



CHOICES FOR CONSERVATION

RESOURCE CONSERVATION COMMITTEE
FINAL REPORT to the
PRESIDENT and CONGRESS
JULY 1979

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RESOURCE CONSERVATION COMMITTEE

Washington, D.C. 20460

July 13, 1979

To the President and Congress of the United States:

It is my honor to transmit for your consideration the fourth and final report of the Resource Conservation Committee, *Choices for Conservation*.

The Committee was established under Section 8002(j) of Public Law 94-580, the Resource Conservation and Recovery Act of 1976. This legislation directed the Committee to "conduct a full and complete investigation and study of all aspects of the economic, social, and environmental consequences of resource conservation" with respect to present and proposed Federal policy choices affecting the use of material resources. This report brings together the results of the Committee's work on this subject.

While we do not appear to be facing an imminent shortage of material resources similar to that which we face with energy resources, we must be aware that we have no cause for complacency about the rate at which we consume our natural endowment. Our material use practices affect environmental quality, energy consumption, waste generation, the balance of trade, and other important national concerns. Individuals, private companies, local governments and the Federal Government all make choices every day which affect our use and conservation of resources. *Choices for Conservation* describes how some of these decisions might be affected by ten present or proposed Federal policies.

The Committee has agreed on a series of findings for each policy. Members of the Committee have also made recommendations on each policy. This report shows where there was consensus and where members took different positions.

The Committee was fortunate to have a high degree of public participation throughout its deliberations. We held eight public meetings in varying locations across the country to listen to peoples' opinions on the policies we reviewed. The advice that many interested individuals and representatives of public and private organizations offered in these meetings has been invaluable. We are highly appreciative of their interest.

Respectfully submitted,

DOUGLAS M. COSTLE
Chairman

Enclosure

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EXECUTIVE SUMMARY: FINDINGS AND RECOMMENDATIONS

The Resource Conservation Committee was established under the mandate of the Resource Conservation and Recovery Act of 1976 (RCRA) for the purpose of studying present and proposed Federal policies that might affect the choices of individuals, industry, and governments to consume or conserve material resources.

Several major concerns about our pattern of material use led to the passage of RCRA and the creation of the Resource Conservation Committee:

- problems of industrial pollution and environmental degradation;
- community problems of solid waste management;
- the availability, cost, and efficient use of material resources;
- energy supply and consumption;
- international trade, dependency, and security;
- the material welfare of future generations.

Problems of material supply do not presently appear to be as serious as those we face with energy resources. The threat of temporary shortages will probably always be with us, but our best judgment is that we are not in serious danger of soon exhausting or being unable to obtain the major raw materials on which we depend. Nevertheless, the economic, environmental and other concerns noted above should prevent us from being complacent about the rate at which we consume our endowment of material resources.

Resource conservation — consuming less of our virgin natural resources than we otherwise would — is often suggested as one approach to these problems. Materials can be conserved at any or all stages in their life cycle: less total extraction; more complete use of what is extracted (less processing waste); longer-lived products and multiple use of material before disposal (more reuse, recycling, or conversion into energy); and, in the case of renewable resources such as timber, more replanting and improved husbandry of the land. Consuming less of a material also means that less of it will ultimately have to be handled as waste.

There are many existing and potential Federal policies relating to resource use that the Resource Conservation Committee could have studied. The Committee chose 10 policy areas for study and spent a relatively large amount of time on two of them — beverage container deposits and the solid waste disposal charge. The Committee chose these 10 areas because of the legislative mandate, Congressional and public interest, and a desire to review

a full spectrum of policy alternatives. Each of the policies studied is focused on a particular stage in the materials life cycle. However, if effective, each would cause a “ripple effect” throughout the cycle, affecting people’s choices to consume or conserve at the extraction stage, through processing and use, to disposal or recovery.

The 10 policy areas which the Committee studied are:

1. Existing Federal Tax Subsidies for Virgin Materials
2. Extraction Taxes on Virgin Materials
3. Subsidies for Resource Recovery
4. Railroad Freight Rate Discrimination
5. Product Regulations
6. Beverage Container Deposits
7. Deposits and Bounties on Durable and Hazardous Goods
8. National Litter Tax
9. Local User Fees
10. National Solid Waste Disposal Charge

The remainder of this summary consists of the Committee’s findings and recommendations regarding each of these policy areas.

Existing Federal Tax Subsidies for Virgin Materials

Committee Findings

Based on staff analysis conducted by the Treasury Department and other considerations, the Resource Conservation Committee finds that:

- Several Federal tax subsidies significantly reduce supply costs for domestic virgin materials. Important among these are:
 - percentage depletion for minerals
 - favorable tax treatment of mineral exploration and development costs
 - capital gains treatment for timber
 - mismatching of income and expenses in timber growing and harvesting.
- Such subsidies encourage overuse of virgin domestic resources. However, the negative effect on recycling appears to be small (less than 5 percent), although significant uncertainties exist in analyses of the

elasticities of domestic and foreign supply and of substitution between virgin and recycled materials.

- As presently designed, these subsidies are not cost effective compared to appropriated subsidies with the same budgetary cost.
- There is no public policy justification for subsidizing virgin materials over secondary materials.
- Removal of these subsidies would probably increase imports of iron ore, copper, lead, and zinc; it would decrease export volume of phosphate rock and timber.

Committee Recommendations

Only one of the nine members of the Committee is prepared to make an immediate recommendation for elimination or modification of the tax subsidies presently granted to the domestic virgin materials extraction industries. This member asserts that Federal tax policies should be neutral, and therefore not favor domestic natural resource development or virgin materials. On the other hand, only one member specifically recommends that no changes be considered at the present time, citing estimates of low impacts on recycling and general uncertainty about what the other effects of such an action would be.

All the members agree, however, that the issue of reducing existing Federal tax incentives for extraction industries is worthy of further consideration. Eight members join in recommending that the arguments for revising virgin materials tax policy be included in a broad review of U.S. minerals policy. They therefore recommend that the Administration's (interagency) Task Force on Non-Fuels Minerals Policy, upon completion of an analysis of this subject by the Treasury Department, consider elimination or modification of these tax subsidies in light of overall national objectives such as resource supplies, environmental protection, economic health, and national security. Four of those members recommend further that the Administration undertake such a review as part of the next tax reform package. The ninth member of the Committee stresses that any further study or other consideration should include public participation.

Extraction Taxes on Virgin Materials

Committee Findings

As a result of their evaluation, the members of the Resource Conservation Committee reached the following findings regarding taxes on virgin material extraction:

- Virgin material extraction taxes, accompanied by complementary tariffs, would make virgin materials more expensive and encourage resource conservation. However, the RCC did not undertake specific quantitative studies to estimate the reduction in consumption that might accompany the taxes.
- If virgin material extraction taxes are not matched by tariffs on imports, domestic production could be at least partially displaced by imports of materials and fabricated goods.
- Administration of a set of complementary virgin material extraction taxes and tariffs would be complex.
- The virgin material extraction tax concept runs directly counter to existing Federal tax policy, which encourages domestic virgin resource use.
- Virgin material extraction taxes could be the most direct and broadly based financial incentive to accomplish resource conservation.
- Virgin material extraction taxes which are large enough to significantly affect domestic resource use would cause economic dislocation in the extraction industries and in some communities unless phased in over time; they would also lower living standards in the short run.

Committee Recommendations

None of the members of the Committee favor recommending that virgin material extraction taxes be developed or proposed at this time. Two members, however, endorse taxes on virgin material extraction as a potentially useful tool to encourage resource conservation; one of these members recommends further study.

Two members oppose virgin material extraction taxes generally, although one of them also recommends further study. One other member also recommends further study to determine the specific impacts of the taxes, without taking a further position at this time.

Six members of the Committee emphasize that existing tax policies to encourage virgin material production should be eliminated before any new extraction taxes are considered further. Taxing virgin material extraction to foster resource conservation would be virtually the reverse of the present tax advantages enjoyed by the extractive industries.

Subsidies for Resource Recovery

Committee Findings

The Committee concluded the following with respect to subsidies for resource recovery:

- Subsidies for resource recovery can be an effective although potentially costly tool to stimulate resource conservation.
- Subsidies can be particularly useful in the “short term” to help local governments plan resource recovery operations and to aid the development of “infant industries.”
- Subsidy programs should be designed so as not to create undue biases towards capital intensive solutions.
- Appropriated subsidies are preferable to tax subsidies.
- The Federal Government currently has two subsidy programs for resource recovery: differential tax treatment of capital investment and grants for demonstration projects and local implementation planning.
- Subsidy approaches are generally contrary to the polluter-pays principle: they substitute payments by taxpayers for payments by beneficiaries of the subsidized activity.

Committee Recommendations

Having found that subsidies designed specifically for resource recovery can be an effective, although potentially costly, tool to stimulate resource conservation, the Committee nevertheless unanimously agrees that no new specific subsidies should be proposed at this time.

There are many ways that subsidies might be used for resource recovery, and five members join in calling for further research on the subject before firmer policy conclusions are drawn. Only two members are willing to take positions on the overall advisability of instituting subsidy programs for resource recovery: One member gives general endorsement, while the other recommends against any form of specific subsidy and further recommends repeal of existing subsidies, seeing no need for them.

Some of the members wish to state the conditions under which they would consider adopting subsidies and the types of subsidies they would prefer if subsidies are adopted. Four members are willing to endorse subsidies as a last resort in order to offset existing virgin material economic advantages (e.g., tax advantages, freight rates, municipal solid waste costs). One of these members also emphasizes that subsidies can be appropriately employed in the technology development process. Three members specifically recommend

that any future subsidies be designed to avoid undue biases toward large-scale, capital-intensive solutions, citing significant opportunities in this area for small-scale and more labor-intensive technologies.

Railroad Freight Rate Discrimination

Committee Findings

The Resource Conservation Committee concluded the following with respect to railroad freight rate discrimination:

- Based on presently available Interstate Commerce Commission cost and revenue information, railroad rates for wastepaper, glass cullet, and scrap copper reflect a higher ratio of revenue to variable cost and thus are probably discriminatory in comparison with rates for related virgin materials. ICC data do not confirm a higher ratio nationwide for iron and steel scrap, but this conflicts with evidence provided by other sources.
- If such discrimination exists, it probably makes only a very small difference in the amount of most secondary materials used. The largest relative impacts appear to be on glass cullet and wastepaper.
- There is no public policy reason for discriminating between virgin and secondary materials.

Committee Recommendations

The members of the Resource Conservation Committee fully recognize that the Congress and the Courts have already established a clear public policy in ordering the Interstate Commerce Commission to eliminate railroad rate discrimination between virgin and recycled raw materials and products. The Committee also recognizes that its findings regarding the existence and degree of discrimination for individual materials must be considered preliminary, given the data on which they rest, and that later review by the ICC using improved statistics may provide more valid estimates.

Most of the members recommend that the Administration file a brief with the ICC, stating the results of the Committee's research and expressing the Committee's interest in achieving compliance with Section 204 of the Railroad Revitalization and Regulatory Reform Act of 1976, the purpose of which is to eliminate discriminatory pricing. Several members feel that the Administration does not need to file the brief because the ICC is under court order to conduct a new investigation into rate discrimination.

One member favors allowing competition to establish the rates, acknowledging that such a recommendation would imply outright deregulation of rates for rail freight carriers. However, other members feel that, whether railroad deregulation has merit or not, the RCC is an inappropriate forum in which to consider this broader question.

Product Regulations

Committee Findings

The Resource Conservation Committee reached the following conclusions with respect to product regulations:

- Product design regulations could be effectively employed as a resource conservation tool.
- Direct regulation imposes costs on the economy by circumventing the free market system and reducing flexibility; direct regulation may also discourage technological innovation.
- Administration of mandatory design and packaging standards would present enforcement problems and costs and would add to the burden of Federal regulations on the private sector.
- There may be some areas where such direct intervention is appropriate, such as in areas where the risks associated with improper management are very great. (Two examples might be the handling and storage of toxic and hazardous wastes or where certain materials might significantly inhibit resource recovery operations.) In these cases, product design regulations should probably be part of or at least be done in coordination with regulations on toxic and hazardous wastes.
- More research is needed on the following topics before specific proposals can be developed: (1) the identification of objectives to be served by mandatory design standards, (2) materials flow through the production process, and (3) the effects of such regulations.

Committee Recommendations

The full committee agrees that product regulations should not presently be proposed as a general-purpose tool for resource conservation. The members cite problems with administration and enforcement, the burden on businesses, possible inflation effects, and general cost-ineffectiveness.

Nevertheless, all but one of the members agree that the Government should sponsor further research on the use of regulations for resource

conservation in the areas of toxic and hazardous wastes and products made with materials that especially impede resource recovery. Half of those members state explicitly that there might be a role for product regulation in the areas recommended for further study; the other half make clear their desire to express general opposition to the idea of product regulations unless the studies show very positive opportunities.

One member recommends against direct regulations in all circumstances.

Beverage Container Deposits

Committee Findings

Based on empirical studies and economic modeling reviewed or conducted by its staff, the Resource Conservation Committee made the following findings with respect to national beverage container deposit legislation:

- Imposition of mandatory deposits is an effective means for reducing litter associated with beverage containers.
- Up to two percent of municipal solid waste would be eliminated by the imposition of mandatory deposits.
- Beverage container deposits would result in significant conservation of virgin material and energy resources at a return level of at least 85 to 90 percent.
- The precise effects of a deposit system on beverage prices are difficult to project. However, the experience to date in two States where legislation has been in force for several years indicates that the retail price effects generally appear to fall within a range of plus or minus several percent. Caution should be used in extrapolating from this data.
- Most consumers would experience some inconvenience as a result of a mandatory deposit system.
- A net increase in jobs would occur, although some industries would experience significant dislocations. Both high- and low-skilled jobs would be affected. While some portion of the higher skilled jobs that would be lost appear to be offset by gains in high-skilled jobs in other sectors, the main effect would be an increase in low-skilled jobs to account for the total net employment increase. The dislocation in the job market needs to be addressed in the event of legislation.
- The deposits would reduce the volume of glass and metal in the waste stream, thus simplifying the operation of certain resource recovery facilities, notably combustion-based facilities in which glass can cause significant slagging problems. Similarly, deposits should help to eliminate difficult-to-recycle containers (e.g., bimetals) since

the deposits will induce either recycling of containers or conversion to refillables.

- The benefits of deposits do not appear to decrease disproportionately with a reduction in return rates.
- The experience to date with deposits in two States (Oregon and Vermont) has indicated high levels of both public acceptance and return rates. However, because there has been very little experience in industrial States, the applicability of this experience to a nation-wide deposit system is uncertain.

Committee Recommendations

I. Design Recommendations

If beverage container deposit legislation is adopted, there are a number of ways it could be designed. The Committee endorses the following features for a deposit system, if one is adopted.

1. The deposit should cover beer and carbonated soft drinks in sealed containers, with a discretionary option for the EPA Administrator to include others by regulation (subject to guidelines in the law).
2. The deposit should cover all sealed containers for the designated beverages, regardless of material used, with a discretionary option for the EPA Administrator to include or exclude others by regulation (subject to guidelines in the law).
3. The deposit should be a minimum of five cents, indexed to the Consumer Price Index, in full-cent increments.
4. The deposit should be specified as a uniform minimum deposit on all beverages and containers.
5. The deposit should begin at the distributor wholesaler stage of the distribution system.
6. The effective date of any legislation should be two years from the date of passage.
7. Existing Federal employment impact assistance programs should be examined as a possible means of mitigating the adverse affects of job dislocations directly attributable to the introduction of a beverage container deposit system mandated by the Federal Government.
8. Nonrefunded deposits should not be taxed away or regulated (other than as normal contribution to income). No special tax provisions are necessary. The present tax code is sufficient.
9. The legislation should not ban pull tops.

10. Cartons or carriers should not be regulated.
11. No position is taken on the question of whether State and local deposits should be preempted by Federal law.

One of the members further notes that, although these design features are reasonable, the States should be actively consulted on this subject.

II. Policy Recommendations

Four of the eight members taking a position on national beverage container deposit legislation recommend that it be adopted. Two members recommend against such legislation, two favor postponing consideration of national legislation until there has been more experience at the State level, and one member takes no position.

The four members in favor cite expected savings in materials and energy, as well as reductions in expenditures for solid waste management and litter control. They point out that consumer inconvenience appears to be more than offset by the popular support that has been expressed in a number of public opinion polls. Moreover, a national beverage container deposit program is a resource conservation measure that would impose no significant administrative costs on the Treasury. Two members, noting the job losses that might accompany such a program, make a special point of suggesting either that the program be implemented gradually or that the Federal Government give assistance to mitigate any adverse effects on labor.

Two members recommend against beverage container deposit legislation, noting that the costs would likely outweigh the benefits. One of those members further observes that consumers currently have the opportunity to choose returnable containers and suggests that they could retain that choice without a mandatory deposit system. This member believes that the data generated by different sources interested in this issue, such as that regarding public support and energy usage, are unpersuasive. For example, a number of States in recent years have defeated deposit referenda.

Two members favor postponing consideration of mandatory national beverage container deposit legislation until the State programs in Michigan, Connecticut, and Iowa have been fully implemented and more empirical evidence on the effectiveness of State programs is available. Currently, information is available from only two States — Oregon and Vermont. One of these members further recommends that individual States give full and fair consideration to the enactment of State beverage container deposit legislation, based on an assessment of the benefits and costs in their areas. The member notes that different legislation in different States probably would not impose undue hardship on the beverage industry.

The final member takes no position on the issue, recognizing the arguments in favor but noting that sufficient attention has not been paid to the private inconvenience which would result from such legislation.

Deposits and Bounties on Durable and Hazardous Goods

Committee Findings

The Resource Conservation Committee concluded the following with respect to deposit and bounty systems for consumer durables and hazardous goods:

- Deposits and bounties could be effective in
 - achieving source-separated delivery of discarded durable and hazardous goods to specific points;
 - reducing improper disposal;
 - reducing uncontrolled dumping.
- The extent of the problem of littering and improper disposal of durable and hazardous goods is unclear.
- Hazardous materials appear to be the most likely candidates for this approach in the future.

Committee Recommendations

Because the Committee has not studied any specific applications of deposits or bounties for durable or hazardous goods, none of the members is prepared to recommend that the Federal Government apply either of these tools to specific products. Nevertheless, most of the members endorse the concept as potentially useful. Several members express special interest in using these tools for hazardous products, and one member endorses the general concept, while expressing reservations about mandatory national programs. All the members join in recommending further research on the subject.

National Litter Tax

Committee Findings

(Findings on the national litter tax relate only to litter taxes as they might be used to raise revenue and to provide incentives against littering; they do not address funding of litter control programs.)

- A broad-based litter tax is an effective means of raising revenue to fund litter collection and abatement programs but is generally regressive and may be inflationary.
- At the national level, the income tax provides a more equitable means of revenue raising.
- A litter tax provides no incentive for either cleaning up litter or reducing the rate of litter generation.
- Unless the tax is extremely high, and thus unrelated to the cost of litter control, it would have no effect on resource conservation.
- A litter tax is generally inconsistent with the “polluter-pays” principle.
- Without prejudging the merits of a beverage container deposit system, a litter tax is not an effective substitute for a beverage container deposit system.

Committee Recommendations

The Committee unanimously recommends against national litter tax legislation, having found that a litter tax would not provide any incentive to clean up litter or reduce the rate of litter generation, and that a litter tax is not an effective substitute for a beverage container deposit system. One member further asserts that litter should be considered a State problem and not a Federal problem. Because the subject of litter has not been well analyzed at the national level, two members also recommend further study of the litter problem.

Local User Fees

Committee Findings

Based on a review of the theoretical basis supporting local user fees to finance collection and disposal of municipal solid waste and the studies of actual experience to date, the Resource Conservation Committee has concluded:

- Quantity-based local user fees have the potential to stimulate a reduction in the quantity of waste put out for collection and disposal by individuals and to increase the amount of waste material separated and recovered.
- There is some empirical evidence that quantity-based local user fees can cause reductions in the generation of municipal solid waste.
- Administrative costs of existing local user fee systems are generally low.
- Local user fees which vary based on services provided offer a means of payment for waste collection and disposal that is more consistent with the polluter-pays principle than are the predominantly used flat-fee and local-tax-financed systems.
- Federal tax and revenue-sharing policies discourage the adoption of local user fees by encouraging localities to use taxes rather than user fees to finance municipal solid waste collection and disposal.

Committee Recommendations

The Committee unanimously endorses the concept of local user fees for solid waste management. By “local user fees,” the Committee means variable fees that change according to the quantity of waste put out for collection. (In addition, such fees can also vary according to the frequency of service and other major determinants of the actual costs of collection and disposal.) The Committee’s endorsement is based on evidence that variable fees may encourage more economical use of solid waste management services.

The Committee also unanimously recommends additional study of Federal policies that inhibit local user fees, including the non-deductibility of fees for Federal personal income tax purposes and the current exclusion of user fees from the local tax base calculation used for Federal revenue sharing. Nevertheless, the Committee has decided not to recommend precisely how these disincentives should be removed because the options for removing them and the implications of those options have not been studied in sufficient detail.

Finally, although the Committee members agree that the present state of knowledge makes it premature to create positive incentives for local governments to adopt user fees for solid waste management, they unanimously recommend that the Federal government provide localities with information and/or technical assistance on local user fees.

Some members of the Committee suggest stronger Federal action. One member recommends not only that Federal disincentives should be studied but also that the Committee should go ahead now and recommend ending them. Two other members recommend further studies that would include demonstration programs involving, among other things, source separation of materials for resource recovery in conjunction with variable fees.

National Solid Waste Disposal Charge

Committee Findings

Based on the staff's analysis of the national solid waste disposal charge (a Federal excise tax on consumer products and packaging designed to reflect their contribution to local community solid waste management costs), the Resource Conservation Committee found:

- There is a theoretical justification for internalizing municipal solid waste management costs.
- The analysis of the likely effects of a disposal charge based on national average marginal costs for municipal solid waste management indicates that the net economic benefits and impact on materials flows would be low in practice.
- There is no definitive evidence that the failure to include the cost of disposal in the price of materials which enter the municipal solid waste stream has a measurable effect on consumption of virgin materials.
- Data on which the analysis is based, particularly price elasticities and marginal cost of municipal solid waste, are highly uncertain.
- The variability of municipal solid waste costs between communities significantly reduces the potential benefits of a uniform national charge.
- The design of a disposal charge which could achieve the theoretical objectives would be complex in practice.

