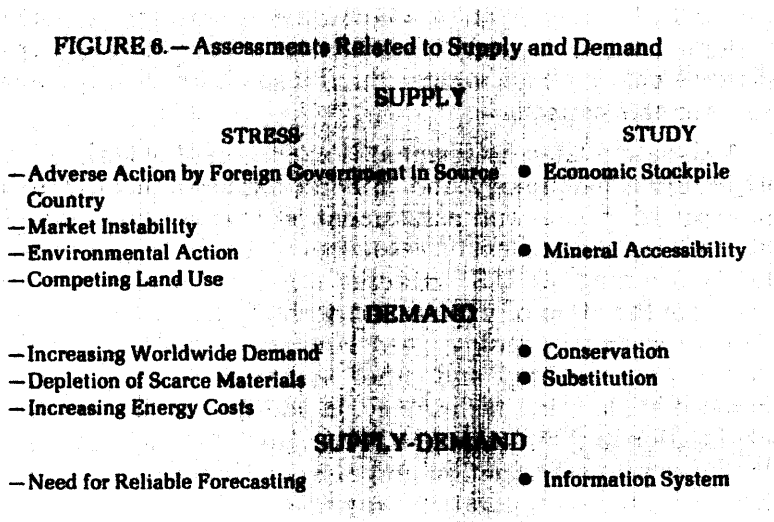


FIGURE 6.—Assessments Related to Supply and Demand

Considered within this framework, these assessments can be viewed as component elements of an overall strategy for dealing with materials-related issues. Both short-term and long-term

stresses can be dealt with by a variety of approaches. Economic stockpiling is one short-term response to many potential supply disruptions; another response might include export controls on critical materials. Other studies in this list, which clearly deal with long-term responses, represent a variety of approaches.

A series of congressional requests has resulted in three studies directed toward increasing the future supply of domestically produced minerals. The first study nearing completion is analyzing the potential impacts of modifying and restructuring laws, policies, and other institutional factors which significantly affect the exploration, production, and physical accessibility of **essen**tial minerals on Federal onshore lands.

This land encompasses about one-third of the Nation, or an area almost equal to that part of the United States east of the Mississippi, and includes vast acreages in the Western States and Alaska, where much of the hard-rock and fuel minerals are located. The utilization of Federal land is subject to a wide variety of restrictions on mining activity, including statutory and administrative withdrawals for wilderness preservation, national parks, wildlife refuges, agricultural and grazing uses, energy development, mineral conservation and development, and military reservations. The drive for greater energy self-sufficiency is likely to produce strong pressure for large-scale, unprecedented development of such domestic energy resources as coal, oil and gas, and oil shale, much of which lie on Federal land. The use of Federal lands to expand domestic availability requires a carefully planned policy which weighs the full spectrum of environmental and societal impacts.

A closely related assessment is examining the state of mineral exploration technology and mineral exploration programs, The purpose of this second assessment is to assess the potential for discovering new domestic resources and reducing the uncertainties pertaining to U.S. mineral resource information. It will examine the state of exploration techniques now in use and the R&D programs in geology, geochemistry, geophysics, deep drilling, remote sensing, and other activities which contribute to mineral exploration technology, In addition to the technology of exploration and the associated R&D, this study will also examine public resource-evaluation programs by Government agencies, as well as mineral exploration programs in the private sector.

The third study in the series on domestically produced minerals deals with the potential for extracting metals from low-grade resources. The purpose of this study is to assess the potential for developing low-quality, domestic resources as possible solutions to both the short-term problems of dependence on

foreign supply and the long-term, worldwide resources demands. For various selected materials, the study will consider U.S. domestic ore resources, facilities and investment requirements, cost of production, and other problems of utilizing domestic resources with available technology, Among the problems of utilizing low-quality resources to be considered include energy requirements, environmental impacts of mining and onsite beneficiation, and transportation availability.

The assessments discussed thus far concentrate primarily on the supply side of the materials equation, On the demand side, a request has been made to assess the potential for materials conservation as one alternative for dealing with the long-term problems of materials scarcity, This study is analyzing the potential for materials conservation throughout the materials cycle, and is developing specific strategies for conservation through improved materials utilization in the manufacturing and use phases of the materials cycle.