Committee Recommendations

None of the members of the Committee recommend legislation at this time to institute a national solid waste disposal charge. Members cite the low projected impact on materials use, recycling, and disposal; the complex administrative problems that would be involved; the difficulty of designing a charge that would achieve the theoretical objectives; and the inefficiencies that might result from its application at the national level.

Although none of the members is in favor of legislation at this time, a few indicate that the uncertainties in the empirical analysis make it imprudent to recommend entirely against the general concept of a national disposal charge. These members note that the basic concept of including disposal costs in decisions on use of materials is consistent with achieving a better balance between conservation and other social goals. Even though they agree that the current analyses show only small gains in resource conservation from imposing a charge, they feel that the uncertainty in the data and the possibility that conditions could change make it desirable to "leave the door open" to reconsideration of the proposal at a later date.



CHOICES FOR CONSERVATION

A wide variety of choices to consume or conserve material resources are made every day. These choices are made by people throughout our economy:

- **Individuals** purchase and use an enormous array of products in many types of packaging. When they have finished using them, a small fraction is set aside for reuse or recycling; most is simply discarded as waste. Although individuals do have opportunities to change this pattern — through selective buying, reuse, and increased recycling — these opportunities are generally limited and there is little incentive to take advantage of them.
- **Private companies** decide what combinations and quantities of materials will go into their products and packaging and what to do with the scrap materials left over from the manufacturing process. Relative prices and customer preferences generally dictate these choices.
- **Local government** officials decide what to do with municipal solid waste: whether materials and energy will be recovered from it and how residents of their community will pay the bill for waste management. Local tax and land use policies are often major determinants in these choices.
- **Federal** officials make decisions about taxes, trade policies, subsidies, and regulations which broadly affect the choices by individuals, private companies, and local government officials to produce, consume, recycle, and dispose of materials. The full range of national goals and objectives enter into these decisions, and tradeoffs must be made among conflicting objectives.

This is a report about 10 existing or proposed Federal policies that might affect these various choices to consume or conserve.

The material resources considered in this report consist primarily of non-fuel minerals (such as iron and aluminum) and forest products. We cannot avoid choices to consume or conserve these resources at any decision-making level. "Business as usual" itself implies choices. Whether by design or not,

often without regard for the full costs to the public, the choices have been to use more (and reclaim fewer) resources.

Many of these choices may have served us well when our “Land of Plenty” was undeveloped, and they may still be appropriate (or unavoidable) in light of our varied and often conflicting national goals. But awareness of problems resulting from this pattern led the Congress in 1976 to pass the Resource Conservation and Recovery Act (RCRA). Among other things, this Act created the Resource Conservation Committee to study “all aspects of the economic, social, and environmental consequences of resource conservation” and, in particular, the Federal policies affecting choices for resource consumption and conservation.

Although we will probably face temporary shortages of certain industrial raw materials from time to time, we do not appear to be in serious danger of soon exhausting or being unable to obtain the major mineral and timber resources which form the basis of our economy and lifestyle. However, we do not have cause for complacency about the rate at which we consume our natural endowment.

The price we pay for resource consumption cannot be easily quantified, but it is high and promises to become higher, possibly foreclosing some options for resource use in future generations. This price includes not only direct extraction and manufacturing costs, but also present and future environmental damages and costs of waste treatment and disposal that often have been neglected. For example:

- Mineral extraction disturbs the land. Even where the land can be reclaimed, the cost may be high.
- As lower grade, more inaccessible ores are mined, mining waste and energy usage typically increase. If technology does not improve rapidly enough, total extraction costs will increase as well.
- A growing percentage of the raw materials we use are imported, contributing to deficits in our balance of trade and in some instances raising questions about national security interests.
- Despite environmental controls and standards for many pollutants, the increased extraction, processing and disposal of materials inevitably leads to more environmental contamination from pollutants as yet unregulated or even unidentified, as well as from those presently controlled.
- The national bill for municipal solid waste management is presently about \$6 billion annually, and much disposal is not yet environmentally acceptable. These costs will rise in the future as disposal requirements become more stringent, present disposal sites are exhausted, and more expensive alternatives must be used.

Portions of these costs might be avoided by making conscious choices for conservation. But what, specifically, is conservation?

As President Taft once said, “There are a great number of people in favor of conservation no matter what it means.” Not surprisingly, what the “great number of people” mean or do not mean by the term “resource conservation” has a great deal to do with how they view policies for achieving it. Many popular definitions of resource conservation vaguely emphasize the “intelligent use” of resources in the “public interest,” but because they are so vague they are of little use as guides to policy. Other definitions are internally inconsistent or openly in conflict with one another. Some are simply synonymous with economic efficiency in the use of resources.

Reduced to basics, resource conservation simply means consuming less virgin natural resources than we otherwise would.

Conservation can occur at any or all stages in the life cycle of a material: less total extraction; more complete use of what is extracted (less processing waste); longer lived products and multiple use of materials before disposal (more reuse, recycling, or conversion into energy); and, in the case of renewable resources such as timber, more replanting and improved husbandry of the land. Consuming less of a material also means that less of it will ultimately have to be handled as waste.

The definition of resource conservation in the Resource Conservation and Recovery Act includes many of these elements explicitly:

The term ‘resource conservation’ means reduction of the amounts of solid waste that are generated, reduction of overall resource consumption, and utilization of recovered resources . . . [which are defined as] material or energy recovered from solid waste. — RCRA, Section 1004(21) and (20)

Defined in this way, the term resource conservation makes no assumptions about or distinctions between materials, methods, motives, values, or ultimate effects on the economy or society at large. Instead, it serves as a point of departure for evaluating existing and proposed policy choices.

The succeeding chapters of this report describe why there is currently a renewed interest in resource conservation, some of the policy choices for conservation that can be made at the Federal level, and the likely effects these choices would have on choices at the individual, corporate, and local government levels.

Chapter 2, “Material Conservation Issues,” outlines in further detail the problems of natural resource use that the policies studied by the Resource Conservation Committee are intended to address. Chapter 3, “Resource Conservation: Historical Context and Perspectives,” describes other efforts

to evaluate resource problems and policies and presents the framework of the Committee's policy analysis.

Chapters 4 through 7 focus on Federal policy choices. There are many policies that the Committee could have studied. Working from its legislative mandate and public comment on its draft plans, the Committee chose 10 policies on which to concentrate. Each of them would affect materials throughout their life cycles — from extraction, to use, to recycling and, finally, to disposal. For purposes of discussion in this report, however, the policies have been grouped in four sets according to the phases of the materials life cycle they would affect most directly.

- “Tax Policies Affecting the Extraction Industries” (Chapter 4): The effects of several existing Federal tax subsidy policies on the production of virgin materials and a possible extraction tax for virgin raw materials.
- “Resource Recovery Policies” (Chapter 5): Present and proposed subsidies for resource recovery, railroad freight rates regulated by the Interstate Commerce Commission for secondary materials, and product regulations as a possible strategy for resource conservation.
- “Product Use and Disposal Policies” (Chapter 6): Proposed mandatory beverage container deposits, possible deposits and bounties on durable and hazardous consumer goods, and proposed national litter taxes.
- “Pricing Policies for Municipal Solid Waste” (Chapter 7): Local user fees for solid waste management based on quantities of waste discarded, and the proposed national solid waste disposal charge.

The Committee has studied these policies in various degrees of detail, and in each case has concluded with a series of findings and recommendations. In several cases members of the Committee have recommended additional study, believing that although the present state of knowledge and analysis does not indicate a recommendation at this time, a desirable policy choice may become clear upon further examination.



MATERIAL CONSERVATION ISSUES

For generations, economic development in the United States has brought about a continually expanding standard of living for a rapidly increasing population. It has also meant increasingly intense demands on natural resources for industrial raw materials, as well as energy, food, water supplies, and recreation.

In the Resource Conservation and Recovery Act, Congress recognized several important implications of the long-term increase in the economy's use of materials, including:

- problems of industrial pollution and environmental degradation;
- community problems of solid waste management;
- the availability, cost, and efficient use of material resources;
- energy supply and consumption;
- international trade, dependency, and security;
- the material welfare of future generations.

As background for the discussion of policies affecting these problems, this chapter first reviews recent trends in our use of material resources and then summarizes available data and prominent viewpoints relating to the major concerns.

Patterns and Trends in Material Use

Unlike earlier Federal commissions assigned to study U.S. natural resource issues, the Resource Conservation Committee did not undertake an extensive analysis of resource availabilities or future raw material supply and demand. Instead, we have relied primarily on the work already completed in these areas and on available statistical data provided by the U. S. Departments of Interior, Commerce, Agriculture, and Energy. The only exception was in the estimation of post-consumer solid waste and resource recovery, for which the

Committee sponsored a study to extend and update the Environmental Protection Agency's material flow estimates.¹

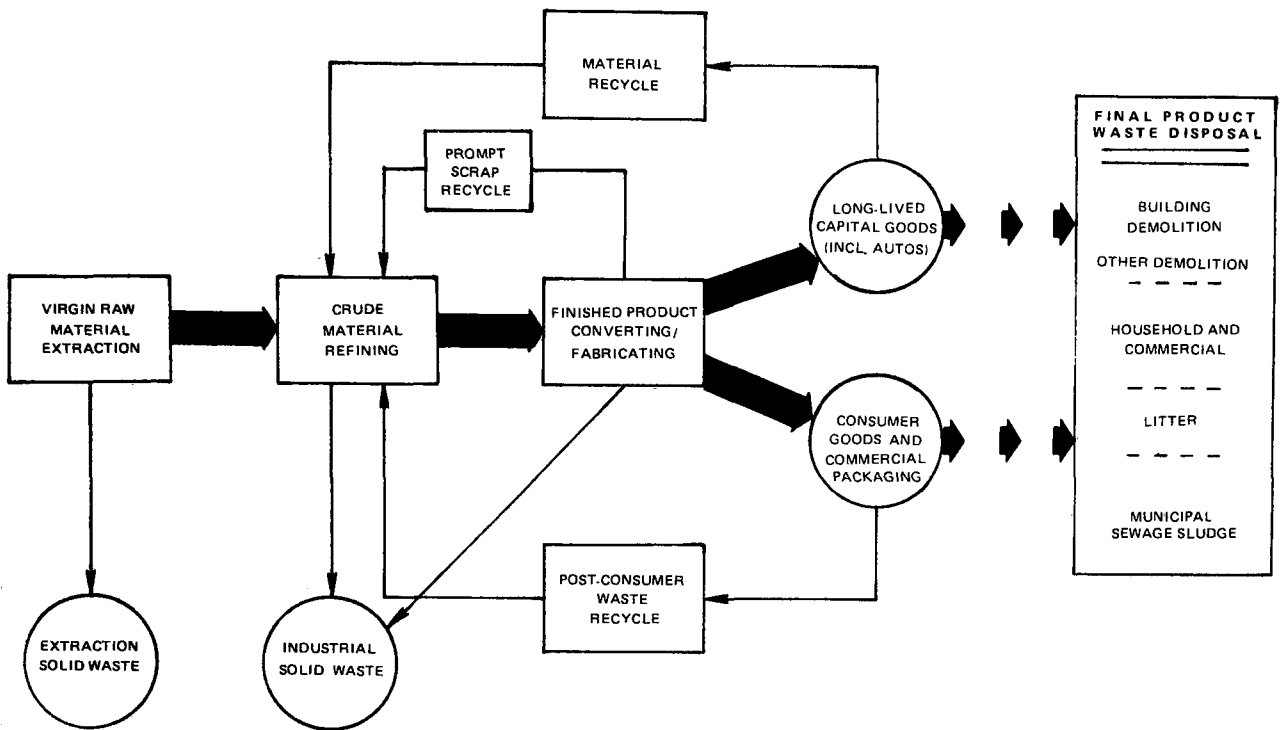
The General Pattern of Material Use

Figure 1 provides a general picture of the flow of materials in the national economy. In brief, the main components of the system include:

- **Extraction.** Virgin raw materials enter the economic system through the mining, forestry, agriculture, and fishing industries. Several billion tons per year are involved, of which the major part is stone, sand, gravel, clays, and other non-metallic minerals. Although difficult to define and estimate, solid waste generation by these industries (including mine tailings and spoils, forest residues, and crop residues) is probably about 2 to 3 billion tons per year.
- **Material refining.** Most crude material goes through one or more stages of purification, chemical refinement, physical forming, or cleaning on the way to becoming a "finished" raw material (steel from iron ore, lumber from saw logs, wood pulp from pulpwood). These include the heavy processing stages for most materials, generating very large volumes of liquid, gaseous, and solid wastes that are often among the most harmful to the environment and the most difficult to control. These are also among the most energy intensive sectors. Increasingly, efforts have been directed to produce byproduct raw materials (from such wastes as slags, sawdust, pulping liquors) and to reclaim and recycle processing chemicals and other materials within the plant.
- **Finished product converting, fabricating, assembling.** Including semi-finished and final product manufacturing and the construction industries, this sector currently uses over 2.5 billion tons of raw materials annually to produce the economy's output of finished capital and consumer goods.² For the most part, these represent "lighter" industries, usually with much lower volumes of waste relative to finished product, than the crude material refining and processing industries.

In certain of these industries, particularly the metal working and paper product converting industries, a very large percentage (possibly over 90 percent) of the scrap waste generated is recycled as so-called "prompt" or "new industrial" scrap. Recent estimates place scrap metal recycling from this sector at over 20 million tons, and paper and paperboard converting scrap recycling at over 5 million tons per year.³

Figure 1: MATERIAL FLOWS IN THE NATIONAL ECONOMY



Source: Resource Conservation Committee Staff

- Final “consumption”.** Households, business firms, and government agencies are all purchasers of final products. In physical terms, by far the greatest volumes of final products are in the form of long-lived capital goods: industrial plant and equipment, transportation systems (highways, railways, bridges) and equipment, military requirements, homes, and office buildings. There is very little accurate or comprehensive data on average lifetimes and ultimate disposition of capital goods. As a practical matter, some last “forever” (monuments, shrines) and a great many are simply abandoned to decay. Most are eventually subject to demolition, either for systematic salvaging of valuable materials or to clear space for new construction or equipment. Current estimates of “old scrap” consumption indicate that about 26 million tons of metals (over 90 percent ferrous) are recovered from salvaging capital goods, including junked autos and other transportation equipment, railroad rails, and other structures and equipment.⁴

Durable and nondurable household consumer goods, office supplies, and packaging materials together currently account for about 115 million tons of the economy’s final product, non-food output.

Correspondingly, in 1978 household, commercial, and government office activities together generated about 100 million tons of post-consumer product solid waste, of which about 11 million tons is currently recovered for material recycling and another small fraction burned for energy recovery.⁵

In addition to the material flow system there is a similar and related energy flow system, supplying direct (fuel) and indirect (electrical) energy for heat, light, and power for all the sectors of the economy. In 1978, the U. S. economy consumed as energy sources 618 million tons of coal, 1,120 million tons of petroleum, and 434 million tons of natural gas. All of this fossil fuel material, together with the air combined in combustion, became waste in the form of fly and bottom ash, air-borne particulates, and gaseous emissions from industrial and powerplant boilers, homes and office buildings, and from auto, truck, and other transportation uses. In addition, the total energy value of this fuel — almost 72 quadrillion Btu's in 1978 — ultimately resulted in the generation of waste heat, after performing its useful energy functions. Of the total primary energy consumed, about 36 percent is currently used in the industrial sectors, 38 percent for residential and commercial heat and light, and 26 percent for transportation in all forms.⁶

In summary, virgin raw materials and fuels enter the economy through the extractive industries. Some of the material is accumulated in the economy in the form of long-lived durable goods and as an inventory of periodically recycled scrap materials. Aside from these stock accumulations, most of the original raw material leaves the economic system in the form of solid, liquid, and gaseous waste which is disposed of into the land, water, and atmosphere.

Historical Trends

The United States has been noted for its high rate of economic growth over the two centuries of our existence as a nation. To a large extent, this growth has been sustained by the continuous availability of extensive natural resources of high quality.

Table 1 compares U.S. consumption of major raw materials and fuels in 1978 and 1948, together with figures on gross national product and population. Figures 2 through 4 picture more detailed trends in decade-to-decade growth rates for selected material categories over the past 30 years and illustrate changes in material consumption relative to economic activity and population.

Several trends are evident from this data.

1. **The economy consumed several times as much material in 1978 as in 1948.** In absolute terms, the tonnage of raw materials consumed increased by several hundred million tons, mainly in building materi-

als, other non-fuel minerals, and forest products. All major material categories showed increases of from about 50 to several hundred percent, with especially high percentage growth in aluminum and plastics. Fossil fuel consumption, led by natural gas and petroleum, also increased substantially. Real GNP grew by 184 percent and population by almost 50 percent in this 30-year period.

Table 1

**U.S. CONSUMPTION OF MAJOR RAW MATERIALS AND FUELS
1948 and 1978**

	Quantities Consumed Per Year (Millions of tons except as noted)		Percent Growth 1948 to 1978
	1948	1978	
Ferrous metals	63	115	83
Aluminum	0.8	6.0	650
Copper, lead and zinc	3.4	5.0	47
Building materials ¹	580	2,021	248
Other non-fuel minerals ²	32	107	235
Forest products			
Lumber, plywood and veneer ³	6,000	8,700	45
Pulp, from roundwood	15	31	103
Plastic resins	0.7	18.8	2,420
Coal	531	618	16
Petroleum ⁴	2.1	6.8	224
Natural gas ⁵	4.9	19.4	293
Gross National Product (billions of 1972 dollars)	488	1,385	184
Population (millions)	147	218	49

¹ Sand and gravel, crushed stone, and cement.

² Phosphate rock, lime and salt.

³ Expressed in millions of cubic feet of roundwood needed to supply actual output.

⁴ Expressed in billions of barrels.

⁵ Expressed in trillions of cubic feet.

Source: Resource Conservation Committee Staff, based on *Mineral Commodity Summaries* 1979 and *Minerals Yearbooks* of 1948, 1958 and 1968, Bureau of Mines, U.S. Department of Interior; *The Demand and Price Situation for Forest Products, 1976-77*, Forest Service, U.S. Department of Agriculture; *Monthly Energy Review*, March 1979, Energy Information Administration, U.S. Department of Energy; *Facts and Figures of the Plastics Industry*, 1978, and personal communications from the Society of the Plastics Industries.

Figure 2: GROWTH RATES IN U.S. RAW MATERIAL CONSUMPTION DECLINED DURING THE PAST DECADE

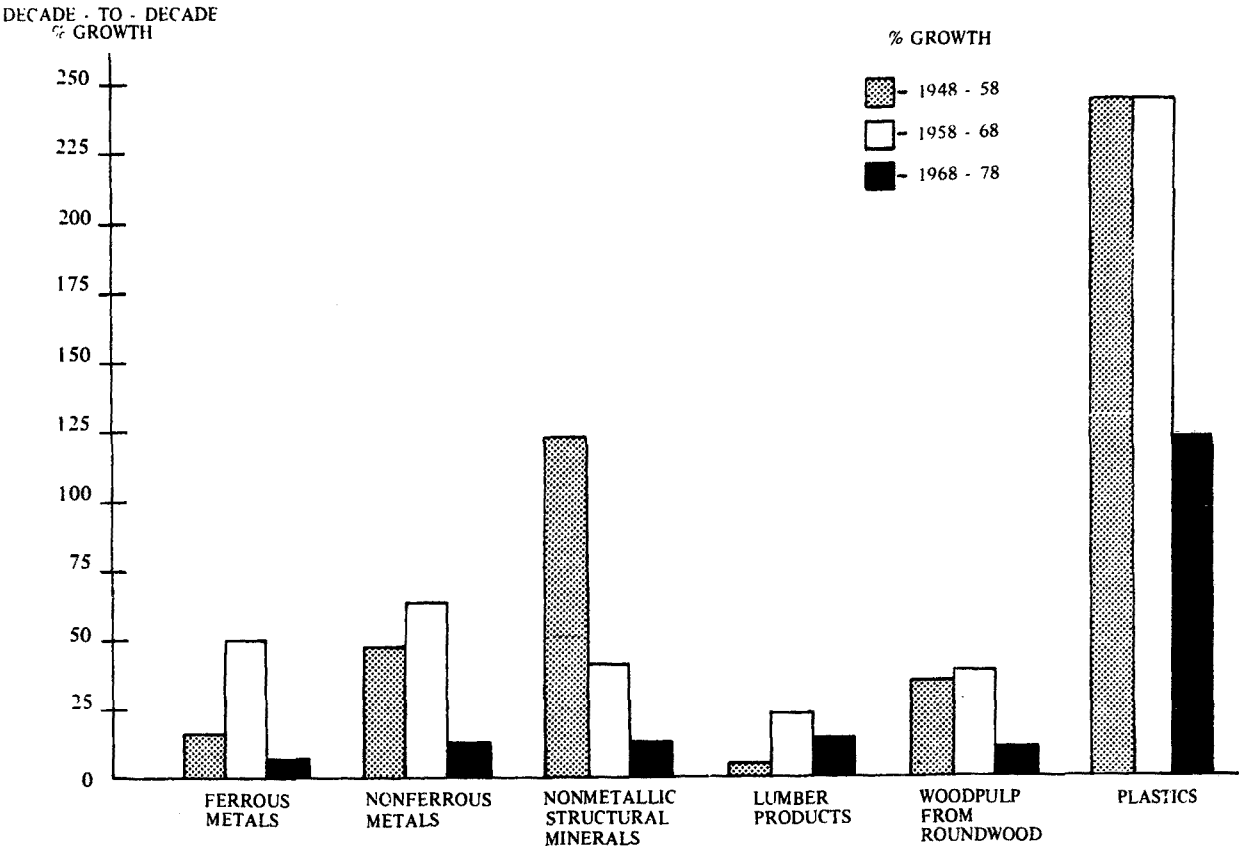
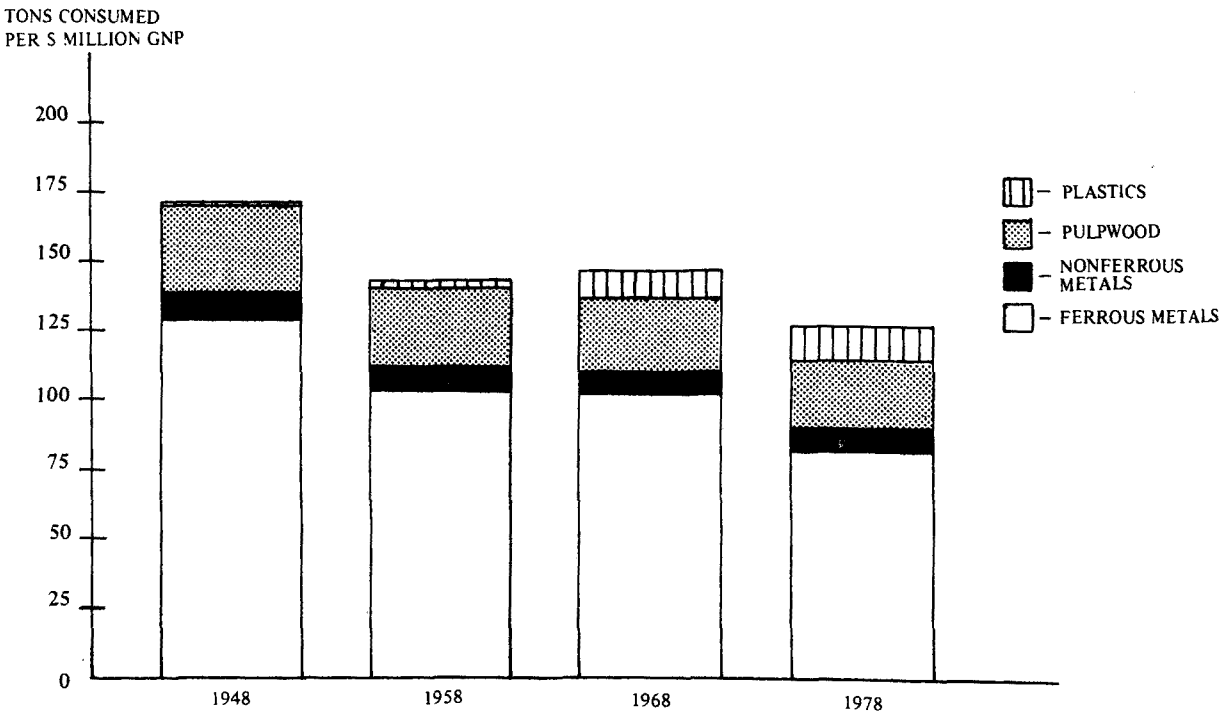
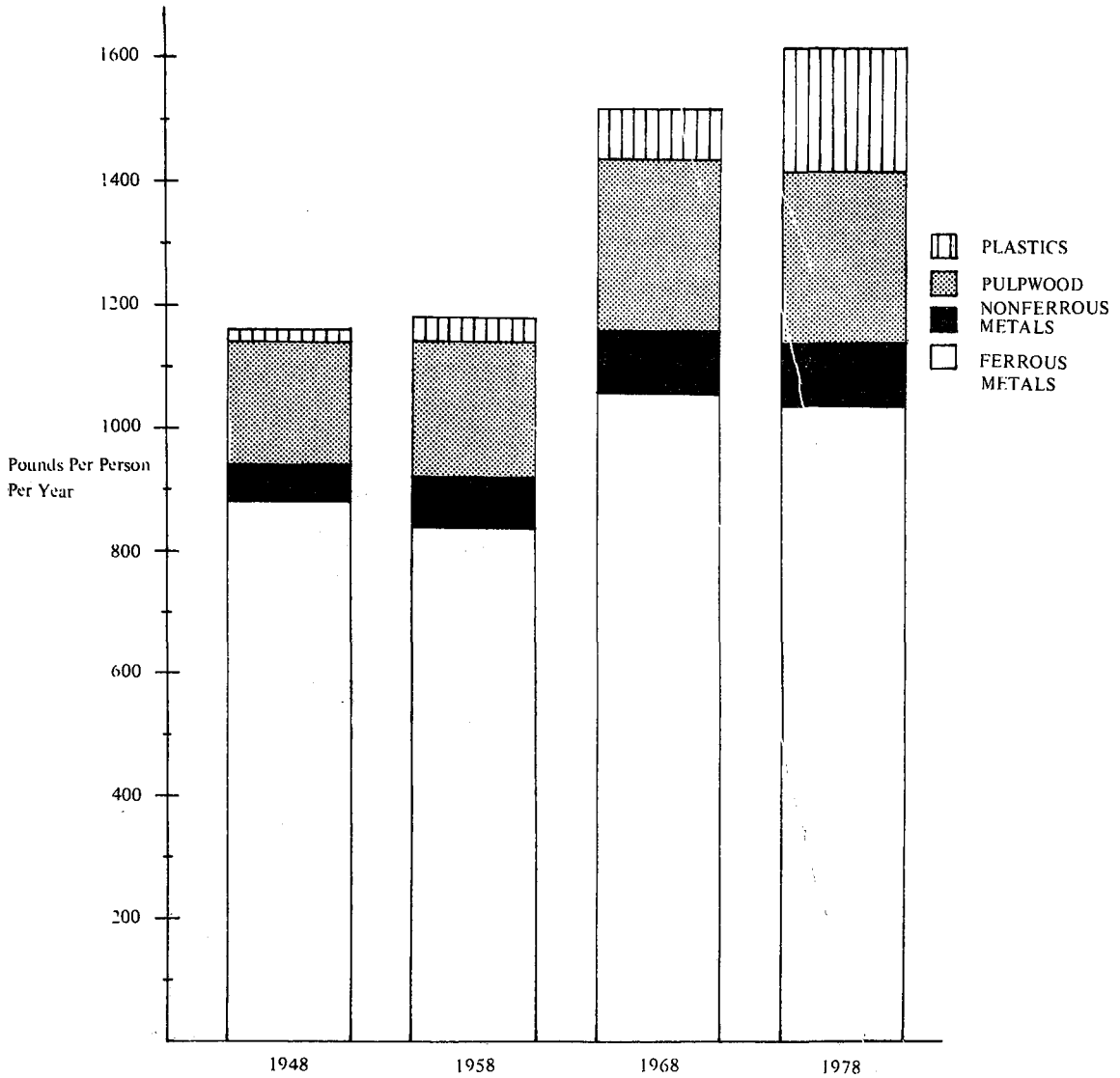


Figure 3: MATERIAL CONSUMPTION PER DOLLAR OF GNP HAS BEEN DECLINING IN RECENT YEARS



Source: Resource Conservation Committee Staff (Reference Tables at the end of Chapter 2).

Figure 4: GROWTH IN METALS AND WOOD PRODUCTS CONSUMED PER CAPITA HAS LEVELLED OFF IN RECENT YEARS



2. **Growth rates have slowed significantly in the past decade (1968–78).** The economy as a whole, measured by constant dollar GNP, grew substantially more slowly over the past decade (2.8 percent per year) than in either of the previous two decades (4.1 percent per year in 1958–68 and 3.7 percent per year during 1948–58). Population showed a continuous decrease in decade-to-decade growth rate over the period. All the major raw material groups showed substantially slower percentage growth rates during 1968–78, even though many categories had experienced increased growth rates in 1958–68 over the preceding decade (Figure 2).*

Nevertheless, in absolute terms, tonnage increments remain high, even at slower percentage growth rates, because of the high base levels achieved during the 1960's and early 1970's.

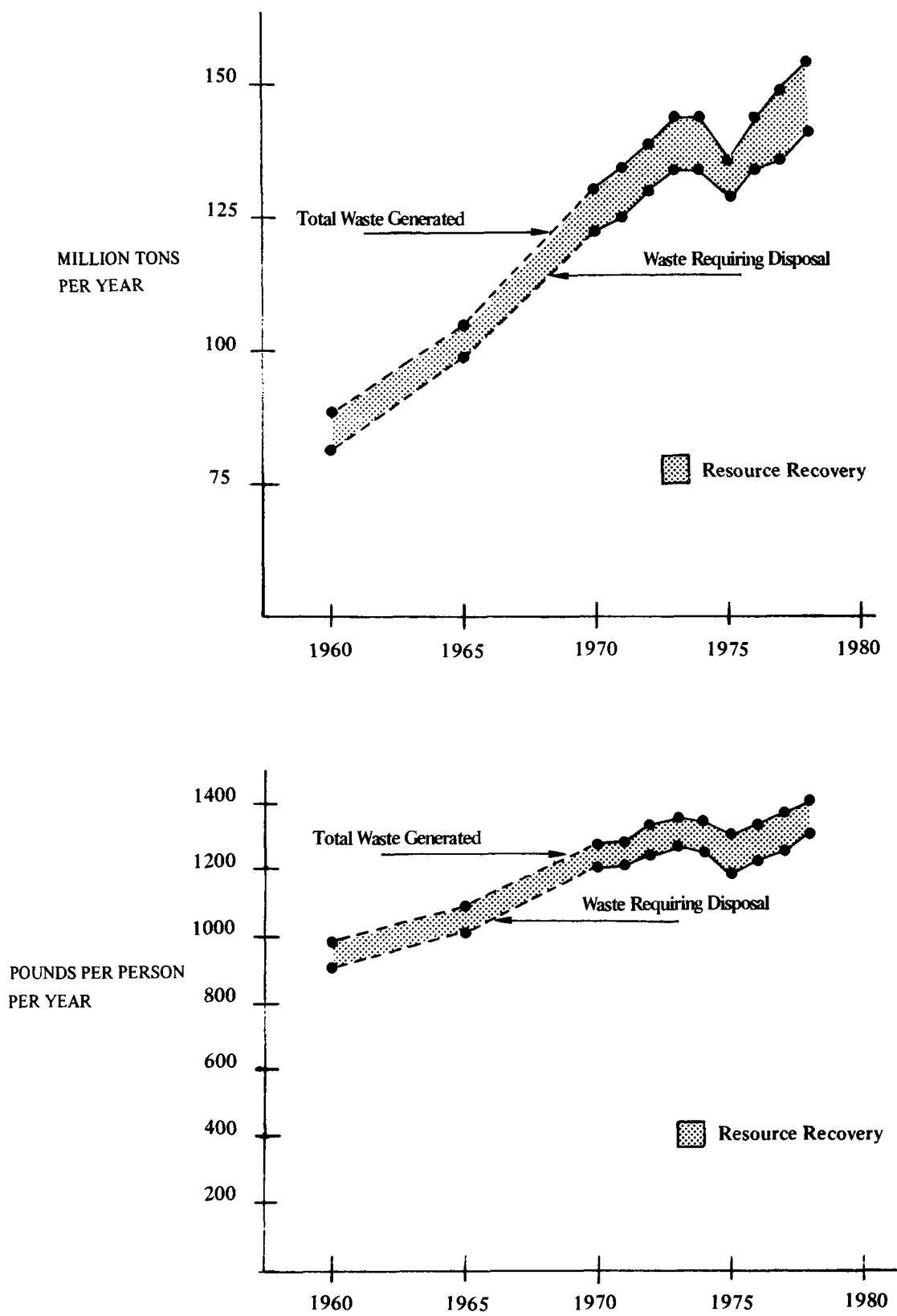
*For more detailed figures, pertaining to this and other conclusions, see statistical reference tables 3 and 4 at end of this Chapter.

3. **Material consumption is increasing more slowly than GNP.** As reflected in Figure 3, there has been a continued decrease in the quantity of materials consumed per dollar of "real" GNP (after adjustment to eliminate the effects of inflation). This is true for most categories of raw materials over the entire 30-year period, and for all major categories during the most recent decade, with the notable exception of plastics. Among the fossil fuels, only petroleum continued to increase relative to GNP during the past decade.
4. **Per capita consumption of most materials in the U.S. was almost stable between 1968 and 1978.** Although per capita consumption increased substantially between 1948 and 1968 for almost all industrial raw materials and for the fossil fuels except coal, the most recent decade experienced:
 - a slight decrease in per capita consumption of the high volume metals other than aluminum;
 - only small increases (2 to 8 percent) in per capita use of non-metallic (non-fuel) minerals;
 - virtually no change in forest products, per capita;
 - a continued steep increase (100 percent) in per capita consumption of plastics;
 - substantial increases for petroleum (30.4 percent) and coal (13.8 percent), but a decrease in natural gas (8.4 percent) per capita.

Figure 5 provides a summary view of post-consumer residential and commercial solid waste generation and disposal for the period from 1960 to 1978. It reflects an overall trend similar to that shown for aggregate material consumption. Total and per capita growth in municipal solid waste has slowed substantially in the past 5 years, contrasted with the previous rapid growth in the 1960's and early 1970's.

It is not clear whether material consumption relative to GNP and per capita growth rate will continue to decrease, stabilize at present levels, or return to the experience of the 1950's and 1960's. If the present low growth in material consumption relative to population size and overall economic activity continues, or decreases even further, it represents a major shift in the long-term economic history of the nation.

Figure 5: POST—CONSUMER SOLID WASTE GENERATION GREW RAPIDLY BETWEEN 1960- 1973, BUT HAS LEVELLED OFF SINCE 1973



Adequacy of Material Supplies and Related Issues

The question that is invariably raised following a discussion of trends in resource use is “Do we have adequate supplies?” The answer to this question is central to any discussion of resource conservation.

There have been many excellent studies on the adequacy of material supplies performed in recent years.⁷ The Committee reviewed several of these studies and used them as a starting point in its own policy analysis. In addition, the final report of the National Commission on Supplies and Shortages (NCSS), *Government and the Nation's Resources*, contains an excellent summary of the issues and analysis.

Several major conclusions can be drawn from the literature on the adequacy of future supplies. Most importantly, it is clear that there is no determinable amount of any given raw material that can be considered the minimum “adequate” supply. Given enough time, we can fill most material needs or functions by a variety of different raw materials; very few, if any, individual materials can be considered absolutely essential over the medium to long-term time frame.

Consequently, supplies of materials can be considered adequate if the price and availability of individual materials do not change too rapidly and if materials in general continue to be available at prices that do not rise faster than our overall inflation rate. Our situation with respect to material supplies may be summarized as follows:

1. While it appears that (in the words of the NCSS) “no physical lack of resources will seriously strain our economic growth for the next quarter century and probably for generations thereafter,”⁸ there are potential problems concerning our domestic resource base.
2. The country's dependence on certain imported resources seriously affects our balance of payments and can result in short-run economic disruptions when imported supplies of some materials fall below critical levels.
3. The United States may not be using its material resources most efficiently because of anomalies in the pricing system and policies mandated by the government. If this is so, we are wasting not only the resources themselves, but also the capital and labor required to produce them.
4. The production and use of materials, however plentiful or scarce, requires the production (or importation) expenditure of valuable energy resources.
5. There is a philosophical issue relating to “intergenerational equity” in the use and endowment of natural resources. Closely

related to this issue is the debate between those favoring the ethics of a “conserving” as opposed to a “consuming” society.

These issues are developed more fully in the following paragraphs.

Resource Availability

Concern about resource scarcity in a finite world is as old as humankind. Civilizations have been made rich, laid low, and have fought wars over access to natural resources. Depletion of resources has spurred vast social changes. For example, the depletion of forests was one of the important contributing causes bringing about the Industrial Revolution in England. Immigration from resource-poor lands to the “land of plenty” is part of the American folklore, as are the deserted mining towns of the West. Today gasoline shortages disrupt our way of life. At the philosophical level, the works of the 19th century English economists Thomas Malthus, David Ricardo, and John Stuart Mill, the American Conservationists of the early 20th century, and the Club of Rome of the 1970’s have continually made people aware of our dependence on material resources and the possibilities of eventual exhaustion of finite reserves.

There has always been debate over future availability of world resources. One point of view, which was expounded by Malthus and recently dramatized by the Club of Rome in *Limits to Growth* (1974), stresses that the exponential growth in population and income, coupled with the finite nature of land, mineral resources, and the earth’s capacity to assimilate pollution, could lead to resource exhaustion and economic stagnation within 100 years if current resource consumption and pollution trends continue.

There is another point of view which is more optimistic. It stresses that the price mechanism adjusts for changes in supply and demand, that new resources are constantly being discovered, that new technology is constantly being developed to extract minerals from lower grade ores, and that new ways of reusing material, using less material, or substituting abundant materials for scarce ones are always being found. Today, for example, we derive copper from ore that has one-tenth the copper concentration that was economical to process in 1900. Our “known reserves” (deposits considered economically viable) of iron increased over twelvefold in the period from 1950 to 1970, mainly due to improved mining and processing techniques. Miniaturized electronic instruments require a fraction of the materials needed by their predecessors. Over one-quarter of all aluminum beverage cans are now being recycled.

Barnett and Morse, in their landmark study, *Scarcity and Growth: Economics of Natural Resources Availability* (1963), and, more recently, Robert Manthey, *Natural Resource Commodities – A Century of Statistics*

(1978), provided evidence that in real terms (i.e., adjusted for inflation), labor and capital costs of mineral extraction have for the most part been either holding steady or declining since the 1870's. This suggests that, relative to our capabilities for extracting and processing them, many of these materials have been increasing in "availability." However, the costs examined did not include the environmental costs of extraction and use, which are discussed later in this chapter.

Figure 6 illustrates, on a worldwide scale, the relationship between known reserves and annual consumption for a number of important metals. It illustrates that, even from the standpoint of physical availability alone and without major economic substitutions or new discoveries, there are considerable resource supplies available under current technology and economics for several of the most important industrial raw materials. Figure 7 shows the relationship for the same metals between ultimate recoverable resources (what geologists **predict** will be available eventually) and current known reserves (circa 1972) for both the U.S. and the world. These multiples indicate further that many of the key materials should continue to be in abundant supply for generations to come.

In contrast to the oil situation, it does not appear that critical long-term materials shortages will develop within the next generation or, in most cases, in the foreseeable future. This was essentially the conclusion of both the National Commission on Supplies and Shortages and of the National Commission on Materials Policy. While the contrast with oil supplies and the lack of an immediate crisis may seem heartening, there are nevertheless potential problems associated with high rates of consumption of raw material resources.

Import Dependence

Although the United States has but 6 percent of the world's population and land area, it accounts for 30 percent of annual world resource consumption. Because minerals are unevenly distributed in the earth's crust, we import many of the materials needed to support our industrial society. Although by comparison with other industrialized countries we enjoy a fairly high degree of self-sufficiency, we have been a net importer of several materials for many years. (Table 5 at the end of this chapter presents data on net imports and exports relative to our total consumption of materials.)

Import dependence is **unavoidable** if the United States contains no reserves of a material. In other cases it may be **economically preferable** if U.S. resources are more expensive than imported foreign raw materials. In almost all cases, import dependence can be avoided, at a price, over the long run because most products could be made of different materials.

Figure 6: WORLDWIDE, KNOWN RESERVES OF MANY KEY MINERALS ARE SUBSTANTIAL

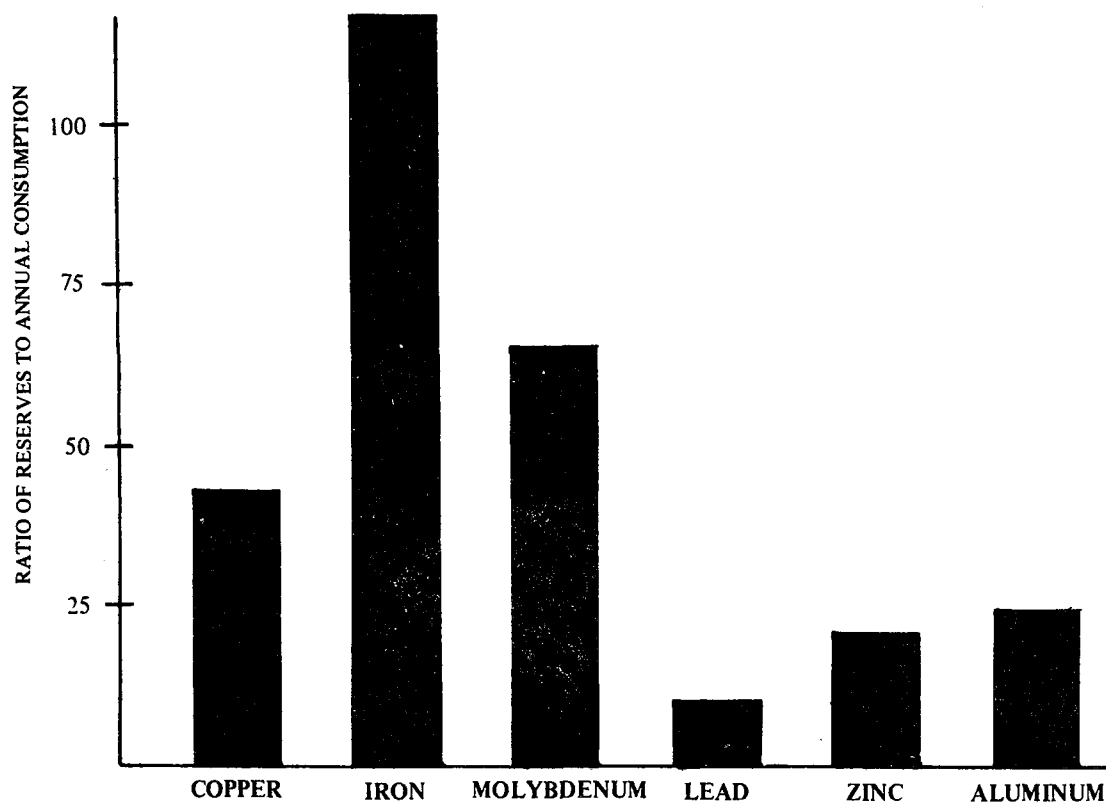
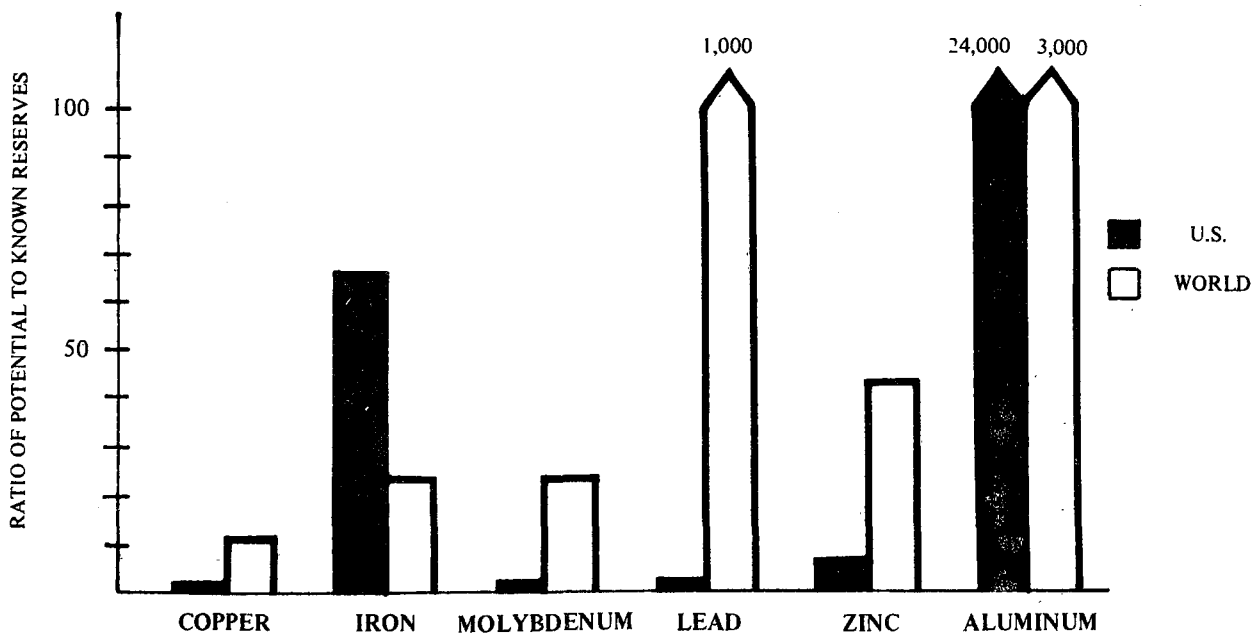


Figure 7: POTENTIAL RESERVES ARE BELIEVED TO GREATLY EXCEED KNOWN RESERVES OF MANY KEY MINERALS



Source: Resource Conservation Committee Staff, based on United States Mineral Resources (U.S. Geological Survey Professional Paper 820), 1973.