Another demand-related study is examining the prospects from ongoing R&D activities in the development of policies to deal with problems of material scarcity. The purposes of this study are (1) to examine for selected materials the state of R&D activities which can lead to substitutions for import-dependent materials and (z) to estimate the time and quantitative impacts which the R&D activities might have on scarcity-related problems. The final study included in figure 6 deals with the supply and demand relationships, and information requirements for materials policy decisions.

Materials Information Systems

The materials information assessment is focused on those aspects of the overall materials information problems which are of most concern to Congress— namely, forecasting and assessing the supply and demand of metals and minerals.

This assessment treats in a unified way the total materials cycle, including the major economic factors associated with the use of materials. Effective management of the materials cycle— providing the right amount of material at each stage in the cycle — requires a broad spectrum of information. To provide this information to decision makers, a large number of formal and informal materials information systems have evolved. Some are in Government, but most are in the private sector.

AIthough these systems have served the Nation well for many years, new stresses on the total materials cycle have raised concern for their continuing effectiveness, and it was against this

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growing concern that OTA addressed the following questions concerning materials information systems:

- Are the systems which currently support Federal materials policymaking adequate to deal with the complex new issues posed by materials shortages?
- In particular, are the systems able to project whether a shortage is likely to occur, estimate its consequences, and evaluate the effects of possible Government actions?
- If not, what kind of new or improved system is needed?
- How might such a system be achieved—by what organizational means and under what institutional arrangements?
- What governmental, economic, social, international, and legal impacts might such an improved system have?

For the sake of time, I will not attempt to present information from the assessment in response to each of these questions. Instead, I would like to give you a brief overview of what is contained in the final report, of which you have the summary volume, and then if you have detailed questions which cannot be covered now, I will respond to them during the Task Force sessions,

The shortcomings of present materials information result not so much from a lack of data as from the more stringent requirements for information management, analysis, and coordination resulting from the increasingly complex problems now facing policy makers. That these shortcomings do exist was determined in large part by interviews with senior policy makers in the Government as well as private industry, These present systems by and large perform well relative to their intended missions. An improved information system would provide policy makers with the means for more adequately testing the effects of likely scarcity situations, Such a system would allow policy makers to assess "what if" scenarios—the effects of a foreign cartel limiting supply, for example, or the consequences of Government incentives to encourage increased domestic production. This capability will not be realized by simply allowing the current materials information systems to evolve.

The study describes a conceptual framework for an improved materials information system which takes into account the complexities linking the amounts of materials produced and used with their domestic and international economic parameters, The conceptual system responds to the need to quantify the most important of these and to make the relationships evident to decision makers formulating materials policy.

The conceptual system developed in the assessment organizes materials information so as to account for the principal sources of

supply, demand, and utilization for each critical material, For each material, the system develops an index of scarcity indicative of the need for close Government monitoring and possible response, Nine essential functions are incorporated into the conceptual system (figure 7),

FIGURE 7.– Conceptual System Core Functions

- **Monitoring inventories of resources and reserves.**
- **Monitoring the status of strategic and economic stockpiles, if established.**
- **Monitoring imports and exports.**
- **Monitoring the status of recycled materials.**
- **Monitoring quantities of materials produced and available production capacity.**
- **Monitoring quantities of materials consumed in end products.**
- **Forecasting supply.**
- **Forecasting demand.**
- **Forecasting the interaction of price on supply and demand.**

By treating supply and demand as functions of price, the conceptual system would indicate how much of a material was likely to be produced and used at each stage in the total materials cycle. The policy maker could thus determine whether the normal market mechanisms could absorb the impacts of a given stress. If they could not, and unacceptable economic distortions could occur, then the system could be used to test the effectiveness of alternative Government responses.

The Government's present materials information systems constitute a strong base on which to implement the conceptual system described in the assessment. Some of these, in particular the systems used for forecasting agricultural food and fibre commodities, have been in development for some 40 years. Other, newer systems covering mineral commodities are rapidly undergoing improvement, Many of these systems already perform some of the monitoring and projection functions embodied within the conceptual framework.

Three approaches were identified for improving the Federal Materials Information System:

- Approach 1 would better coordinate the development of the existing separate materials information systems to achieve the desired capability through an interagency committee or congressionally authorized coordinating group;

- Approach 2 would bring about changes in the existing information systems via a series of step-by-step advances by a full-time coordinating organization. The group would more closely coordinate the existing materials information systems and have the authority to add new supplementary information services as necessary; and
- Approach 3 would design and develop the information system from the "top down," using the existing information systems and adding new ones as determined appropriate by a central management office with adequate authority.

Whichever approach is taken, the improved system would incorporate the following basic information services (figure 8):

All three approaches require specific action by Congress and the President. Approach 1 will, at minimum, require an Executive Order, agency directives, and congressional oversight; it may also call for legislation, Approaches 2 and 3, or any other major program implementing the conceptual system or its equivalent, will probably require new legislation,

FIGURE 8.—Basic Services for a New Policy Level Information System

SERVICE	FEATURES
Referral	Provide Awareness of Information Availability
Information Exchange	Facilitate Information Exchange Through Establishment of Standards and Data Reporting Formats
Clearinghouse	Provide Users with Available Serial Publications and Reports
Summary Data Base	Aggregate Data on Supply, Demand, and Utilization
Query Management	Prepare Statistical, Historical Trends From Summary Data Bases
Routine Statistical	Provide Statistical Summaries to Periodic and One-Time Requests
Modeling	Provide Analytical Modeling for a Variety of Materials Problems. Insure Common Data Base and Selection of Forecasting Parameters

A comparative analysis of establishing the system within the private sector, a State or local government agency, a quasi-governmental institution, and a Federal agency (both in the legislative and executive branches) indicated that locating the materials information system within the executive branch would best accomplish its objectives. Within the executive branch, the range of feasible alternatives is illustrated by seven combinations

of institutional arrangements and information system approaches, each having the functions and responsibilities indicated by the abbreviated titles (figure 9).

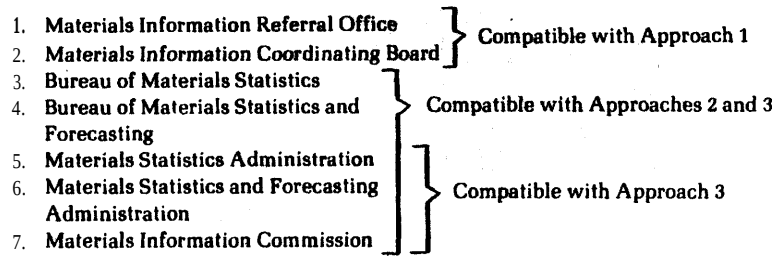
The major impacts of implementing an improved information system are discussed in the report and are grouped into three categories:

1. Beneficial–Strengthening of the Government's capability to forecast scarcity and make contingency plans;
2. Mixed Beneficial or Detrimental–Stimulation of planning in the U.S. economy by increased monitoring;
3. Detrimental—Potential misuse of sensitive information.

The assessment examined the sources of Federal authority to gather materials information from the private sector and concluded that establishment of the conceptual materials information system would (a) be consistent with existing recognized Federal regulatory powers; (b) would not greatly expand, if at all, Federal authority over the materials industry; and (c) need not violate any recognized rights of corporate privacy if adequate attention is given to checks and balances in system implementation.

With respect to the effects of an improved materials information system on patterns of industrial competition, the analysis concluded that the system would collect and provide information which, if properly used and supplemented, could stimulate research and development, possibly decrease major short-term price fluctuations, help stabilize materials-related industries, lower materials costs, and assist in business planning. The information might also increase competition by forcing new dynamics into demand, supply, and use of materials.

FIGURE 9.– **Implementation Alternatives**



Economic Stockpiling

The materials shortages experienced during 1972-1974, coupled with the OPEC oil embargo, raised concerns about other raw materials embargoes and price increases by organized producer countries. At the request of the House Committee on Science and Technology, economic stockpiling has been examined as a possible component of a national strategy for insuring materials supply during peacetime.

The objectives of the assessment were to determine whether or not stockpiling to achieve selected objectives yields sufficient benefits to merit its consideration by Congress as one component in a larger materials strategy, and to develop a generalized methodology for use in establishing and operating an economic stockpile. An economic stockpile is similar to insurance in that acquisition and holding costs are paid in anticipation of reducing the costs of possible future problems. A decision to establish an economic stockpile depends on the belief that there will be eventual net benefits, either through deterrence of a problem, or through relief if a problem occurs.