However, in the short run manufacturing flexibility is much more limited, and a severe economic penalty could result from an inability to obtain even a relatively few “essential” materials, for example, steel alloying metals such as manganese and chrome.

Even very high reliance on imports of a material need not necessarily be cause for alarm. For example, although the United States has very large deposits of low-quality aluminum-bearing clays, the Bureau of Mines projects a continuing reliance on higher grade bauxite imports for about 90 percent of the aluminum supply because this has continued to be the least costly way to supply aluminum. The major sources of U. S. bauxite imports are Jamaica, Surinam, Guyana, and the Dominican Republic. Australia also produces large amounts of bauxite but has not been a major U. S. supply source. Brazil has extensive reserves but has not yet become a major supplier. Therefore, although a 90 percent “dependence” on imports is potentially worrisome, there are many alternative sources of bauxite close to the United States, and, at only moderately higher cost, we could turn to various lower-grade domestic deposits if necessary.

The United States is less import-dependent in the case of iron ore. Once again, although we have extensive reserves, imports are used to reduce raw material costs. The principal sources of imports are Canada and Venezuela, but iron ore is also imported from Liberia, Brazil, Peru, Australia, Sweden, and Chile.

The Committee staff reviewed the issue of dependence on petroleum imports in terms of its implications for plastics. Plastics accounted for 1.5 percent of total petroleum consumption in 1974, of which one-fifth was for plastic packaging (0.3 percent of the total). Recycling or replacing the plastics used in consumer products with other materials might reduce petroleum use somewhat, but processing and transporting other materials also involve the use of petroleum. Over the longer term plastics could be made from coal, forest products, or agricultural crops. However, making plastics from coal, for example, would at present be 2 to 3 times as expensive as making them from petroleum.

A number of circumstances could cause shortages of imported materials – foreign embargoes on shipments to the United States, the organization of mineral cartels, and military or civil conflicts involving exporting nations.

Of these three, the latter probably presents the greatest risk of prolonged supply curtailment. The Strategic Materials Stockpile has been accumulated as a buffer against shortages resulting from such risks. If a principal supplier were to become involved in a conflict with another nation or suffer severe internal disorder, interruption in supply could be relatively complete and long lasting. In general, the National Commission on Supplies and Shortages concluded that stockpiles should in most instances be the preferred approach for reducing risks of short term supply interruptions.⁹

Mineral cartels or embargoes, while possible, do not appear to pose serious threats at this time.¹⁰ In order for either to be effective, all principal exporters of a commodity must perceive similar interests, and, in the case of embargoes, must be willing to forego the revenues that their exports bring them. Moreover, there must be few close substitutes for the commodity available from sources outside the cartel. Although petroleum exporters have employed these techniques quite effectively since 1973, the conditions necessary for success do not appear to exist among exporters of most other minerals.

Economic Efficiency in the Use of Materials

If we are not using resources in the most economically efficient manner, we are not only wasting the resources themselves but also the capital and labor required to produce them. The Resource Conservation Committee was especially concerned that any potential conservation policies enhance economic efficiency, or at least not decrease efficiency without clear recognition of consequences. The Committee made this one of its explicit criteria for evaluating policies (see Chapter 3).

Generally speaking, the United States has relied on the market mechanism to assure efficient use of all economic resources, including natural resources as well as labor and capital. As one resource economist, Talbot Page, has expressed it, the market “defines a balance between depletion and conservation, recycling and disposal, and durability and initial cost. Market forces lead to a certain flow of materials through the economy, extending from extraction to discharge into the environment.”¹¹ Whether or not the balance the market strikes between depletion and conservation is the “right” balance depends on: (1) whether the market is operating efficiently, and (2) whether the market accounts adequately for the future. The first issue is discussed below, and the second is discussed later in this section.

The Resource Conservation Committee looked most closely into two factors which can cause materials markets to operate inefficiently. First, the failure of the market to incorporate environmental costs and collection and disposal costs of products entering the municipal solid waste stream into the prices of finished products has long been suspected of leading to a higher rate of materials consumption than would otherwise be the case. Although many environmental costs have recently been “internalized” by industries’ installation of pollution control equipment, substantial environmental costs still exist. Because these “social costs” and collection and disposal costs are generally borne by the public at large, the product prices do not reflect them and they do not properly affect consumer decisions.

The Committee studied the effect of not including community solid waste management costs in product prices at great length, particularly in connection with the product charge and local user fees. The conclusion reached by

the Committee, given the best information available, was that not including municipal solid waste costs makes a difference of several percent in the amount of virgin raw materials used in final consumer goods and packaging. This issue is one of the major topics of Chapter 7, "Pricing Policies for Municipal Solid Waste."

The second factor related to market inefficiency is government-induced "distortions" in the marketplace. For instance, Federal income taxes on the extractive sector have historically not been as heavy as on other sectors of the U. S. economy. This has been attributed to deliberate government efforts, dating back several decades, to encourage domestic resource development. The effect of these tax advantages has been twofold. Not only has extraction proceeded at a faster rate than it would have without differential tax treatment, but also, to some degree, our primary materials industries have developed at the expense of secondary materials industries. These policies have also tended to stimulate U. S. exports and inhibit imports. This subject is discussed in detail in Chapter 4, "Tax Policies Affecting the Extraction Industries."

A similar allegation has been made in the case of railroad freight rates for secondary materials, as regulated by the Interstate Commerce Commission. The Committee found that the rates probably have discriminated against many secondary materials (compared with the virgin materials against which they compete). This subject is discussed in Chapter 5, "Resource Recovery Policies."

Energy Usage

The production of materials, whether they are plentiful or scarce, inevitably requires the use of energy. Over one-third of U. S. primary energy consumption is directly attributable to industrial demands, mostly to material processing. Another 26 percent goes to transportation, of which a substantial part is related to shipment of raw materials and finished products. Moreover, the lower grades of ore that must be mined in the future, when the higher or more accessible grades have been exhausted, will probably require significantly more energy to mine and refine. If we had an unlimited source of cheap energy, the likelihood of minerals becoming scarce at affordable prices would be considerably reduced.

At a time when energy resources are in short supply, conservation of materials may be an effective way to save energy. This does not necessarily mean "doing without." For example, recycling can often significantly reduce energy consumption, although the amount varies greatly with the materials involved and the processes used. One of the most dramatic examples of energy saving through recycling is the case of aluminum. The extraction of aluminum from bauxite, an extremely energy-intensive process, requires the

equivalent of about 1 gallon of petroleum or 10 pounds of coal per pound of finished aluminum. Recycling aluminum cans saves 95 percent of the energy required to produce an equal amount of aluminum from bauxite.

Intergenerational Equity and the “Ideal” Society

Even if the market system does function reasonably well in allocating resources among current needs, there is a growing controversy over whether it can allocate resources fairly between generations. Economists have traditionally pointed to the economic factors (such as the “discount rate”) used in making business decisions for the future and argue that it does. Others have argued that markets do not inherently take into account the interests of future generations. There is even debate as to whether this question should be considered. There are many who feel that one generation does not “owe” resources to succeeding generations.

Among those who are concerned for future generations, some people argue that virgin material extraction is a vehicle for economic growth and that future generations can best be served by being bequeathed the most productive economy possible. Others argue that future generations should be left as large a stock of materials and undisturbed natural areas as possible, and that a policy of slower-than-market rate of material extraction is most appropriate.

One of the best synopses of the issues associated with the intergenerational equity question is presented by Talbot Page in his book, *Conservation and Economic Efficiency*:

The burdens associated with resource use that we are placing upon the future are largely risk burdens. With respect to both material wastes and depletion, the equity question is: What is a fair distribution of risk to impose upon the future? . . .

While technology is ultimately the only way of renewing “non-renewable” material resources, it adds to the legacy of risk to be bequeathed to the next generation. Technological solutions are not inevitable. As the flows of “non-renewable” resources become larger for the United States and increasingly so for other countries, our dependence on technological fixes becomes greater. The power of technology itself becomes greater, with uncalculated and perhaps unmanageable side effects. Thus, the burden as we use up oil is the risk burden that we will not come up with a substitute technology in time. . . . Our legacy to the future is not homogeneous and is not composed entirely of benefits. Intertemporal equity emerges as an important problem because there is no easy way to add up the costs and

risks along with the benefits and no way to guarantee that the future is going to be better off than the present.¹²

In the final analysis, the question of intergenerational equity becomes a question of personal values, and can be answered most directly on that level. It is also close to the heart of the distinctions between a “conserving” society and a “consuming” society (sometimes referred to as the “throwaway” society). Each of these “ideal” societies implies an ethical framework, often with deep socio-religious roots. Considerations of this type are outside the realms of economics or geology. Ethical judgments are often made unconsciously, but they often cannot be avoided in making choices for consumption or conservation.

Perhaps the most difficult problem in dealing with the question of adequacy of supply is that we do not face an immediate crisis. We are in the position of a driver who hears a rattle in his car which could slow him down ahead if he does not get it fixed, but which has not yet impeded his progress. While we do not appear to be facing immediate difficulties with the supplies of material resources, it may not be wise to act as if this could never happen.

Environmental Protection and Waste Management

A second major focus of interest in discussions of resource conservation has been the relation between material consumption and environmental quality. This section discusses the environmental impacts of material systems, implications of economic growth, and the relationships between resource conservation, waste management, and environmental protection.

Environmental Effects

The multiple relationships between the economy’s system of material and energy flows and the natural environment are reasonably well known, in general terms if not in all details. With very few exceptions, the effects of extracting and “consuming” raw materials and fossil fuels on ecosystems, and on air and water quality generally, are adverse.

Table 2 provides a reminder of how pervasive and diverse these effects can be. Every material in every final product and its packaging has gone through a chain of extraction, refining, manufacture, and distribution (as depicted earlier in Figure 1), and has usually been transported several times. Every material has likewise required electric power at several stages, and ultimately virtually every product ends up as solid waste.

Each step in the life cycle of a consumer product or item of capital investment has its own ecological, public health, economic, and aesthetic

Table 2

EXAMPLES OF ENVIRONMENTAL EFFECTS OF ECONOMIC ACTIVITIES

	Activities	Typical Environmental Effects
E X T R A C T I O N	Mining	
	- Deep tunnel and open pit	Tailings, leachates, mine acid drainage, underground fires, land surface disruption.
	- Petroleum	Sludge ponds, oil spills, land subsidence.
	Agriculture - general	Land surface changes, disruption to pre-existing habitats, waterborne minerals get concentrated.
	- plus, if practices are poor	Soil erosion and siltation, nutrient enrichment and eutrophication, toxic pesticides.
	Forestry - thinning of growth	Habitat disruption from logging, use of roads and increased human accessibility; pesticides.
	- plus, if clear cutting	Habitat destruction, soil erosion.
P R O C E S S I N G	Raw Materials Processing	
	- Size classification and reduction	Noise, dust, tailings, sludges.
	- Sintering, roasting and smelting	Dusts, aerosols, gases, acid rains, slags.
	- Cooking	Pressings, sludges, aerosols, gases.
	- Distilling	Sludges.
	- Washing	Suspended and dissolved solids in water.
	- Separating	Sediments, elutriates, and sludges.
	Product Finishing, Converting and Assembly	Dusts, oils and other contaminants in water, noise, scrap (reusable), heavy metal plating wastes.
P O W E R	Stationary	
	- Fossil fuel power (steam, electricity, and direct drive)	Boiler ash, fly ash, low level radiation in ashes, aerosols, gases, acid rain, thermal pollution of waterways, steam plumes, flue gas desulfurization sludges, CO ₂ -induced weather modification.
	- Nuclear power	Radioactive waste fuel rods, nuclear fallout.
	- Electricity distribution	Transmission right of ways.
	Transportation	Emissions from internal combustion engines (CO, NOx, CO ₂ , hydrocarbons, lead), waste lubricating oils, land surface disruptions for road right of ways, oil and chemical spills.
P O S T C O N S U M E R	Demolition (and Construction)	Dust, noise, scrap (reusable), debris, land surface disturbance, erosion, stream siltation.
	Commercial and Household	
	- Littering	Litter
	- Land disposal	Noise, land use disruption, noxious leachates, landfill gas.
	- Volume reduction	Incinerator emissions.
	Water and Sewage Treatment	Sludges, chlorine and other chemical residuals.

environmental implications. They can range from the micro-habitat or local level to broad regional or even global proportions. Some involve mere nuisance, while others may, if unchecked, portend global catastrophe. Many of the effects are irreversible, and most are costly to control.

Economic Growth and Environmental Quality

In many respects, economic growth and development seriously aggravate problems of maintaining or restoring environmental quality. For example, consider the following:

- (1) **Compound growth.** In recent years the economy has grown at an average annual rate of 2.5 to 4 percent after discounting for inflation. At this rate, GNP doubles or triples every 20 to 30 years. If resource extraction, energy use, and waste generation grow at similar rates, this implies a two- to three-fold increase in mining activity, power-generating capacity, raw material processing, and pollution control requirements over the same brief period. In 50 years the effect is about twice again as great — a four- to six-fold increase. As discussed earlier, the growth in materials consumption and waste generated per dollar of GNP and per capita appears to be slowing, but this only partially compensates for the power of compound growth.
- (2) **Fixed assimilative capacities.** Most natural systems have limited capacities for absorbing, transporting, and neutralizing waste products. Thus, as the number of waste sources (autos, factories) increases, the amount of waste treatment or prevention required to maintain environmental quality must be increased.
- (3) **Increasing costs of treatment.** At higher required levels of control, waste treatment costs often increase disproportionately fast relative to improved control. Where incremental costs of control are rising, the economic feasibility and political acceptability of environmental protection are both weakened.
- (4) **Lower grade resources.** As higher grade and more accessible mineral supplies are depleted, extraction and processing must depend on lower grade and/or deeper deposits. These involve more overburden, tailings, processing residuals, and other waste per unit of refined product. Typically, more total energy is required as well, for both extraction and processing.
- (5) **New chemical substances.** As our economy becomes more sophisticated in applied science and technology, the varieties of new synthetic materials and esoteric chemicals appear to increase without limit. Some of these chemicals turn out to be particularly

hazardous to natural ecosystems and to human health. Long-lasting toxic substances that do not break down in the environment are of special concern.

It is for reasons such as these that advocates of "zero economic growth" argue that continued economic growth at historical rates can only mean environmental catastrophe.

There is of course another side to the ledger. Economic growth and development bring added capabilities for dealing with such problems. Increasing national productivity means that more economic resources will be available to devote to environmental protection without extreme economic sacrifice. Within the present decade we have finally begun to apply a substantial amount of economic resources to controlling many forms of pollution and to prevent or repair some forms of habitat destruction. Moreover, the same modern science and technology that appear to cause so many of our environmental problems can also help control them.

It is also possible that the growth in material consumption may slow down relative to overall economic activity as the economy matures. As discussed earlier, there is evidence that the economy's appetite for material throughput has slackened somewhat in recent years. Although the reasons are not yet clear, consumption of most materials has grown considerably less rapidly relative to real GNP and relative to the size of our population in the 1970's than in earlier decades. In addition, population growth has also slowed and may possibly stabilize early in the 21st century.

Thus, continued economic growth is not a simple or one-sided issue as far as its implications for environmental quality are concerned. On balance, however, it does raise serious concerns regarding our capabilities to continue to grow at or near past rates without experiencing substantial further environmental degradation. The fact remains that in absolute terms we are continuing to consume vast amounts of raw materials and fossil fuels. When imposed on high base levels, even relatively small percentage increments can yield very large absolute annual increases in material and energy flows, and this continues to jeopardize the quality of our environment.

Problems of Solid Waste Management

One of the principal reasons for the passage of the Resource Conservation and Recovery Act of 1976 (RCRA) was the growing problem of dealing with post-consumer solid waste at the local level. In Section 1002(a)(3) of RCRA the Congress found that:

the continuing concentration of our population in expanding metropolitan and other urban areas has presented these communities with

serious financial, management, intergovernmental, and technical problems in the disposal of solid wastes resulting from the industrial, commercial, domestic, and other activities carried out in such areas.

The Environmental Protection Agency has studied, and is continuing to study, the environmental and aesthetic impacts of improper disposal and the local public management problems associated with locating disposal sites for waste materials. The RCC staff spent considerable time estimating the costs of municipal solid waste management and assessing the importance of waste disposal pricing methods as a factor in the overall solid waste management problem.

Environmental Impacts of Improper Disposal Practices. Traditionally, incinerator emissions and the breeding of disease-bearing insects and rodents at collection, storage, and dumping sites have been the principal environmental and public health concerns in municipal solid waste management. Although these problems are still a concern, increasing attention is now being focused on the effect of improper solid waste management on water quality because of evidence that surface runoff and underground leachate from landfills can contaminate surface waters and ground waters.

Contamination of ground water is particularly serious because, once it occurs, there is no technology presently available to reverse the effect, and an aquifer may then be unusable as a source of drinking water for generations. Currently, about half the U. S. population relies on ground water for drinking water supplies, and the use of ground water is increasing rapidly.

Aesthetic Effects of Improper Disposal Practices. Everyone is aware of the aesthetic problem associated with improper solid waste disposal practices. The results of illicit dumping and littering are apparent in the garbage washed up on beaches, the trash scattered through urban, rural, and even wilderness areas, and the durable products, such as refrigerators and automobiles, which are abandoned in alleys and vacant lots. With some exceptions — cuts from broken bottles, accidents to children playing in abandoned vehicles or appliances, occasional injuries to animals — litter is primarily an aesthetic problem rather than a public health or ecological hazard. Nevertheless, perhaps \$500 million is spent annually by State and local governments and private agencies for litter pickup, antilitter promotions and other control efforts. Considering the relatively small quantities of littered waste involved, our willingness to finance these programs indicates that we consider the aesthetic problem to be significant. Littering and unsanctioned dumping are often very hard to control because they are the result of individual actions which are already generally illegal.

The Resource Conservation Committee addressed the litter problem in several of its policy evaluations, including mandatory beverage container deposits, deposits and bounties on durable and hazardous products, and the

concept of a national litter tax. The results and recommendations are reported in Chapter 6, "Product Use and Disposal Policies."

Local Public Management Problems. Although municipal solid waste management is a significant portion of local government budgets, often the biggest problem at the local level is finding sites for new landfills rather than the money to pay for them. It has become very clear that people do not want a landfill located in their neighborhoods. In one survey, 70 percent of the residents surveyed felt that proposed landfills should be at least 1 mile from their residences.¹³

Local residents are concerned about the environmental and public health problems associated with improperly managed landfills. Odors, unsightly appearance of the site, trash blowing around their neighborhood, increased truck traffic, and possible effects on property values are major concerns. Promises made by State and local officials that landfill operations will not have adverse impacts do little to sway citizen objections; and the opportunity to have a new park or recreation area after the landfilling is completed is apparently unconvincing or of little importance to most residents in determining their attitudes.

When local landfill sites are not available, local officials may become involved in jurisdictional disputes over where trash can be sent for disposal. In some cases siting problems can lead to expensive long-distance hauling of trash and provide a strong stimulus to convert the trash into usable materials or energy.

Solid Waste Management Costs. As a part of its investigation into the effects of waste management service prices on resource conservation, the Committee staff revised previous Environmental Protection Agency estimates of the cost of municipal solid waste management which had indicated that collection and disposal had averaged about \$30 per ton for U.S. communities in 1976. The revised estimates indicate that collection and disposal activities averaged about \$43 per ton in 1978, or over \$25 per person per year. General inflation will cause these costs to increase, but constant dollar (deflated) costs are also expected to grow because of rising land values, longer haul distances to disposal sites, more stringent environmental requirements for landfills and incinerators, and more stringent noise and safety regulations for refuse collection vehicles. However, analysis of collection operations indicates that there is considerable potential for increasing efficiency which, if realized, could reduce costs in the future.

Collection and disposal costs vary considerably among cities. Collection costs, for example, reportedly range from \$7 to over \$100 per ton in 1978 dollars. The larger cities – those over 100,000 in population – appear to have generally higher average costs.

The RCC was also interested in determining what fraction of municipal solid waste management costs could be saved through a reduction in the

waste entering municipal collection and disposal systems. Since service must still be provided on a regular basis, the potential savings from reduced waste collection are less than the average per ton costs.

The staff analyzed the savings associated with reductions in wasteloads using both econometric and process engineering techniques. Although the results from the two estimating methods were not completely consistent, the staff concluded that reducing municipal solid waste requiring collection and disposal would, on the average, save about \$15 for each ton of waste that did not have to be handled. Differences among communities and their responsiveness to opportunities for cost reduction would cause individual cases to show higher or lower incremental savings. The staff's analysis of these costs is discussed in detail in Staff Background Paper No. 11, "A Cost Analysis of the Solid Waste Management Industry."