The assessment addressed the following questions:

. Should the United States consider establishing an economic stockpile?
- What possible economic stockpiling policies might be established?
- What possible impacts might result from implementing these policies?
- What are the alternatives to an economic stockpile?
- What options and institutional arrangements are available to Congress in considering possible legislation? and
- What considerations require further analysis?

Again, for the sake of time, I will not attempt to present information from the assessment in response to each of these questions. Instead, I would like to give you a brief overview of what is contained in the final report, of which you have a draft copy, and then if you have questions, respond to them during the Task Force sessions.

Eleven policies were initially examined, and five were selected for detailed assessment (figure 10). These five are numbered SP-1 to 5, One material relevant to each policy was then used to assess its impacts. The impact analysis covered economic, political, social, legal, and institutional considerations. Both the methodologies and the specific impacts are presented in the final report; however, let me briefly highlight the key findings for you.

Economic stockpiling can be considered one means of responding quickly to the short-term problems, but it should not be con-

FIGURE 10. –Possible Economic Stockpiling Policies

FOREIGN

- **Discourage or counteract cartel or unilateral political actions** (SP-1)
- **cushion the impact of nonpolitical import disruptions** (SP-2)
- International materials market stabilization (SP-3)
- Support friendly nations in the event of temporary shortages
- Increase or maintain foreign country production
- Commodity trading between the U.S. and foreign countries

DOMESTIC

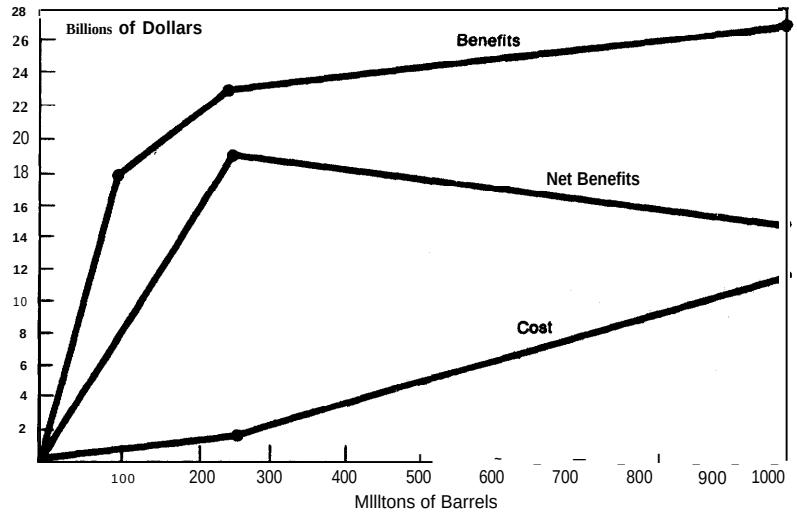
- Conserve scarce domestic materials (SP-4)
- Provide a market for temporary surpluses and ease temporary shortages (SP-5)
- Support domestic production of selected foreign source materials
- Advance new technology for materials supply
- Encourage recycling

sidered a means of effecting long-term solutions to them. On the other hand, an economic stockpile could have value in providing the time required for the United States to implement such long-term policies as substitution, conservation, or the development or alternative supply sources.

Economic stockpiling is inherently a process of market intervention and will create economic impacts (i.e., benefits and costs) which are distributed unequally throughout the U.S. economy. An economic welfare model developed in the assessment permits the stockpile managers to estimate economic benefits and costs in terms of an assumed future, which includes probabilities of supply interruptions and elasticities of supply and demand.

The economic welfare model was used to estimate, for the economy in general as well as for specific groups, the economic impacts of implementing five selected stockpiling policies for petroleum, copper, tin, tungsten, and zinc. These estimates indicate that some policies will have positive economic net benefits and some will have negative economic net benefits. As indicated in figure 11, **a** petroleum stockpile in the range of 250 million barrels would be required to deter cartel actions. It should be emphasized that the estimates apply only to the specific materials examined and within the scenario assumptions described, and should therefore not be taken to indicate that precise quantities of specific materials should or should not be stockpiled. Nevertheless, the nature and magnitude of the estimates are sufficient to indicate that an economic stockpile should be given detailed consideration as one component of a more comprehensive national materials strategy and that measuring the benefits or costs of a supply disruption in terms of its probability.

FIGURE 11 .—**Economic** Net Benefits of SP-I



rather than its certainty, will significantly reduce the quantity of material to be stockpiled.