Table 3
TRENDS IN U.S. CONSUMPTION
OF MAJOR RAW MATERIALS AND FUELS, 1948 - 1978

	Quantities Consumed (Millions of tons per year except as noted)				Percent Growth			
	1948	1958 ¹	1968	1978	1948- 1978	1948- 1958	1958- 1968	1968- 1978
Ferrous Metals ²	62.9	71.5	107.3	115.0	83	14	50	7
Aluminum	0.8	2.2	4.7	6.0	650	175	114	28
Copper, Lead and Zinc	3.4	4.0	5.2	5.0	47	18	30	-4
Building Materials ³	580.1	1,291.0	1,812.8	2,020.6	248	123	40	11
Other Non-Fuel Minerals ⁴	31.9	49.4	91.0	106.8	235	55	84	17
Forest Products								
Lumber, Plywood & Veneer ⁵	6,000	6,240	7,680	8,700	45	4	23	13
Pulp, from Roundwood	15.	20.4	28.1	30.5	103	36	38	9
Plastic Resins	0.7	2.5	8.6	18.8	2,420	240	240	118
Coal	531.1	366.7	498.8	618.0	16	-31	36	24
Petroleum ⁶	2.1	3.3	4.8	6.8	224	57	45	42
Natural Gas ⁷	4.9	10.8	19.5	19.4	293	118	81	0
Gross National Product (billions of 1972 dollars)	487.7	697.3	1,051.8	1,385.3	184	43	51	32
Population (millions)	146.6	174.9	200.6	218.4	49	19	15	9

¹ Except for forest products and fuels, 1958 figures are annual averages of 1956 through 1960.

² Steelmill shipments plus imports net of exports.

³ Sand and gravel, crushed stone, and cement.

⁴ Phosphate rock, lime and salt.

⁵ Expressed in millions of cubic feet of roundwood needed to supply actual output.

⁶ Expressed in billions of barrels.

⁷ Expressed in trillions of cubic feet.

Source: Resource Conservation Committee staff, based on statistical sources listed under Table 4.

Table 4

**TRENDS IN U.S. MATERIAL AND ENERGY USE
RELATIVE TO TOTAL NATIONAL PRODUCT AND POPULATION
1948 - 1978**

	Tons Consumed per \$ Million of Gross National Product (1972 Dollars)			1978
	1948	1958	1968	
Ferrous Materials	128.9	102.5	102.0	83.0
Aluminum	1.6	3.1	4.4	4.3
Copper, Lead and Zinc	7.0	5.7	4.9	3.6
Building Materials	1,189.4	1,851.4	1,723.5	1,458.6
Other Non-Fuel Minerals	65.4	70.8	86.5	77.1
Lumber, Plywood and Veneer ¹	12.3	8.95	7.3	6.3
Pulp from Roundwood	30.8	29.3	26.7	22.0
Plastic Resins	1.5	3.6	8.2	13.6
Coal	1,089.0	525.9	474.2	446.1
Petroleum ²	4,335.0	4,754.0	4,553.0	4,924.0
Natural Gas ³	10,140.0	15,430.0	18,500.0	14,010.0

	Pounds Per Person Per Year			1978
	1948	1958	1968	
Ferrous Materials	858.1	817.6	1,069.8	1,053.1
Aluminum	10.9	25.2	46.9	54.9
Copper, Lead and Zinc	46.4	45.7	51.8	45.8
Building Materials	7,914.0	14,762.7	18,073.8	18,503.7
Other Non Fuel Minerals	435.2	564.9	907.3	978.0
Lumber, Plywood and Veneer ⁴	40.9	35.7	38.3	39.8
Pulp, from Roundwood	204.6	233.3	280.2	279.3
Plastic Resins	10.1	29.0	85.9	172.2
Coal	7,245.6	4,193.3	4,973.1	5,659.3
Petroleum ⁵	605.6	796.0	1,002.7	1,307.7
Natural Gas ⁶	33.7	61.5	97.0	88.9

¹ Thousand cubic feet of roundwood per million dollars.

² Barrels per million dollars.

³ 1,000 cubic feet per million dollars.

⁴ Cubic feet of roundwood per person per year.

⁵ Gallons per person per year.

⁶ 1,000 cubic feet per person per year.

Source: Resource Conservation Committee Staff, based on *Mineral Commodity Summaries* 1979 and *Minerals Yearbooks* 1948, 1958, and 1968, Bureau of Mines, U.S. Department of Interior; *The Demand and Price Situation for Forest Products, 1976-77*, Forest Service, U.S. Department of Agriculture; *Monthly Energy Review*, March 1979, Energy Information Administration, U.S. Department of Energy; *Facts and Figures of the Plastics Industry*, 1978, and personal communications from the Society of the Plastics Industries.

Table 5

**U.S. RELIANCE ON RAW MATERIAL AND FUEL IMPORTS
1978**

Materials	U.S. Consumption	Net Imports as % of Consumption
Imports Exceed 50% of Consumption ^{1,2} :		
Aluminum (content)	6,000,000 tons	85
Asbestos	583,000 tons	84
Chromium	600,000 tons	92
Fluorspar	1,250,000 tons	82
Manganese	1,415,000 tons	100
Natural Rubber	856,000 tons	100
Nickel	232,000 tons	77
Potash	4,880,000 tons	61
Rutile	280,000 tons	90
Tin	66,500 tons	81
Zinc	1,114,000 tons	62
Zirconium	110,000 tons	50
Moderate Reliance on Imports ³ :		
Barite	2,800,000 tons	40
Copper	2,480,000 tons	19
Forest Products	13.5 billion cubic feet	10
Gypsum	22,323,000 tons	34
Ilmenite	1,005,000 tons	39
Iron and Steel	135,000,000 tons	28
Lead	1,350,000 tons	13
Peat	1,170,000 tons	32
Petroleum	6.8 billion barrels	48
Silicon	650,000 tons	18
Sulfur	14,000,000 tons	10
(Continued)		

¹ 90 to 100% reliance on imports also exists for:

Beryllium	Columbium	Graphite	Radium	Strontium
Bismuth	Corundum	Iodine	Rhenium	Tantalum
Cesium	Diamonds	Mica Sheets	Rubidium	Thorium
Cobalt	Gem Stones	Platinum	Scandium	

² 50 to 70% reliance on imports also exists for:

Antimony	Cadmium	Selenium	Yttrium
Arsenic	Mercury	Tungsten	

³ 10 to 50% reliance on imports also exists for:

Gallium	Germanium	Indium	Tellurium	Thallium
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Table 5 (Continued)

**U.S. RELIANCE ON RAW MATERIAL AND FUEL IMPORTS
1978**

Materials	U.S. Consumption	Net Exports as % of Consumption
Self-Sufficient or Net Exporter ⁴ :		
Boron	1,390,000 tons	9
Bromine	179,000 tons	16
Clays	53,167,000 tons	5
Diatomite	510,000 tons	31
Feldspar	770,000 tons	1
Helium	5,000 tons	19
Iron and Steel Scrap	42,700,000 tons	17
Lithium	4,300 tons	47
Magnesium	110,000 tons	25
Mica, Scrap and Flake	194,000 tons	4
Molybdenum	33,000 tons	100
Phosphate Rock	36,800,000 tons	33
Sand and Gravel	933,700,000 tons	0.3
Sodium Carbonate	7,500,000 tons	10
Talc & Pyrophyllite	1,037,000 tons	22
Titanium	19,000 tons	26
Coal	625,000,000 tons	9

⁴ Other commodities for which the U.S. is either self-sufficient or imports less than 10% of its consumption:

Argon	Lime	Pumice	Stone
Cement	Nitrogen	Rare-earths	Uranium
Garnet	Oxygen	Salt	Vermiculite
Hafnium	Perlite	Sodium Sulfate	

Source: Resource Conservation Committee Staff, based on: *Mineral Commodity Summaries, 1979*, Bureau of Mines, United States Department of the Interior; *The Demand and Price Situation for Forest Products 1976-1977* plus updates, Forest Service, U.S. Department of Agriculture; *Monthly Energy Review*, March 1979, Energy Information Administration, U.S. Department of Energy.

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RESOURCE CONSERVATION: HISTORICAL CONTEXT AND PERSPECTIVES

Resource conservation is hardly a new idea. The historical views of the concept, especially in the most recent generation, and the explicit approach that the Resource Conservation Committee took are important to understanding resource conservation in general and the work of the Committee in particular.

Recent and Contemporary Evaluations of Resource Policy

During the past quarter century, five major government groups have been established to report on the general subject of materials policy: the President's Materials Policy Commission, better known as the Paley Commission (1951–52); The National Commission on Materials Policy (1971–73); the National Commission on Supplies and Shortages (1974–76); the Resource Conservation Committee (1977–79); and the Non-Fuels Minerals Policy Task Force (established in 1977, work still in progress). In addition, other government offices have done considerable work in this area.

Each of these groups has had a different mandate, but they all have made major statements concerning resource use and conservation. Together they reflect a changing perception of “problems” connected with natural resources. The focus of national policy has been moving from assuring development of resource supplies to managing resource development under greater constraints, particularly environmental ones. The Resource Conservation Committee's Staff Paper No. 17, “Findings and Recommendations by Predecessor Commissions, Committees, and Associations on Resource Conservation Issues,” quotes from the reports of these groups as well as a number of studies by private organizations. The Resource Conservation Committee built on the work of these groups, adding its own perspective where appropriate.

Paley Commission

The threat of shortages of strategic materials following the outbreak of the Korean War led President Truman to appoint the President's Materials Policy Commission, better known under the name of its chairman as the Paley Commission. The concerns at the time were best expressed in the title of its final report, *Resources for Freedom*. The focus of the Commission's work was on the supply of raw materials for the industrial engines of the "Free World," especially the United States. At issue were security and the availability of resources; the Commission also examined how well existing instruments of government could cope with these problems.

This emphasis was summarized in the Commission's overall objective for a materials policy, which, it said, should "insure an adequate and dependable flow . . . at the lowest cost consistent with national security and with the welfare of friendly nations" (p. 3). As a result, the report generally looked toward the use of abundant domestic resources in preference to importing scarce foreign materials. In this context, the Commission gave resource conservation and reuse comparatively little attention.

National Commission on Materials Policy

The establishment of the National Commission on Materials Policy in 1970 coincided with the gathering momentum of the environmental movement. The scope of its concern was consequently different from that of the Paley Commission.

Highlighting this change was the fact that the Commission was established by the Resource Recovery Act of 1970, a set of amendments to the Solid Waste Disposal Act of 1965. In contrast to the Paley Commission, the National Commission on Materials Policy gave the "need to protect" equal weight with the "need to produce" in its final report, *Materials and the Environment*, which was published in 1973.

Recognizing the full costs of materials usage from extraction to disposal, the Commission recommended that environmental costs be computed at all steps of the materials cycle. It stressed that, before materials are extracted, rehabilitation or enhancement of the site should be assured. The Commission made many other recommendations affecting resource use, including the encouragement of recycling and increased attention to waste management as a part of overall materials policy. The recommendations of this report gave significant impetus to the "full-cost" orientation that the Resource Conservation Committee later adopted.

National Commission on Supplies and Shortages

In 1973 and 1974, unexpected and dramatic short-term scarcities in many sectors, including energy, led to a widespread fear of general shortages of materials. The National Commission on Supplies and Shortages was established in 1974 to investigate why those shortages were occurring and to determine what the government might do to improve the situation. The Commission's final report, *Government and the Nation's Resources*, was published in December 1976. The report provided an important starting point for the work of the Resource Conservation Committee.

The most important finding of the Commission on Supplies and Shortages was that they could see no geologic, economic, or demographic evidence for concern about the availability of resources. The Commission concluded that impending exhaustion of a specific raw material will be signaled sufficiently ahead of time to allow for a period of adjustment. However, they warned that the adjustment mechanism must not be subverted by actions taken by the public or private sectors. In addition, the Commission noted that the magnitude of government influence over the materials industry has not always been fully appreciated, and it is important that the spectrum of government policies be consistent with efficient use of materials.

The Commission recommended that the government consider policies which would reflect the cost of disposal in the prices consumers pay for products. Among the means of "internalizing" the cost of disposal, the Commission listed mandatory deposits on beverage containers, excise taxes on nonreturnable containers, and product disposal charges on other consumer packaging and paper.

The Commission generally rejected the idea of Federal funding for recovery of materials or energy from waste, citing hidden costs and lack of cost effectiveness. While recycling can be used as a source of supply and can help reduce escalating capital requirements, environmental degradation, energy demand, and import dependence, the Commission observed that recycling is not a "good" per se and should be judged only in competition with other national goals.

For this same reason, the Commission generally did not favor subsidizing virgin materials. It was unable to acquire sufficient information to make specific recommendations regarding capital gains treatment of income from timber, but it did state that unless compelling evidence for continuing the percentage depletion allowance for minerals could be shown, it should be repealed.

Task Force on Non-Fuels Minerals Policy

The Task Force on Non-Fuels Minerals Policy, established by the President in December 1977, is presently studying a very broad range of concerns that have been raised in recent years regarding Federal policy affecting non-fuel minerals. The group is chaired by the Secretary of the Interior and includes the chief officials of 13 other Federal agencies and offices, all of whom are also members of the Resource Conservation Committee.

The study has two basic objectives: (1) to submit for Presidential consideration appropriate policy options, analyses, and recommendations on current and anticipated problems related to non-fuel minerals, including an assessment of existing and alternative Government policies to address these problems; and (2) to develop a process or framework for policy analysis which Federal decisionmakers can use to assess minerals-related problems in the future.

The study itself is divided into two phases: problem analysis and policy analysis. Twelve representative non-fuel mineral commodities have been selected for specific examination in the following nine problem areas:

- Major mineral supply problems;
- Availability of foreign minerals to the United States and its allies;
- Relationship of environmental quality, health, and safety to price and availability of minerals;
- Mineral resource potential of Federal lands;
- Financing, capital formation, and tax policies;
- Competitiveness of the U.S. mineral industry versus foreign mineral industries;
- Conservation, substitution, and recycling;
- Adequacy of mineral-related research and development; and
- Adequacy of existing government capabilities to support Federal policymaking.

In some respects the Task Force is building on the work of the Resource Conservation Committee, but in general its efforts are much broader than those of the Committee.

Other Government Offices

Nearly all the major offices of the Federal Government, including the members of the Resource Conservation Committee, are presently engaged in projects affecting resource conservation and recovery.

The Environmental Protection Agency has worked closely with communities across the nation to assist them in the area of resource recovery,

principally through various types of technical assistance. The agency is also developing a solid waste regulatory program and has done considerable research in the area of solid waste and resource recovery. The Resource Conservation Committee staff drew heavily on this research.

The Department of Energy is working on several projects to demonstrate how energy can be recovered from waste. The Treasury Department currently administers tax subsidy programs for materials production and resource recovery and constantly analyzes the effects of those programs. The Treasury recently completed a study, *Federal Tax Policy and Recycling of Solid Waste Materials* (February 1979), which the Resource Conservation Committee used in its deliberations.

Likewise, the Departments of Commerce, Interior, and Agriculture are conducting programs to monitor materials stocks, production, and flows; find better ways of using all types of materials; and encourage the use of different kinds of materials.

The Office of Technology Assessment, a staff office of the U.S. Congress, is currently completing two major studies on the conservation of non-renewable, non-fuel resources. Two reports will be published in the summer of 1979 covering some subjects addressed by the Resource Conservation Committee, as well as several others. The first study, *Materials and Energy from Municipal Waste*, examines the potential for, and barriers to, recovering and recycling materials and energy from municipal solid waste. The second study, *Technical Options for Conserving Metal*, evaluates options for conserving metals in the design, manufacturing, use, and disposal of products.

The Resource Conservation Committee

The Resource Conservation and Recovery Act of 1976 (RCRA) was a set of amendments to the Solid Waste Disposal Act. Citing serious problems in solid waste, environment and health, materials, and energy, RCRA established far-reaching programs affecting many aspects of solid waste management and resource usage. Most importantly, the Act set up specific programs in the areas of hazardous waste management and State and regional solid waste management plans.

Because information on which to base non-technological resource conservation policies and programs was scarce, and this lack of knowledge threatened to limit the range of alternatives open to the Congress in the future, the legislation established the Resource Conservation Committee to examine a variety of present and potential government policies that might affect resource conservation.

The Resource Conservation Committee's legislative mandate caused its scope of work to be somewhat different from those of its predecessors. Specifically, the Committee's charge was to examine the "economic, social, and environmental consequences" of a range of policy issues, including the following in Section 8002(j)(1):

"(A) the appropriateness of recommended incentives and disincentives to foster resource conservation;

"(B) the effect of existing public policies (including subsidies and economic incentives and disincentives, percentage depletion allowances, capital gains treatment and other tax incentives and disincentives) upon resource conservation, and the likely effect of the modification or elimination of such incentives and disincentives upon resource conservation;

"(C) the appropriateness and feasibility of restricting the manufacture or use of categories of consumer products as a resource conservation strategy;

"(D) the appropriateness and feasibility of employing as a resource conservation strategy the imposition of solid waste management charges on consumer products, which charges would reflect the costs of solid waste management services, litter pickup, the value of recoverable components of such products, final disposal, and any social value associated with the nonrecycling or uncontrolled disposal of such products; and

"(E) the need for further research, development, and demonstration in the area of resource conservation."

Working from this mandate and from public comment in response to the Committee's draft implementation plan and at a series of public meetings, the Resource Conservation Committee drew up a list of policies which were either known to affect or suspected to affect resource conservation. The Committee studied these policies in varying degrees of detail, depending on the possibilities each appeared to offer. It settled on the following 10 policy areas:

1. Present Federal tax policies affecting the extraction industries;
2. A proposed tax on virgin materials extraction;
3. Proposed subsidies for resource recovery;
4. Railroad freight rates that are alleged to discriminate against secondary materials;
5. Proposed regulations on product design;
6. Proposed national mandatory beverage container deposits;
7. Proposed deposits or bounties on durable and hazardous goods;

8. A proposed national litter tax;
9. Proposed quantity-based user fees for local solid waste collection and disposal; and
10. A proposed national solid waste disposal charge.

Because the Resource Conservation Committee's mandate emphasized policies rather than strictly supply or technology, the Committee made no independent assessments of the latter subjects. Instead, the Committee depended on the work of others on these subjects, particularly the Commission on Supplies and Shortages (1976).

Nor did the Committee work to develop policies explicitly directed at materials in shortest supply. In fact, due to its major concern with solid waste problems and environmental protection, the Committee examined policies which tend to have their strongest impact on the materials in greatest supply and which are produced and discarded in the greatest quantities: wood products (including paper), iron and steel, aluminum, and glass. In general, the Committee concentrated more on consumer goods and waste rather than on industrial goods and waste.

The Committee paid little explicit attention to conservation of energy resources, electing to concentrate on nonenergy resources and to leave work directed explicitly at energy to the Department of Energy and other agencies concerned with that area.

In studying these 10 policy areas, the first consideration was the actual or projected effect of each policy on resource conservation. The nation has a variety of competing goals, however; no single objective — resource conservation included — can be considered in isolation. Therefore, the Committee specified five additional criteria to be considered in evaluating the economic and social consequences of resource conservation policies: (1) adherence to free market principles, (2) consistency with the "polluter-pays" principle, (3) social and economic equity, (4) economic efficiency, and (5) administrative feasibility and cost.

1. Free Market Principles. As much as possible, conservation policies should not interfere with the free choice of producers, consumers, and local governments to make decisions. This criterion is consistent with the broader democratic philosophy of freedom of choice and also represents the basic belief in the United States that the private market system should be the primary mechanism for allocating society's resources.

Adherence to this principle does not mean blind faith in the status quo. Shortcomings in market structure (e.g., monopoly) or the absence of effective private mechanisms to provide for public goods such as environmental protection require government involvement to assure the efficient and equitable functioning of the competitive private enterprise system.

2. The “Polluter-Pays” Principle. In simple terms, the “polluter-pays” principle means that whoever is responsible for pollution should pay for preventing, controlling, or correcting the damage. Although there are exceptions to any rule, pollution costs should be neither subsidized by taxpayers in general nor borne directly by those exposed to the pollution.

“Polluters” can include not only the industry in question but also the consumers of that industry’s products: the principle is broad enough to mean that those who produce and use pollution-associated products should pay.

The proposition that the polluter should pay has been enunciated in some detail by the Organization for Economic Cooperation and Development (OECD) — an international agency for research and policy formulation comprised primarily of the governments of western industrial nations. The principle has been accepted as a basic tenet of pollution control by all OECD member nations, including the United States, to help ensure equitable international trade policies in a period when pollution control costs are becoming an increasingly significant factor in product prices.

3. Social and Economic Equity. Any significant new policy will, if effective, create changes. Often such changes will be more beneficial to some groups than to others. The short-term consequences of a conservation policy might be that specific industries, labor groups, and geographical regions of the nation would experience “windfall” gains or losses. For example, some consumer groups may find their living costs rising much more rapidly than others as a result of a policy directed at conserving the entire nation’s material resources.

Such questions relate to the distribution of costs and benefits, as opposed to their total magnitude. Often equity is the major feature which determines whether a specific proposal will be accepted or rejected. For example, any tax that is seriously regressive — that is, imposes a disproportionate burden on the poor — is unlikely to receive much consideration in the political forum in which all policies must be heard.

Emphasizing equity is not arguing against change. Rather, the issue is that we must, in developing, evaluating, and recommending policies for conservation, consider how the interests of various groups will be affected. If serious inequity appears likely with a specific proposal, the government may be able to minimize it through changing the design. For example, the introduction of the policy could be stretched out to reduce dislocations during the transition. Alternatively, some groups could be exempted from the requirements. In still other cases, society might directly compensate groups hurt by the policy or might impose special taxes on groups enjoying unearned gains.

4. Economic Efficiency. Economic efficiency — the situation in which society gets the most of those goods, services, and environmental benefits it desires within the constraints of existing resources and technology — requires comparing total social benefits with total costs to ensure that society

does not sacrifice more goods and services than are justified by the benefits of the policy.

So long as resource recovery and other conservation approaches cause a reallocation of economic resources from some industries or products to others, there will be costs as well as benefits. Both require evaluation. The concept of economic efficiency is also discussed in Chapter 2.

5. Administrative Feasibility and Cost. A conservation policy should not require information or data that cannot be acquired at reasonable cost. From a practical viewpoint, the total cost of administration and enforcement of any given policy for both public administrative agencies and private parties should be small compared to the benefits derived.

In applying these five criteria, the Committee was primarily interested in resource conservation, and not, for instance, in correcting economic inefficiencies per se. However, the case for a policy to encourage resource conservation is strengthened to the degree that it would also bring about an improvement in economic efficiency or serve other generally accepted environmental or social goals.



TAX POLICIES AFFECTING THE EXTRACTION INDUSTRIES

The “extraction sector” of the economy includes all mining, agricultural, forestry, and fishing industries engaged in obtaining raw materials, energy, and food products from natural resources. Financial incentives or disincentives for this sector can thus have far-reaching implications, not only for the quantities of natural resources used but also for the volume and composition of resulting waste products and related environmental effects.

The Resource Conservation Committee restricted the scope of its work on the extraction sector to tax-related incentives affecting primarily the non-fuel mineral and forest products industries, although parts of the analysis may also apply to other extractive industries as well. In particular, the Committee studied two sets of Federal tax policies for the extractive sector with respect to their implications for conservation. The first involves existing Federal tax advantages (or “tax subsidies”), which are generally viewed as a stimulus to domestic non-fuel mineral and forest industries. The second policy relates to new extraction sector taxes that might be imposed as a disincentive to slow down the rate at which we use up our natural resources.

As explained more fully in the next section, **existing extraction industry tax advantages** — such as percentage depletion allowances for mining and capital gains treatment of income from timber growing — are viewed by economists and tax specialists as subsidies because they depart from normal methods of taxing income from business investments and provide special economic benefit to the favored industries. In effect, they shift part of the real economic cost of virgin materials from the producers and users (i.e., the market) to the general taxpayer, thus making materials appear less costly in the marketplace. In assessing the effects of these subsidies, the Committee relied heavily on a recent report to Congress, *Federal Tax Policy and Recycling of Solid Waste Materials* (February 1979), by the U. S. Department of the Treasury.

Those who favor the subsidies are usually interested in encouraging development of our domestic resources. Those who oppose them feel that the treatment creates an undesirable incentive for more extensive production

from domestic natural resources than the free market would otherwise provide, thereby causing inefficiency in the use of resources.

The Resource Conservation Committee considered the policy question to be whether these tax subsidies for extractive industries should be reduced or eliminated to achieve a more neutral Federal position relating to resource conservation. Most members of the Committee agree that a neutral tax policy towards virgin material extraction is preferable on grounds of resource conservation and long-range economic efficiency. However, the Committee also recognizes that other national objectives relating to domestic economic stability and national security, particularly with regard to strategic or economically significant minerals that may be subject to foreign-imposed supply restrictions, should also be included in a comprehensive policy decision.

The second policy approach, a **virgin material extraction tax**, would impose either a unit or a value-related tax on mineral and timber production or sale. Its purpose would be to increase production cost and market prices, and thereby potentially both restrain demand for virgin materials and indirectly stimulate secondary material use. Such a policy would presuppose a national consensus favoring increased material conservation. It would operate in precisely the opposite direction from existing tax subsidies, which stimulate virgin materials production, and therefore represents a reversal in national policy. The Resource Conservation Committee recognizes that it would not make consistent policy sense to impose new extraction taxes while at the same time retaining percentage depletion and other tax incentives for the extraction sector.

At the outset, the Committee defined its interest in new extraction industry taxes to be exploratory rather than for the development of an immediate policy initiative. The analysis presented in Staff Background Paper No. 19, "A Conceptual Evaluation of a National Virgin Material Extraction Tax as a Resource Conservation Policy," therefore provides only a conceptual evaluation of the feasibility and implications of this approach. While no Committee members favor recommending immediate consideration of new extraction taxes as a conservation policy, some members endorse them as a potentially useful tool and recommend further study.

Existing Federal Tax Subsidies for Virgin Materials

Background

Several provisions of the Internal Revenue Code afford special Federal tax advantages to mining and timber growing that are not available to other economic activities. Most students of the subject agree that these "tax

subsidies” tend to encourage investment and production in these industries beyond the levels that would be profitable under a neutral tax policy.

The general argument in support of these tax advantages has been that they stimulate natural resource development and thereby contribute to economic growth. Proponents also note that incentives for virgin domestic materials contribute to national self-sufficiency and security and improve our international balance of payments by reducing our reliance on foreign sources.

On the other side of the controversy, many economists and public finance specialists have long criticized these tax subsidies on grounds of general economic inefficiency as well as tax inequity. More recently, reports by the Environmental Protection Agency and others have questioned the wisdom of virgin material subsidies of all kinds in terms of their implications for domestic resource conservation and environmental quality. According to these arguments, subsidizing virgin materials biases economic choices throughout the economy towards more material-intensive manufacturing processes, products, packaging, and consumer lifestyles. The net effect is a faster rate of depletion of our nation’s mineral resources, increased energy usage, more extensive exploitation of land resources, increased air and water pollution, and a larger volume of waste than there would otherwise have been under a neutral tax policy.

In the legislation creating the Committee, Congress specifically instructed the Resource Conservation Committee to study:

. . . the effect of existing public policies (including . . . percentage depletion allowances, capital gains treatment and other tax incentives and disincentives) upon resource conservation, and the likely effect of [their] modification or elimination. . . . (RCRA, Section 8002(j)).

In approaching this task, the Committee has relied heavily on work by the U.S. Department of the Treasury; this chapter in particular draws on the recent Treasury report to Congress on Federal tax policy. That report identified three major forms of tax subsidy for mining and three others for timber growing.

Types of Tax Subsidies

The major tax subsidies for **mining**, as reviewed in the Treasury’s report, include percentage depletion, “current expensing” of certain exploration and development costs, and capital gains treatment of royalty income from properties used in mining iron ore and coal.

Under percentage depletion, the mining enterprise is allowed to deduct a specified fraction of the gross annual value of a mine’s production as a business expense from its current income when calculating its tax liability.

The allowable annual percentage deduction ranges from 5 percent for sand and gravel up to 22 percent for lead, zinc, sulfur, and certain other non-fuel minerals.

Tax specialists define the subsidy element of percentage depletion as the decrease in the firm's net tax liability using the percentage measure compared with what the liability would have been under cost depletion. For tax accounting purposes, cost depletion is equivalent to ordinary capital depreciation as a means of allocating the initial costs of exploration, acquisition, and development over the life of a mine.

Unlike the cost depletion alternative or ordinary tax depreciation of capital assets in other kinds of business, the amount of tax deduction under percentage depletion does not have to bear any relationship to the taxpayer's original investment or "cost basis" in the mineral deposit. In fact, it is possible under percentage depletion to take tax deductions that add up over time to several times the original investment in the mine. Percentage depletion has been available for petroleum and natural gas since the Internal Revenue Act of 1926; it was extended to metallic ores in 1932, and by 1954 all minerals were covered. Its application to petroleum and gas has recently been severely reduced.

Treating mine exploration and development costs as current expenses, rather than including them in the cost basis of the mine, provides a financial advantage by allowing an immediate tax deduction instead of a gradual cost depletion deduction as the mineral is "used up" by mining. This "current expensing" yields an improved cash flow and can be considered equivalent to an interest-free loan from the Federal government.

The taxation of royalty income at capital gains rates (40 percent of the ordinary income tax rate for individual taxpayers and 28 percent instead of 46 percent for corporations) is of obvious direct benefit in mine leasing arrangements. Although percentage depletion cannot be taken against royalty income treated as "capital gains," the lower capital gains tax more than compensates for this. As with the other tax subsidies, it has the effect of lowering the supply price of mineral deposits, thus increasing the amount available for development by the mineral industries.

For **timber growing**, the major tax subsidies are capital gains treatment of income, "mismatching" of income and expense, and deductibility of expenses used to create capital gains in timber growing against current income from other company operations.

Basically, taxing the income from timber growing at capital gains rates reduces the tax rate for timber growing companies by almost 40 percent below the rates usually applied to corporate income. This practice was introduced into the Internal Revenue Code in 1944. It encourages the use of forest resources for timber and the renewal of timber stocks following cutting.

The “mismatching” of income and expense relates to the timing of tax deductions on expenses for timber growing, such as planting, spraying, and thinning. Present tax practice allows for deducting such expenses as they occur, rather than requiring the more usual method of “capitalizing” the costs over time and deducting them from income received at the time the timber is sold. This form of “current expensing” for timber growing is similar in its effect on profits to the current expensing of exploration and development costs in mining, in that it is equivalent to a very long-term interest-free loan from the Federal government.

Finally, currently deductible expenses incurred by a company in growing timber can also be claimed as a business expense to reduce tax liabilities in other, unrelated activities of the same company, where the marginal corporate tax rate is at the normal 46 percent rate (48 percent in past years) rather than being deducted against capital gains from sale of the timber itself which is taxed at a 28 percent rate. In effect, according to the U.S. Treasury analysis, this deduction has the effect of converting ordinary income in the company’s manufacturing or other business lines into capital gains in timber growing.

Size of the Tax Subsidies

Estimating the size of the tax subsidies is a necessary beginning in evaluating their effects on natural resources and the economy. Since tax accounting can be complicated and because much necessary data is not available for individual investment properties, calculating the actual value of the various tax subsidies to mining and timber growing is difficult and subject to error. Not the least of the difficulties is determining valid sales values for ores and timber; both are substantially controlled by vertically integrated enterprises and often transferred between divisions of the same company instead of being sold on the open market. Nevertheless, several estimates have been made, using various accounting assumptions, including two approaches used by the U. S. Department of the Treasury which are summarized here.

One approach has been to perform sample corporate income tax calculations for “typical” mine and forest properties, comparing resulting tax calculations under the subsidy allowances with what taxes would have been under normal corporate tax rules. Using this approach, the recent U. S. Treasury Department report, *Federal Tax Policy and Recycling of Solid Waste Materials*, estimated the before-tax cash value of the three listed mineral industry subsidies at 8 to 12 percent of the value of output for United States ore and copper extraction. Among the three types of mineral subsidies, percentage depletion accounted for most of the total value.

The Treasury estimated the combined (before tax) value of the three subsidies for timber at between 35 and 45 percent of the standing value of

timber before cutting. The three forms of subsidy are interrelated. Capital gains treatment and mismatching of income and expense would each have larger impact individually if the other form did not exist; the effect of deduction of expenses against other ordinary income, however, is magnified by the existence of the other two factors.

An alternative approach, based on an evaluation of tax returns and data on total annual production, has been used by the Treasury's Office of Tax Analysis to calculate the total "tax expenditure" impact of these subsidies, among others, on the Federal budget. Table 6 summarizes the results of these calculations for the fiscal year 1978.

Table 6

**ESTIMATED COST TO THE U.S. TREASURY
OF TAX SUBSIDIES FOR THE NATURAL RESOURCE
EXTRACTION INDUSTRIES, 1978 (Millions)**

Type of Subsidy	Non-fuel Minerals	Mineral Fuels	Timber Growing	Total Resource Industries
Percentage Depletion	\$350	\$1,110	—	\$1,460
Expensing Exploration and Development Costs	15	1,170	—	\$1,185
Capital Gains Treatment				
(a) Iron ore and coal royalties	10	65	—	75
(b) Timber income	—	—	275	275
Total Budget Value of Tax Subsidies	\$375	\$2,345	\$275	\$2,995

Source: Calculations by Office of Tax Analysis. U.S. Department of the Treasury, for the Resource Conservation Committee. Based on estimates and procedures used in calculating tax expenditure estimates by function in *Special Analyses: Budget of the United States, Fiscal Year 1979*, Special Analysis G, pp. 155-158.

The figures in Table 6 are estimates of the foregone Federal income tax revenues that constitute the various tax subsidies. Thus, for all non-fuel minerals, the cost to the Treasury in 1978 was estimated at \$375 million. However, these subsidies are "paid" in tax-exempt form; they are thus equivalent to an appropriated cash subsidy of \$720 million at the (then

existing) corporate tax rate. The revenue impact of these subsidies for fossil fuels in 1978 was over \$2.3 billion (about \$4.4 billion on a before-tax basis).

For the timber industry, only capital gains treatment of timber income is included in the budget cost figures because of difficulties in estimating the values of the other tax subsidies. However, on the assumption that capital gains treatment accounts for roughly one half of the total subsidy to timber growing, the total tax saving would be twice the \$275 million estimate shown in Table 6, or \$550 million. This converts to the equivalent of a (before-tax) appropriated cash subsidy of about \$1.06 billion per year to U. S. timber growers.

Economic Effects

Tax subsidies to virgin materials, by transferring part of the real costs of material extraction to the Federal budget, have the general effect of making virgin domestic materials appear less costly in the marketplace than they really are. Economic theory suggests a variety of implications of understating the true costs of domestic virgin materials, depending particularly on the position of the material in world trade.

Where commodities are widely traded on world markets and the nation is a substantial net importer, it is likely that the major effect of subsidizing a domestic virgin raw material is to cause expanded production and substitution of the domestic for the imported material. There will be increased development and use of the domestic natural resource, but relatively little effect on price of the raw material which is largely determined in the more competitive world market. Consequently, the "material-intensiveness" of the economy would not be significantly effected. However, depending on the size of subsidy and on cost conditions for the domestic virgin material, the rate of extraction of the virgin resource could be significantly increased.

Under alternative circumstances where a material is not widely traded on the world market, due to high relative cost of transportation, or where the domestic firms provide a significant portion of the world supply, the implications of subsidizing the country's virgin resource extraction can be somewhat more complex. Under these conditions, subsidizing the domestic virgin material may produce a downward shift in the commodity's market price, inducing a variety of other substitution effects in domestic material markets.

For example, to the extent that prices of raw materials are reduced:

- (1) **Raw material processing may be less technologically efficient.** There may be less incentive to economize in processing it or to develop more efficient (material-conserving) processing

technology. The processing sector will then tend to consume more crude raw material per unit of finished product than it would in the absence of subsidies.

- (2) **Secondary (recycled) raw materials may be less in demand, and there may be less recycling.** If virgin raw materials are sufficiently subsidized, secondary materials recovered from the waste stream become less competitive.
- (3) **Products may be designed to use more materials.** To the extent that raw materials in general are made relatively less costly, there will be less incentive to economize on materials and there will be a tendency to design products and packaging that are relatively more “material-intensive.” This applies to capital goods (industrial equipment and buildings) as well as to consumer goods. Material-intensive consumer goods may take the form of larger, heavier products and more packaging.
- (4) **Consumers may be encouraged to buy more material goods and less services.** If material-intensive goods become relatively less expensive compared with more labor-intensive services (or leisure), consumers will tend to consume more of the former. To the extent that the government sector bases decisions on relative costs, public choices will be similarly skewed in the direction of material goods.

In a “closed economy” or a relatively isolated nation that depended primarily on domestic raw materials – a condition that characterized the U.S. during most of its history – these types of price-induced effects would likely be much more probable and pronounced. In a world in which there is extensive international trade in a great many basic raw materials (for example, see Table 5 in Chapter 2), the more competitive world prices will exercise a moderating or controlling influence on domestic raw material prices.

Empirically, there is still much to be learned about the quantitative dimensions of these domestic and international economic effects. Because of the complexities involved, no one has yet made comprehensive estimates. However, several analyses have attempted to estimate the effects of extraction industry tax subsidies on finished raw material prices and the rate of recycling. Among the more well known are two studies for the Environmental Protection Agency: *An Evaluation of the Impact of Discriminatory Taxation on the Use of Primary and Secondary Raw Materials* (1974), by Booz, Allen and Hamilton; and *Impacts of the Federal Tax Code on Resource Recovery* (1976), by the Environmental Law Institute. The most recent is the aforementioned report by the U.S. Treasury Department, *Federal Tax Policy and Recycling of Solid Waste Materials* (1979).

The most carefully studied relationship has been that between tax subsidies and material recycling. Based on conventional statistical-economic methods, the general conclusion from several studies, including the Treasury's report, has been that recycling of the major materials in solid waste would increase by only a few percentage points, at most, if existing virgin material subsidies were to be eliminated. The lower range of estimates has been a less than one percent increase for some secondary materials.

One principal reason for this lack of response in recycling is that the crude raw material (mined ore, standing timber), of which the tax subsidy is a relatively large percent, contributes only a modest fraction to the total cost of the finished or refined raw material (steel, paper). Thus, the relative impact of the tax subsidy on refined raw material prices is much less than its initial percentage of extraction prices.

Another major reason for the relatively low estimates of recycling effects is that most investigators have found low responses to market price changes both on the part of manufacturing industries that can use secondary raw materials and on the part of secondary material suppliers. These low "price elasticities" of secondary material demand and supply have been estimated by researchers applying statistical techniques to historical market data. Though subject to various shortcomings, the methods represent the most advanced quantitative approach available.

The "state-of-the-art" economic analyses thus predict a positive but relatively small recycling impact from removing virgin material tax subsidies. However, these conclusions should not be accepted without some qualification.

In particular, the conventional econometric analysis underlying these market estimates assumes highly competitive industries, using responsive competitive prices as the principal means of allocating resources to the production of virgin and secondary materials and of allocating supplies of these competing raw materials among potential manufactured-goods markets. In reality, the major raw material industries in the United States are heavily integrated "vertically" from virgin raw material extraction (both domestic and foreign), to final finished material, and often into final manufactured goods as well. They are also highly concentrated "horizontally," with a small number of firms dominating each material market. For example, eight major vertically integrated firms control 75 percent of the steel industry in the United States, and in 1974, 85 percent of their iron ore consumption came from company-owned sources.

Under these market structures, published prices of virgin crude materials and of secondary materials may not reflect relevant opportunity costs or retain their traditionally assumed significance in determining raw material production and allocation decisions. Data on price and quantity relationships

from these industries may also bias the results of econometric models attempting to project responses to changes in subsidies.

The final report of the National Commission on Supplies and Shortages suggested, but offered little evidence to support the thesis, that percentage depletion and other tax subsidies have encouraged the growth of vertical and horizontal concentration in the primary materials industries. If true, these subsidies may also continue to give the dominant primary material firms reason to reinvest profits primarily into virgin resources and processing, rather than towards competing secondary material supply sources or processing technologies.

The dominant firms tend to control the major private sector sources of funding for innovative activity in the material industries — invention, research, development, marketing. If it could be demonstrated that basic innovation is biased towards virgin materials by present tax subsidies, then removing these subsidies could have a much more profound long-term influence on secondary material recycling and conservation than the economic models suggest. It is not possible, under present knowledge, to demonstrate that the pattern of innovation in raw material processing and use has in fact been significantly influenced by virgin material subsidies, although this effect has been suggested by secondary raw material dealers.

Recently, in two of the most important modern examples of innovation in the use of secondary materials, the Garden State Paper Company has achieved full-scale commercial production of newsprint based on 100-percent secondary fiber, and companies in the primary aluminum industry have undertaken wide-scale recycling of aluminum beverage cans. Both cases are of particular interest in that they also involve a new type of vertical integration — not to domestic or foreign virgin raw materials but into domestic systems of source-separated, post-consumer waste. In both instances, the innovations were undertaken by companies that did not have vertical control of a domestic virgin resource supply. In the case of Garden State Paper, this innovation was achieved by a new entrant into the newsprint sector, integrating backward from publishing operations, rather than the traditional integrated forest-product firms. In the aluminum example, the traditional primary firms do not have the low cost bauxite as a domestic resource option.

Examples such as these suggest, though they certainly do not prove, that if domestic virgin resource extraction were less encouraged by governmental subsidy, the raw materials industries might shift their investment forms and innovational efforts somewhat more towards secondary materials.

The general conclusion of the analysis is that removal or reduction of existing Federal tax subsidies to the extraction industries would conserve domestic natural resources, save energy, and reduce the domestic environmental damages associated with basic material extraction and processing.

The extent of these conservation effects is somewhat uncertain, but the preponderant available evidence suggests rather weak effects on overall material consumption and recycling, at least in the short to medium term for which predictions have been made.

Other Policy Issues

In addition to natural resource and environmental implications, several other economic, social and administrative consequences of virgin material tax subsidies were also reviewed by the Committee:

Free Market Principles; Economic Efficiency. Economists have long argued that subsidizing domestic virgin materials tends to reduce national economic welfare by encouraging an inefficiently high investment in development and use of those materials at the expense of other sectors. In effect, subsidies distort free market choices of “what to produce” and “how to produce” by favoring some products and raw materials over others. In addition, to the extent that these subsidies have artificially stimulated those economic sectors (primarily basic mining, processing, and energy) that have the most adverse domestic environmental effects, they contribute to the economic costs of pollution. Thus, removal of these subsidies would be entirely consistent with the principles underlying a competitive market economy, thereby contributing to improved overall allocation of the nation’s resources.

The “Polluter-Pays” Principle. Subsidy approaches are generally contrary to the “polluter-pays” principle: they substitute payments by taxpayers for payments by beneficiaries of the subsidized activity.

Social and Economic Equity. Tax subsidies to virgin materials raise several issues concerning economic equity or justice. Those noted in the literature include transferring income from general taxpayers to the windfall benefit of the favored landholders and benefiting larger integrated companies over smaller, nonintegrated competitors in the forest products industry. Secondary materials producers have long argued that their competitive position in materials markets has been diminished by subsidies to virgin materials.

In addition, some have argued further that the present tax subsidies hasten natural resource depletion and environmental degradation, thereby impoverishing future generations and contributing to “intergenerational inequity.” Others have argued that this has not been demonstrated historically, at least in relation to material availability, pointing out that technological innovation has enabled use of lower grade resources and provided substitutions at equal or lower cost.

Administrative Feasibility and Cost. There is little question that the present tax subsidies complicate the tax code and raise administrative costs of the Internal Revenue Service for review and monitoring. Although there is no present estimate of the amount of these costs, removing these provisions could only increase the efficiency of the tax collection system. However, simply reducing the level of the subsidies (for example, by reducing the percentage rates for depletion allowances) would probably have little or no effect on administrative costs, although it would result in increased net tax revenue.

The Department of the Treasury has also pointed out that, in this context and many others, providing subsidies to industries through tax deductions is more costly to the government than an appropriated (direct) subsidy of the same budgetary cost (see Chapter 5).

Committee Findings

Based on staff analysis conducted by the Treasury Department and other considerations, the Resource Conservation Committee finds that:

- Several Federal tax subsidies significantly reduce supply costs for domestic virgin materials. Important among these are:
 - percentage depletion for minerals
 - favorable tax treatment of mineral exploration and development costs
 - capital gains treatment for timber
 - mismatching of income and expenses in timber growing and harvesting.
- Such subsidies encourage overuse of virgin domestic resources. However, the negative effect on recycling appears to be small (less than 5 percent), although significant uncertainties exist in analyses of the elasticities of domestic and foreign supply and of substitution between virgin and recycled materials.
- As presently designed, these subsidies are not cost effective compared to appropriated subsidies with the same budgetary cost.
- There is no public policy justification for subsidizing virgin materials over secondary materials.
- Removal of these subsidies would probably increase imports of iron ore, copper, lead and zinc; it would decrease export volume in phosphate rock and timber.

Committee Recommendations

Only one member of the Committee is prepared to make an immediate recommendation for elimination or modification of the tax subsidies presently granted to the domestic virgin materials extraction industries. This member asserts that Federal tax policies should be neutral, and therefore not favor domestic natural resource development or virgin materials. On the other hand, only one member specifically recommends that no changes be considered at the present time, citing estimates of low impacts on recycling and general uncertainty about what the other effects of such an action would be.