The United States should consider economic stockpiling in terms of foreign policy as well as domestic affairs. The policy objectives of a particular stockpile should be clearly delineated, Analysis of the Strategic and Critical Materials Stockpile indicates, for example, that it has been used in a limited manner to achieve selected economic purposes. Further, the operation of an economic stockpile will create enough problems and pressures to warrant its being sufficiently insulated from the political process that it may act in the public interest, yet remain responsive to congressional scrutiny,

The decisions relating to the establishment and operation of an economic stockpile—specifically, the acquisition and disposal of materials—should be systematically made and documented, using an approach similar to the decisionmaking process developed in this assessment (Decision Criteria Model).

There are four basic options available to Congress in considering possible legislation.

1. The first option is for Congress and the President to forego establishing an economic stockpile, letting the current market system, with its existing support mechanisms, attempt to prevent or correct the impacts of supply disruptions and price increases.
2. The second option is for Congress to act without drafting new legislation. It could initiate such action by providing

information regarding economic stockpiling within the legislative branch, the executive branch, or the private sector.

3, The third option is for the President to take action, within the limits of his existing authority, without proposing new legislation. Such action could be accomplished in several ways: (a) issue a Presidential proclamation to set overall policy direction, (b) issue an Executive or agency order, or (c) make research and development grants available for analysis of materials problems.

4. The fourth option presumes that, for one or more reasons, the first three options will not be sufficiently effective in dealing with current or anticipated materials supply and price problems and that authorizing legislation is required,

There are six institutional arrangements available to Congress in considering possible legislation.

First, a unilateral economic stockpile controlled and operated by the U.S. Government might be established. It could be another component of the strategic stockpile, or it could be an independent stockpile whose operations are carefully coordinated with those of the strategic stockpile.

Second, a unilateral economic stockpile, controlled by the U.S. Government but operated by U.S. industry, might be considered.

Third, a unilateral economic stockpile, controlled and operated by a public-private corporation, could be established. It could be funded by the Government, vested by Congress with a mandate and guidelines on U.S. stockpile purposes, and given independent authority to acquire and maintain national stockpiles without direct Executive control but with provisions for Executive consultation. The corporation would be able to maintain a certain degree of political independence comparable to the Federal Reserve System on monetary matters.

Fourth, the United States could participate in an economic stockpile operated by two or more nations, either multinational or international in nature, formed along such existing political or organizational lines as the Organization of American States (OAS); the European Economic Community (Common Market); the United Nations; or just with friendly nations having materials requirements similar to those of the United States. At present, the United States is conducting several discussions/negotiations which do consider this arrangement: the United Nations Conference on Trade and Development (UNCTAD) discussions within the United Nations and the International Energy Agency.

Fifth, the United States could participate in an economic stockpile through the creation or expansion of producer/con-

sumer councils like the International Tin Council which is run by both producers and consumers and maintains its own buffer stock to help stabilize the supply and price of tin.

Sixth, the U.S. Government could establish and control an economic stockpile, but operate it according to international guidelines. Arrangement 6 would recognize the fact that some national economic stockpiles are being created, but that some countries like West Germany have not implemented them because of serious concern regarding their impact on domestic and world market systems. An international code of operations might help reduce this concern, as well as develop effective mechanisms for alleviating U.S. supply problems without increasing the world shortage.

Conclusion

As Mr. Daddario stated, the role of OTA is to consider the long-range needs of the United States in the field of materials management and materials technology. I have presented today the approach we are taking, building on much of what has been developed before–particularly the unifying concept of the total materials cycle.

The principal continuing objective in carrying out OTA assessments will be to provide Congress with an analytical framework, a methodology, and a current information base for examining the various interrelated policy instruments of a national materials strategy—and in so doing, establish a response capability to address congressional inquiries regarding materials-related issues, We are asking the task forces to assist in meeting this objective by evaluating the importance of various stresses in terms of their anticipated intensity and timing, possible policy alternatives to avert or relieve the stresses, and finally the decision mechanisms to implement the alternative policies.

These then are the general directions which we hope the task forces dealing with the materials assessments for Congress will take. In this way we hope to utilize the special expertise represented here to assist in developing component strategies for U.S. materials policy.

Thank you for your attention. We look forward to working with you in the task sessions.