All the members agree, however, that the issue of reducing existing Federal tax incentives for extraction industries is worthy of further consideration. Eight members join in recommending that the arguments for revising virgin material tax policy be included in a broad review of U.S. minerals policy. They therefore recommend that the Administration's (interagency) Task Force on Non-Fuels Minerals Policy, upon completion of an analysis of this subject by the Treasury Department, consider elimination or modification of these tax subsidies in light of overall national objectives such as resource supplies, environmental protection, economic health, and national security. Four of those members recommend further that the Administration undertake such a review as part of the next tax reform package. The ninth member of the Committee stressed that any further study or other consideration should include public participation.

Extraction Taxes on Virgin Materials

If the nation should decide to pursue a more aggressive resource conservation policy, one option to consider would be disincentive taxes applied to virgin material extraction. The purpose of such taxes would be to slow the rate of domestic natural resource development by increasing the prices of domestic virgin materials, thereby discouraging the demand for them in less essential uses.

Several State governments have long employed severance taxes on mining operations in order to raise revenue. These taxes are levied at relatively low rates so as not to discourage production and are sometimes used as a substitute for property taxes. The Federal government does not presently levy such taxes, although from an administrative standpoint the strip-mine restoration tax and the royalty fees charged some private mining operations on Federal lands are similar in form and point of application.

Interest in national extraction, or "severance," taxes has been stimulated in academic and conservationist circles by the recent work of Talbot Page at

Resources for the Future and others on intergenerational equity in the use of natural resources and long-term conservation policy. In that context, the term "severance tax" has been used broadly to refer to the concept of applying unit or value taxes at the point of raw material extraction. The Resource Conservation Committee has used the broader term, "extraction taxes," to refer to this concept, because traditionally severance taxes have applied only to mining and because they may also, according to some writers, involve Constitutional implications which limit their use to State governments. For present purposes, then, the Resource Conservation Committee has viewed extraction taxes as Federal excise taxes on the output or sales of timber or material obtained through mining.

As discussed in Chapter 2, there are several reasons why it might become desirable to slow the rate of virgin material use. One reason, for example, might be a desire to restrict production and use of virgin materials in the short run as a means of encouraging development of substitute materials and technologies; this could be a way to relieve future pressures on natural resources and stabilize real costs of materials in the long run. Efforts to restrict current virgin material use demonstrate a conservative preference to reduce risks of future resource exhaustion or shortage in an uncertain world. Another reason is that it may be desirable at some time to employ a general strategy of restraint on material use as a long-term environmental protection measure and as a way of reducing the total cost of pollution control and land protection. All of the rationales cited presuppose a long-range viewpoint and a sense of conservatism regarding future material use and environmental prospects.

If the policy were intended to conserve domestic virgin resources only, then the tax would only have to be applied domestically. However, if the objective of the policy were to reduce all domestic use of virgin material (both home and imported), then taxes or other restrictions would also have to be applied to imported virgin materials and to imported goods containing virgin materials.

As noted previously, the Resource Conservation Committee's interest in extraction taxes as a conservation policy was primarily exploratory, and staff work was limited to a conceptual evaluation of general feasibility and impacts. Staff Background Paper No. 19, "A Conceptual Evaluation of a National Virgin Material Extraction Tax as a Resource Conservation Policy," presents the results of the staff's analysis.

Consequences of Extraction Taxes

In principle, extraction taxes should produce the same general types of responses as those indicated for virgin material tax subsidies discussed previously, but in the reverse direction. In a closed economy (no international

trade) the economic theory of substitution suggests that if a virgin materials extraction tax were imposed:

1. Products and service systems would be designed to use **less** material per unit of product or service provided.
2. Raw material processing would tend to be performed **more** efficiently from a materials standpoint, leaving less process waste and requiring less raw material per unit of finished material.
3. Consumers (both private and government) would be encouraged to buy **fewer** (and less material-intensive) goods and **more** services. In certain instances, the population might choose more leisure and less consumption.
4. Secondary (recycled) materials would be used **more** extensively in place of virgin materials.

In an open economy (with international trade) the country would import **more** and export **less** of the taxed domestic raw materials and products manufactured from them. If imported materials and goods were also taxed, imports might not increase, but exports of raw materials and products manufactured from them would still be reduced.

The net effect of taxing both domestic virgin materials and imported goods and materials would be a less “material-intensive” economy. A given level of gross national product would require less in the way of natural resources to sustain it, and would generate a lower rate of waste products and pollutants. In addition, energy use would be less, partly because material use and industrial energy requirements are complementary and also because secondary material supply systems typically use less energy than virgin material supply operations. However, some uses of energy substitute for materials or consumption of goods, at industrial or household levels, and the net effects would have to be studied in detail empirically to reach firm conclusions.

Much of the impact of extraction taxes depends on the role and responsiveness of foreign trade. If foreign sources of the taxed virgin materials are readily available at competitive cost, unrestricted by import quotas or tariffs, then import substitution would partially or substantially short-circuit the impact of the tax on material and energy use. The use of domestic virgin material would still be expected to decline, but changes in overall raw material and energy prices would be tempered by imports, thus weakening the market incentives for greater efficiency in material use and for increased recycling. Thus, under free trade, many of the conservation objectives of an extraction tax policy — especially those related to waste generation and domestic pollution control — could be largely unattainable.

Moreover, under free trade, part of the price of using extraction taxes for conservation purposes could be a shift in the balance of payments and a

possible reduction in the international value of the dollar. Clearly, in addressing extraction taxes, policymakers would be well advised to consider imposing an equalizing import tariff on raw materials and/or rebating the tax for materials and products exported to neutralize the foreign trade implications.

The Committee staff did not develop numerical estimates of the effects that extraction taxes might have on virgin material use or other economic and environmental consequences. Some inferences can be drawn, however, from the analyses of existing tax subsidies noted previously in this chapter. Basically the “econometric” analyses indicate that the economy would be relatively unresponsive to virgin raw material price increases. If true, this would mean that very high tax rates, perhaps 10 to 50 percent of the value of mineral or timber production, might be required to achieve “meaningful” conservation results (say, 2 to 5 percent reduction in virgin material extraction). There is considerable room for uncertainty and speculation concerning these relationships, and more work would need to be done before drawing any firm conclusions.

Other Policy Issues

In addition to examining their implications for conservation and the environment, the staff also evaluated extraction taxes from the standpoint of economic efficiency, social equity, and administrative practicality.

Free Market Principles; Economic Efficiency. Extraction taxes would be a major intervention by the Federal government into the private market system of resource allocation. However, given a national decision to pursue a policy of material conservation, extraction taxes would be generally consistent with decentralized decisionmaking and free-market resource allocation.

In contrast with other policy options for regulating virgin material production or use, such as production quotas or rationing, extraction taxes would preserve the traditional role for the private sector regarding how natural resources are to be allocated among products. In essence, national priorities regarding how much domestic virgin resources to consume could be influenced through extraction taxes, while leaving choices about specific allocations to the marketplace. In theory, this would represent a minimal interference with the efficient operation of the market economy.

The “Polluter-Pays” Principle. If extraction taxes were adopted to minimize the environmental damage associated with material use, they would be consistent with the polluter-pays principle. Otherwise the polluter-pays principle would not be relevant to extraction tax policy.

Social and Economic Equity. The primary short-run equity issue involved in levying extraction taxes involves windfall gains and losses. The major losers would be the owners of those mine and forest properties that would be

hurt by the decrease in value of properties made less profitable by the tax policy. Principal short-term gainers would include owners of virgin materials overseas if imports were not taxed and exports were not credited and those with present investments in domestic secondary material supply systems if imports were taxed.

If the negative effects on mining or forest investment were substantial and if the transition occurred rapidly, there could also be locally concentrated unemployment and other adverse community impacts. The Committee did not study these effects.

In the long term, future generations of Americans would presumably be better off because they would inherit a less depleted or degraded endowment of natural resources than they otherwise would have. On the other hand, because the rate of natural resource development and consumption would have been slowed and more expensive methods of providing goods and services would have been substituted, present generations would probably have had to accept a somewhat lower standard of living.

Administrative Feasibility and Cost. Extraction (“severance”) taxes have long been used by State governments, suggesting that they are feasible from an administrative and enforcement standpoint. It is also possible that, once implemented, a well designed extraction tax might be less complex and costly to administer than the present tax subsidies for the extraction industries. However, if the conservation tax policy also involved a system of tariffs or quotas on virgin material and product imports to complement domestic extraction taxes and a rebate for exports of goods and materials, the administrative considerations would be very complex. Since the Committee has not investigated these considerations in any detail, no firm conclusions are warranted.

Committee Findings

As a result of their evaluation, the members of the Resource Conservation Committee reached the following findings regarding virgin material extraction taxes:

- Virgin material extraction taxes, accompanied by complementary tariffs, would make virgin materials more expensive and encourage resource conservation. However, the RCC did not undertake specific quantitative studies to estimate the reduction in consumption that might accompany the taxes.
- If virgin material extraction taxes are not matched by tariffs on imports, domestic production could be at least partially displaced by imports of materials and fabricated goods.

- Administration of a set of complementary virgin material extraction taxes and tariffs would be complex.
- The virgin material extraction tax concept runs directly counter to existing Federal tax policy, which encourages domestic virgin resource use.
- Virgin material extraction taxes could be the most direct and broadly based financial incentive to accomplish resource conservation.
- Virgin material extraction taxes which are large enough to significantly affect domestic resource use would cause economic dislocation in the extraction industries and in some communities unless phased in over time; they would also lower living standards in the short run.

Committee Recommendations

None of the members of the Committee favor recommending that virgin material extraction taxes be developed or proposed at this time. Two members, however, endorse taxes on virgin material extraction as a potentially useful tool to encourage resource conservation; one of these members recommends further study.

Two members oppose virgin material extraction taxes generally, although one of them also recommends further study. One other member also recommends further study to determine the specific impacts of the taxes, without taking a further position at this time.

Six members of the Committee emphasize that existing tax policies to encourage virgin material production should be eliminated before any new extraction taxes are considered further. Taxing virgin material extraction to foster resource conservation would be virtually the reverse of the present tax advantages enjoyed by the extractive industries.



RESOURCE RECOVERY POLICIES

One method of conserving virgin materials without having to “make do with less” is to recycle materials. Today the United States reclaims only about 8 percent (by weight) of its municipal solid waste — tin cans, bottles, paper, refrigerators — to recover the resources contained in them. We simply throw away the other 92 percent.

The Resource Conservation Committee examined a number of policies that might lessen the financial or technical impediments to resource recovery. The three policies discussed in this chapter — subsidies for resource recovery, revision of railroad freight rates that may discriminate in favor of primary (virgin) over secondary (recycled) materials, and product design regulations — have increased resource recovery as their explicit goal, although many of the other policies the Committee studied would also have a similar effect.

The Committee defined **subsidies for resource recovery** as explicit Federal payments or tax advantages which are specifically granted to promote resource recovery. These payments shift part of the cost of recovering materials or energy from producers and consumers to taxpayers. The subsidies studied by the Committee do not include assistance specifically for research and development or for technological improvement, although these are undeniably forms of government subsidy.

With respect to **freight rates for primary materials**, scrap dealers and their trade associations have long alleged that railroads have systematically charged higher freight rates relative to costs for transporting secondary materials than for their primary material counterparts. If the allegation is true, and if, moreover, the differences are unwarranted, substantial, and systematic, the structure of railroad freight rates could be artificially encouraging use of virgin materials at the expense of reclaimed materials. This disparity, in turn, would interfere with more fully recycling our wastes. The issue has been under review by the Federal Courts and by the Interstate Commerce Commission, the Federal agency responsible for regulating railroad rates. The Resource Conservation Committee had a direct interest from the standpoint of whether existing public regulatory policy might be operating against material conservation.

Product regulation is a broad term which, in general, refers to direct, mandatory controls restricting the design, manufacture, or use of consumer products. Product design regulations could be used as a resource conservation tool in two principal ways: (1) to promote a reduction in the rate at which resources are consumed and wastes are generated (e.g., by requiring the production of reusable or more durable products or by requiring product designs which reduce the quantities of material used per unit) or (2) to promote the recovery of energy and materials from the waste stream once generated (e.g., by prohibiting materials or designs that inhibit resource recovery or by requiring the use of recovered materials in manufacturing).

Although all of these policies are aimed at increasing the rate of resource recovery, they would achieve that end through very different means. Subsidies for resource recovery would be a positive step on the part of the Federal government to encourage the development and use of resource recovery systems. Product design regulations would also be an explicit measure to stimulate either the use of less virgin materials or the supply of or demand for recycled materials. Removing any discrimination in the setting of freight rates would neutralize existing Federal policy by removing an artificially created competitive disadvantage.

The Committee found that all three policies could be effective in furthering resource recovery. The complete evaluation, which is summarized in the following sections, led the Committee to recommend only more study of subsidies and product regulations, however, since economic, administrative, and other problems do not make them suitable to recommend at this time. The Committee found that freight rates probably discriminate against many secondary materials, although not all. However, subsequent to the Committee's analysis and final deliberations, the Interstate Commerce Commission recently ordered widespread reduction in secondary material railroad freight rates. Although the reductions are generally consistent with resource conservation objectives, the Committee did not have an opportunity to review and comment on them in detail.

Subsidies for Resource Recovery

Governments frequently supply economic assistance — subsidies — when they wish to encourage behavior that would be difficult to bring about without the assistance. Grants to communities to build wastewater treatment plants are a typical example: the Federal Government supports a policy (preventing water pollution) that would be difficult to carry out without intervention. With respect to resource recovery, the government could use subsidies to encourage the creation and operation of facilities for processing mixed municipal wastes or to encourage source-separated materials recovery,

which would involve public education on how to separate materials as well as facilities to recover materials from the separated wastes.

Although the Committee found that subsidies could be effective in promoting resource conservation, it does not recommend subsidies at this time, primarily because of the costs involved. These costs can include not only the direct budgetary costs to the government, but also indirect costs; for example, one might ask if it is fair for all taxpayers to pay for subsidies that benefit only a few. Transferring the cost burden for subsidized resource recovery to all taxpayers would violate the “polluter pays” principle. Subsidies also disrupt normal market operations and in some cases may encourage levels of recycling that could cost more to subsidize than they return in benefits.

The Committee elected to defer recommending further subsidies until such time as the government judges that it would be to the public good to have more recycling than the market itself and present subsidies provide.

Although the Committee did not favor recommending new subsidies, it did evaluate different forms that a subsidy might take, should it later become a national priority to increase recycling through subsidization. The RCC did not attempt to analyze in depth any questions of detailed policy design or cost-effectiveness. Within those restrictions, the Committee staff evaluated ten forms of government subsidies for resource recovery in Staff Background Paper No. 15 “Preliminary Staff Report on Recycling Subsidies.” The ten general forms, and a definition of each, appear in Table 7.

The Department of the Treasury report, previously referenced in Chapter 4, *Federal Tax Policy and Recycling of Solid Waste Materials*, also covers many of the same subsidy topics as the RCC staff report and reaches similar conclusions.

Characteristics of Subsidies

The ten subsidies share several characteristics that allow us to classify them. Table 8 sets out one arrangement. Subsidies can be classified by whether they relate to capital (plant, equipment) or to throughput (quantity or value of material sold, purchased, or processed). Of the 10 subsidy forms listed in Table 7, cash bounties for recycled materials and tax credits for recycled materials are throughput or operating subsidies; the remaining eight are capital subsidies.

Those who believe that an initial reduction in facility or equipment costs is necessary generally advocate capital subsidies. That stress on investment, however, encourages the construction of resource recovery facilities that have higher capital costs as a percent of total costs than might otherwise be the case.¹ The resulting technological bias can lead to premature replacement of existing facilities and failure to adopt systems (including labor-intensive

¹ See, especially, *Federal Tax Policy and Recycling of Solid Waste Materials*, Chapter 4; Department of the Treasury, February 1979.

Table 7

**SUBSIDIES EXAMINED
BY THE RESOURCE CONSERVATION COMMITTEE**

Type of Subsidy	Definition
1. Construction and Equipment Grants	Outright cash payments by the Federal government to private groups or individuals or to states or municipalities; reduces out-of-pocket costs of building resource recovery facilities or purchasing equipment.
2. Construction and Equipment Loans	Loans by the Federal government to cover costs of constructing plants or purchasing equipment; provides financing for resource recovery facilities when the risk is too high for a private lending institution or provides financing at a lower rate of interest than that prevailing in the market.
3. Loan Guarantees	Promises by the Federal government to make payment to the lending institution if the borrower defaults on a loan; lowers the risk to the lending institution and therefore makes financing less costly or more available than it otherwise might be (similar to #2 in effect).
4. Investment Tax Credit	A provision in the Internal Revenue Code which would allow investors to pay a smaller tax on earnings from an investment in resource recovery than they would on other earning; encourages investment in resource recovery facilities.
5. Accelerated Depreciation	A provision in the Internal Revenue Code which would allow depreciation on resource recovery plants and equipment to be written off sooner rather than later; defers tax payments to the later years in the life of the facility than would otherwise be the case and thus reduces the cost of recovering energy or materials.
6. Tax-Exempt Bond	A provision in the Internal Revenue Code which exempts interest earned on State and municipal financial instruments from federal income taxes; enables States and municipalities to raise capital at a lower rate of interest.
7. Industrial Development Bonds	Financial instruments which raise capital for private business enterprises but are nominally issued by state or local governments; allows private businesses to take advantage of state or local bond tax exemption and thus build resource recovery facilities at lower costs.
8. State and Local Taxable Bond Option	Partial payment by the Federal government of interest due on a taxable obligation; reduces the costs borne by states or municipalities of resource recovery plant construction.
9. Cash Bounties for Recycled Materials	Direct cash payment by the Federal government to a private firm, State or municipality engaged in resource recovery, based on the amount of recycling achieved; reduces the marketing cost of recycling materials and the out-of-pocket purchase prices of recovered materials.
10. Tax Credits for Recycled Materials	A provision in the Internal Revenue Code granting a credit to a taxpayer based on the amount of recycling achieved or on the volume of recycled material used; encourages recycling by lowering tax liability.

Table 8

CLASSES OF SUBSIDIES

	Capital	Throughput
Cash	Construction and Equipment Grants	Cash Bounties for Recycled Materials
Credit	Construction and Equipment Loans Loan Guarantees	
Tax	Investment Tax Credits State & Local Taxable Bond Option* Accelerated Depreciation Industrial Development Bonds* Tax-Exempt Bond Financing*	Tax Credits for Recycled Materials

* Subsidies marked with an asterisk are also credit-capital subsidies: they encourage investment by giving the investor a tax break on the income from the investment. The effect is to make financing available at an interest rate that is less than the prevailing private market rate.

solutions) which minimize total cost. Operating or “throughput” subsidies avoid this technological bias, since capital-intensive as well as labor-intensive processes compete for the subsidy on a least-total-cost basis.

A second method of distinguishing among subsidies is by type of transfer mechanism, i.e., whether they involve (1) cash payments (construction and equipment grants, cash subsidies for recycled materials); (2) credit arrangements (construction and equipment loans, loan guarantees, industrial development bonds, tax-exempt bond project financing); or (3) reduction in tax liabilities (investment tax credits, accelerated depreciation, State and local taxable bond option, tax benefits for recycled materials). (See Table 8.)

Cash subsidies include not only direct cash payments to private sector firms and individuals, but also direct grants from the Federal government to States or municipalities. Depending on their design, cash subsidies can be limited or open-ended in terms of the amount of funds made available, and, compared to other types of subsidies, can be changed fairly easily over time (e.g., through budgetary amendments).

Credit subsidies arise whenever the government enters a loan transaction to lower the rate of interest below what the borrower would otherwise pay. Credit subsidies can take the form of direct loans, involving the flow of funds from and back to the government; interest rate subsidies; or loan guarantees, which involve the transfer of funds only if the recipient defaults on a loan from another source.

A tax subsidy is a special provision in the tax code which allows an individual or a company that engages in a specified activity covered to make a smaller tax payment to the government than would otherwise be required. For example, the Energy Tax Act of 1978 provides for a 10 percent business tax credit for investment in equipment which recycles solid waste or recovers energy from waste.

The Committee found several inherent weaknesses in tax subsidies. There is no fixed budget ceiling, because the amount of the subsidy is typically open-ended, depending on the level of economic activity. Furthermore, unless there is a fixed time duration specified in the law, tax subsidies are also open-ended in time, remaining in the Internal Revenue Code until removed. In addition, this form of subsidy does not fall under the same scrutiny as budgeted items, because it does not involve annual appropriations. Therefore, the Committee considers appropriated subsidies — for which specific amounts are set aside for each government program, all of which must compete for funding with other programs — more desirable.

A third way of distinguishing among subsidy programs is to separate them into two categories which the Committee chose to call “short-term” and “long-term.” Subsidies designed to help overcome barriers to the commencement of resource recovery (examples are technical assistance, research and development, local implementation planning, and aid to newly developing, or “infant” industries) are “short-term” assistance; the others provide continuing, and usually much more costly, assistance over the “long-term,” as is the case with capital and operating subsidies. All of the subsidies the RCC evaluated were of the “long-term” type.

While the Committee did not look favorably on the idea of establishing new “long-term” subsidies, it did point out that “short-term” subsidies can be an appropriate and useful way of helping to launch resource recovery activities that will later be self-supporting. An example of this “short-term” approach is a current Federal program of grants to help local governments plan for resource recovery. These grants, which are authorized under the Resource Conservation and Recovery Act, and were developed as a part of the President’s Urban Policy, amounted to \$15 million in Fiscal 1979.

Administering Subsidies

The prospect of subsidy programs for resource recovery raises a number of administrative issues. For instance, equipment purchased to process second-

ary materials can sometimes process virgin raw materials as well. Policymakers must decide how much of the capital subsidy should be allowed for this dual-use equipment.

Similarly, if the government designs an operating subsidy to apply to a specific type of solid waste (say, post-consumer solid waste), then post-consumer materials must be distinguished from the same materials obtained from other types of waste (e.g., industrial solid waste). These different names for what is physically the same substance may create severe administrative problems in practice: shredded steel from junked automobiles may be similar to “new” or “prompt” shredded ferrous scrap from an industrial fabricating source.

These difficulties in administering capital and operating subsidies suggest that a potentially expensive inspection system would be necessary to insure that the objectives of the subsidy are in fact being met.

Many innovative subsidies (as opposed to more traditional tax write-offs) would require the administering agency to establish a new and perhaps complex organizational structure in order to distribute funds and monitor the activities of the recipients. Tax subsidies do have the advantage of using existing Internal Revenue Service procedures to deliver the benefits to private enterprises. However, the fact that another Executive Branch agency must help the IRS to draft the regulations and possibly to certify claims by the recipients diminishes the advantage of tying into a well-established program (e.g. tax subsidies). The additional cross-agency coordination could well strain the mechanism for granting the subsidy.

In brief, the Committee’s finding that appropriated subsidies are more desirable than tax subsidies stands, even taking administration into account.

Other Policy Issues

In addition to their implications for conservation and resource recovery, the Committee also evaluated subsidies for their consistency with its five criteria.

Free Market Principles. While subsidies take advantage of certain aspects of the free market, they are a direct public intervention into the free market. By lowering the effective market prices of resource recovery, subsidies would, through normal market responses to price and cost, encourage resources to flow into the secondary materials sector. Thus, while subsidies affect prices, they do not affect the mechanisms by which the market adjusts to prices. For these reasons they are often preferred to direct regulation as a means of accomplishing public policy goals.

The “Polluter-Pays” Principle. Subsidy approaches are generally contrary to the “polluter-pays” principle: they substitute payments by taxpayers for payments by beneficiaries of the subsidized activity.

Social and Economic Equity. Public subsidies generally shift the cost of resource recovery activities from those most directly involved to the public at large. To the extent that this causes some specific groups or firms to benefit at the expense of others, they may be considered inequitable.

Economic Efficiency. Subsidies for resource recovery could offset losses in economic efficiency arising from existing government policies that encourage virgin material extraction (such as discriminatory rail rates, percentage depletion allowances, and capital gains). In the absence of those other policies, however, a program of subsidies for resource recovery would generally not improve economic efficiency. Subsidies would direct economic resources away from other sectors and into resource recovery by changing effective market prices. This would be considered an improvement in efficiency only if the subsidies had been adopted in the first place as a measure to correct a perceived market failure (and, of course, if no new inefficiencies are created). In most instances, subsidies are not enacted for this reason, but rather to further some national goal.

Administrative Feasibility and Cost. It is feasible to administer subsidies, as demonstrated by Federal government subsidy programs in areas other than resource recovery. Administrative costs and the benefits derived will vary for each type of subsidy, making it very difficult to generalize about the relative significance of the costs.

Committee Findings

The Committee concluded the following with respect to subsidies for resource recovery:

- Subsidies for resource recovery can be an effective although potentially costly tool to stimulate resource conservation.
- Subsidies can be particularly useful in the “short term” to help local governments plan resource recovery operations and to aid the development of “infant industries.”
- Subsidy programs should be designed so as not to create undue biases towards capital intensive solutions.
- Appropriated subsidies are preferable to tax subsidies.
- The Federal Government currently has two subsidy programs for resource recovery: differential tax treatment of capital investment and grants for demonstration projects and local implementation planning.
- Subsidy approaches are generally contrary to the polluter-pays principle: they substitute payments by taxpayers for payments by beneficiaries of the subsidized activity.

Committee Recommendations

Having found that subsidies designed specifically for resource recovery can be an effective, although potentially costly, tool to stimulate resource conservation, the Committee nevertheless unanimously agrees that no new specific subsidies should be proposed at this time.

However, because there are many ways that subsidies might be used for resource recovery and many people feel that further research is needed on the subject before firmer conclusions can be drawn, only two members are willing to take positions on the overall advisability of instituting subsidy programs specifically for resource recovery. One member gives general endorsement to the use of subsidies as a tool in this area, while the other recommends against any form of specific subsidy and further recommends repeal of existing subsidies, seeing no need for them. Five members join in calling for further study.

Some of the members wish to state the conditions under which they would consider adopting subsidies and the types of subsidies they would prefer if subsidies are adopted. Four members are willing to endorse subsidies as a last resort in order to offset existing virgin material economic advantages (e.g., tax advantages, freight rates, municipal solid waste costs). One of these members also emphasizes that subsidies can be appropriately employed in the technology development process. Three members specifically recommend that any future subsidies be designed to avoid undue biases toward large scale, capital-intensive solutions, citing significant opportunities in this area for small scale and more labor-intensive technologies.

Railroad Freight Rate Discrimination

Transportation typically accounts for a very large fraction (often over 50 percent) of the delivered cost of crude raw materials like mineral ores, timber, and most types of scrap. These basic commodities are shipped in bulk, and longer distance shipments usually travel by rail or water to minimize costs.

Ideally, competition among carriers would cause all shipments, of whatever material, to travel at prices that just cover all costs (including normal profit) necessary to ship the individual raw materials. However, to the extent that different commodities or shippers are charged rates that differ **relative to the required costs** incurred by the carrier, a condition exists that economists refer to as freight rate "discrimination." If substantial and systematic, rate discrimination can be considered unfair to competition among shippers, and it can also contribute to inefficient allocation of resources among products, consumers, transportation modes, or geographic regions.

The Resource Conservation Committee addressed the question of railroad freight rate discrimination because of a long-standing concern that railroad

rate-setting practices in the United States may in fact have resulted in discrimination against shipments of secondary (recycled) materials to the competitive advantage of virgin raw materials.

From the Committee's viewpoint, the central issue was not so much the question of economic efficiency or fairness, but rather that unwarranted rail rate discrimination may be contributing to an unnecessarily rapid rate of natural resource use and consequent environmental degradation. Moreover, since railroad shipping rates have long been regulated by an agency of the U.S. Government, the Interstate Commerce Commission (ICC), this may have been a situation in which the Federal government itself has been working against natural resource conservation.

Recent Developments

In fact, Congress firmly enunciated national policy on secondary material rail rate discrimination in 1976, following several years of debate, when it included Section 204 in the Railroad Revitalization and Regulatory Reform Act (P.L. 94-210), often referred to as the "4R Act." In Section 204, Congress responded favorably to long standing allegations of discrimination by scrap material dealers and environmentalists, by specifying that railroad rate setting should not discriminate against scrap materials, and, further, by requiring that the ICC investigate current practices and revise any rates or practices found to be discriminatory.

Following its investigation, the Commission returned its initial ruling in early 1977. Referred to by the Commission's case docket number, "Ex Parte 319," the ruling stated that the existing rates were not "discriminatory" under the Commission's definition of the term. In Ex Parte 319, the Commission basically reaffirmed its traditional position that three conditions must hold for a finding of rate discrimination. Thus, not only did the Commission have to find (1) disparity in rates not justified by costs, but it also had to find (2) that the materials in question did in fact "compete" by being physically used or potentially usable in the same technological process, and (3) that the rate disparity must also significantly and adversely affect competition on the part of the secondary material shipper (i.e., that damages be shown).

The ICC ruling was appealed to the U. S. Courts by two secondary material industry trade associations, the National Association of Recycling Industries (NARI), and the Institute of Scrap Iron and Steel (ISIS). The U. S. Department of Energy (then the Federal Energy Administration) and the Environmental Protection Agency joined to support the trade associations' position that a broader definition of competition should rule (that is, one that includes competing technologies and final products), and that the intent of Congress did not require proof of damages. In August 1978, the U.S. Court of Appeals for the District of Columbia ordered the ICC to reexamine these

rates, looking particularly at the question of comparative costs and revenues associated with transporting virgin and secondary materials. Furthermore, the Court did not accept the ICC's narrow interpretation of material competition, affirming the broader interpretation argued by the secondary material industries. In addition, the Court held that under the 4R Act the burden of proof was shifted from the shipper, who should not have to show damages for a finding of discrimination, to the railroad, which should have to justify any rate differentials not based on cost.

The Court of Appeals thus reaffirmed Congress' intent to end rate discrimination between virgin and secondary commodities, stipulating that rate differentials unjustified by cost constitute prima facie evidence of discrimination, and returning the case to the ICC for further proceedings. Operating under a Court-imposed deadline, the Commission reopened the Ex Parte 319 investigation to obtain further evidence, and issued a new decision on April 16, 1979.

In this latest action, the ICC found, in accordance with the Court's August decision, that several secondary commodities suffered rate discrimination relative to the competing virgin materials, and ordered reductions in secondary material rail rates to equalize the relationship between rates and variable costs on a regional basis. On grounds of discrimination, the ICC ordered secondary material rates to be reduced on scrap iron and steel (south and west); aluminum scrap (east and south); copper and alloy scrap (west); lead, zinc, and alloy scrap (south); and wastepaper (west and south). Because of time limitations these decisions were based on previously gathered data on revenues and costs, updated by the Commission.

In a companion issue the Commission also reviewed the "reasonableness" of secondary material rail rates relative to variable costs of shipping. (Variable costs represent costs directly attributable to specific shipments as opposed to more general fixed overhead costs and return on investment.) In all instances where secondary material ratios of revenue to variable cost were greater than 180 percent, the Commission ordered them reduced to that level, taking 180 percent to be "reasonable" from the standpoint of the railroads' recovery of fixed costs and profit. The secondary material trade associations objected to this position and immediately (April 17) filed a complaint in the U.S. Court of Appeals, arguing that "reasonableness" should mean a ratio of revenue to variable cost of 127 percent, the estimated nationwide average for all commodities.

Scope of RCC Analysis

The Resource Conservation Committee studied only the question of rate discrimination and did not assess either the issue of "reasonableness" of secondary material rates or the broader subject of the implications of railroad

deregulation for natural resource conservation. Moreover, due to the fact that the Committee conducted its analysis before the 1978 Court of Appeals ruling, the analysis was focused primarily on an examination of then-available ICC evidence on discrimination and an evaluation of general implications for resource recovery and conservation. The staff did not attempt to evaluate all secondary commodities, but focused principally on major obsolete or "old scrap" materials.

Railroad rate setting is an inherently complex procedure, involving variations in volumes, distances, alternative routings, and special handling and transfer characteristics of specific commodities. Thus, straightforward comparisons of freight rates and tons shipped between virgin materials and scrap commodities are seldom very meaningful. In addition, although fairly easy to define in the abstract, the concept of rate discrimination itself has not been easy to translate into workable cost-accounting terms as a basis for practical measurement.

Most students of the subject appear at least to agree that the issue in fact relates to the comparative relationship between rates charged and shipping costs incurred, although some would argue that available cost accounting data are not adequate to make proper judgments. As a measure of this relationship, comparison between the competing commodities' revenue-to-variable-cost ratios has gained increasing acceptance as a working basis for defining and measuring the extent of rate discrimination. Hence, if the revenue-to-variable-cost ratio is consistently higher for shipments of a secondary material than for its primary counterpart, the secondary material is paying more than its share of the railroad's fixed costs (equipment, track, rail bed, administrative overhead, and return on investment) compared to the virgin material. Variable cost — the difference between fixed cost and total cost — includes those operating costs directly incurred by or allocatable to a specific shipment, such as fuel, electric power, crew time, special equipment rentals, and the like.

Based on this working definition of rate discrimination, and relying heavily on available ICC data on railroad costs and revenues for virgin and scrap commodities (assembled in the course of its earlier Ex Parte 319 investigation), the Resource Conservation Committee staff conducted a brief quantitative analysis to assess the extent of discrimination and its possible impact on recycling. The analysis went through three steps. The first was a comparative review of ICC revenue and cost data for seven groups of competing virgin and secondary commodities. Then, for a selected set of commodities for which discrimination appeared evident, a further analysis was done to determine the effect of the discrimination on delivered prices of the affected secondary materials. Finally, based on available estimates of demand and supply responsiveness, the staff calculated how much additional recycling might result if discrimination were removed.

Results of RCC Analysis

The Committee found that freight rates probably have discriminated against many, but not all, important secondary materials. As discussed below, among the materials studied, the most significant adverse differentials were observed for wastepaper, glass cullet, and scrap copper.

Assessment of Rate Differentials. The results of the RCC staff's analysis of railroad revenue and cost data are summarized in Table 9. Estimates of the U.S. average ratios of railroad revenue-to-variable-cost are presented in the first two columns for secondary and competing virgin materials. In all instances (except as indicated for some of the iron and steel data) the figures in this table are based on 1975 regional data assembled and processed by the ICC and combined into weighted national averages by the RCC staff.

Table 9

COMPARISON OF RAILROAD FREIGHT RATE REVENUE-TO-VARIABLE-COST RATIOS FOR SELECTED SECONDARY AND VIRGIN COMMODITIES*

Commodities	Ratio of Revenue to Variable Cost		Difference in Ratios (S/V)
	Secondary	Virgin	(Percent)
<u>Substantial Differential</u>			
Wastepaper vs. virgin fiber**	1.45	1.05	+ 38
Copper scrap vs. ore	2.03	1.50	+ 35
Glass cullet vs. glass sand	2.02	1.51	+ 34
<u>Possibly Substantial Differential</u>			
Iron and steel scrap vs. ore:			
ICC (1975)	1.55	1.53	+ 1
Moshman (1969)	1.95	1.71	+ 14
Moshman (1972)	1.30	1.01	+ 28
ISIS (1975)	1.56	1.20	+ 29
<u>No Substantial Differential</u>			
Aluminum scrap vs. bauxite	1.74	1.60	+ 9
Lead/zinc scrap vs. ore	1.89	1.86	+ 2

* Computations by Resource Conservation Committee Staff involving weighted averages of 1975 regional freight revenue and cost data compiled and adjusted by the Interstate Commerce Commission under Ex Parte 319. Exceptions for iron and steel data as noted in text.

** Virgin fiber represents weighted average for shipments of roundwood, wood chips, and woodpulp.

These ratios represent the extent to which the rates charged each commodity contribute to the railroads' fixed costs and investment return, over and above allocatable variable operating costs of shipping. Thus, for example, in the case of aluminum materials, scrap (with a ratio of 1.74) was estimated to contribute \$0.74 to overhead and profit for every \$1.00 charged to cover current operating costs; bauxite and semi-processed aluminum ores contributed \$0.60 per \$1.00 of variable costs.

Of the six commodity groups shown, there was none for which the virgin material showed a higher ratio of revenue to variable cost on a nationwide average basis than the secondary material. At the regional level, however, there were a few exceptions; and there were other materials, such as scrap rubber and certain textile wastes for which the ICC data indicated higher ratios for virgin commodity shipments. The "Difference" column of Table 9 presents the percentage differences by which the secondary ratios exceeded the corresponding virgin material ratios. These differences were substantial for three materials — paper (38 percent), copper (35 percent), and glass (34 percent). For aluminum (9 percent) and lead/zinc (2 percent), the ratios were not appreciably different. In the case of iron and steel scrap, the ICC figures showed no industrywide rate discrimination. However, because of the great quantitative importance of ferrous scrap and because the ICC's ferrous metal statistics have been severely criticized, three other sources of data on this material have also been included in the RCC review.

These other sources — two studies by Moshman Associates based on published waybill statistics for 1969 and 1972, and an analysis of 1975 data conducted by the Institute for Scrap Iron and Steel — fail to confirm the finding of no discrimination based on the ICC's Ex Parte 319 data for 1975. The second (more recent) Moshman analysis and the ISIS figures both indicate a differential of almost 30 percent. The reasons for these significant differences are not fully understood, but in a large measure they reflect different judgments used in selecting weights for scaling regional sample data into regional averages. Whatever the reasons, the need for an official reexamination to resolve the conflicting findings appears self-evident.

The RCC staff analysis thus confirms that for the two largest components of post-consumer municipal solid waste, paper and glass, railroad freight rates do appear to discriminate substantially against secondary materials. For the third largest component of municipal waste and the largest volume scrap material overall, ferrous metal, there is conflicting evidence, but a possibility of substantial discrimination also exists. In the case of the non-ferrous metals studied by the RCC staff, the ICC data did not indicate substantial differences in rates between virgin and secondary materials except for copper.

Effects on Delivered Prices and Recycling. If discrimination were ended by equalizing virgin and secondary revenue-cost ratios, what would be the effect, initially, on delivered prices of secondary materials and, ultimately, on

levels of recycling? The RCC staff attempted to answer this question for the four materials prominent in post-consumer waste — wastepaper, glass cullet, aluminum scrap, and ferrous scrap.

Table 10 summarizes the results relating to the effect of removing discrimination on delivered prices of secondary materials. In estimating the effect on delivered prices, the staff assumed for analytical purposes that eliminating discrimination would involve reducing secondary material freight rates to the level where the revenue-to-variable-cost ratios were the same as those for the counterpart virgin materials. This would imply average rate reductions of 38 percent for wastepaper, 34 percent for glass cullet, 1 to 29 percent for ferrous scrap, and 9 percent for aluminum (Table 9). Then, using actual 1976 average delivered prices and the contribution of railroad freight rates to those prices, the staff calculated the effect of reduced freight rates on the delivered prices shown in Table 10. In two cases the price effect appeared significant: the average delivered price of glass cullet shipped by rail would be reduced by about 15 percent and the average price of wastepaper by about 12 percent, according to these estimates.

Table 10

**ESTIMATED EFFECT OF REMOVING
RAILROAD RATE DISCRIMINATION ON
DELIVERED PRICES FOR SCRAP MATERIALS**

Scrap Materials	Decrease in Delivered Price of Scrap With Revenue/Cost Ratios Equalized*	
	Dollars/Ton**	Percent
Glass cullet	\$4.70	15.4
Wastepaper	3.57	12.4
Aluminum Scrap	1.92	0.6
Ferrous scrap		
ICC (1975)	0.11	0.2
Moshman (1969)	1.06	1.7
Moshman (1972)	1.90	3.0
ISIS (1975)	1.96	3.1

* Estimates by Resource Conservation Committee staff, based on assumption that ratios of revenue-to-variable-cost for scrap shipments would be set equal to ratio for corresponding virgin material by reducing the average railroad shipping charge for secondary material.

** Based on 1976 delivered scrap prices and rail rates of October 1975, as researched by Moshman Associates.

For ferrous scrap, even the high estimate of price discrimination (29 percent) resulted in only a 3 percent reduction in average delivered price, because freight charges were at that time a much smaller fraction of the delivered price of iron and steel scrap than of wastepaper or glass. Wastepaper and glass are less dense and have lower market values per unit weight than ferrous metal, on average.

The small reduction (less than 1 percent) for aluminum scrap results from its low rail freight differential and its high unit price.

These estimated changes in freight rates were then combined with information on quantities of rail shipments and available statistical estimates of demand and supply elasticities for the secondary materials to calculate expected impacts on recycling of wastepaper, glass cullet, and ferrous scrap.

The conclusion from this standard economic estimating approach is that one should not expect much more than a 1 percent increase in recycling for any of these waste materials following elimination of railroad freight rate discrimination. In fact, a less than 1 percent increase for each of the three commodities is consistent with these numerical results. There are two primary reasons for this. First, substantial quantities of secondary materials do not travel by rail — 55 percent of wastepaper, 35 percent of ferrous scrap, and 90 percent of glass cullet travel by other modes, primarily trucks — and the analysis conservatively assumed that these large market segments would be unaffected by rail rate reductions. Second, estimated demand and supply elasticities for secondary paper and steel are low, meaning that these markets are judged to be relatively unresponsive to a decrease in delivery costs. In addition, there is the smallness of the estimated national average change in delivered price of ferrous scrap.

However, these estimates undoubtedly understate somewhat the effect on recycling of eliminating rail freight discrimination. For one thing, a reduction in rail freight rates would probably shift traffic towards rail, at the same time exerting a downward pressure on trucking rates for secondary materials. Both of these responses could broaden the delivered price reductions at user mills, but neither was factored into the analysis. In addition, it is quite possible that the available statistical measures of demand and supply elasticities relate primarily to short-term responsiveness of these secondary material markets. If true, then longer-term responses, involving more fundamental industry adaptations and investment options, could be more dynamic, leading to substantially greater long-term increases in recycling rates than the numerical analysis suggests. It is clear from testimony presented to the ICC under Ex Parte 319 that secondary material shippers, and many users as well, believe that recycling will increase substantially when discrimination is ended.

Other Policy Issues

In addition to its effects on conservation, removing railroad rate discrimination would have other economic and social implications relevant to public policy. The following discussion briefly summarizes the expected implications for free market principles, economic efficiency, equity, and public administration. This issue was not considered directly relevant to the "polluter-pays" principle.

Free market principles. The railroads have long been regulated as a public utility under the Interstate Commerce Act. Removing rate discrimination would not, in itself, have any institutional effect on opportunities for free choice among either shippers or carriers. It could, of course, by reducing shipping costs and increasing feasible shipping distances expand the marketing options of buyers and sellers of secondary commodities.

Economic efficiency. Although the overall effects on the economy may not be large, the removal of discrimination in freight rates would be expected to improve economic efficiency in resource allocation. Currently, according to data used in the ICC Ex Parte 319 docket, the fixed costs of shipping several scrap materials by rail are overstated in the rates paid, and this overstatement eventually appears in the delivered price of the scrap material. Because the higher prices distort the true relative costs of using virgin rather than secondary materials, the economy is encouraged to use an inefficiently large quantity of virgin resources and "too few" secondary materials. Freight rate discrimination also tends to bias selection of transport modes by secondary material shippers towards less efficient forms of motor transport.

Social and economic equity. Removing discrimination would equalize the relative share of fixed costs borne by primary and secondary materials shippers. This in turn would equalize competitive opportunities among virgin and secondary industry suppliers, at least insofar as freight rates are concerned, and would thus represent an improvement over the current situation.

Administrative feasibility and cost. The ICC reviews rate changes as part of its ordinary business. Changing allowable rates in this case should not cause the ICC to incur any unusual expenses, since the issue in question would relate to a change in criteria for rate making rather than imposing a new regulatory burden. The new criteria, however, may require additional data and analysis not now routinely provided, and the railroads may consequently incur additional expense for compliance. No direct estimates of additional cost were made by the staff or brought to the Committee's attention.

Committee Findings

The Resource Conservation Committee concluded the following with respect to railroad freight rate discrimination:

- Based on presently available Interstate Commerce Commission cost and revenue information, railroad rates for wastepaper, glass cullet, and scrap copper reflect a higher ratio of revenue to variable cost and thus are probably discriminatory in comparison with rates for related virgin materials. ICC data do not confirm a higher ratio for iron and steel scrap nationwide, but this conflicts with evidence provided by other sources.
- If such discrimination exists, it probably makes only a very small difference in the amount of most secondary materials used. The largest relative impacts appear to be on glass cullet and wastepaper.
- There is no public policy reason for discriminating between virgin and secondary materials.

Committee Recommendations

The members of the Resource Conservation Committee fully recognize that the Congress and the Courts have already established a clear public policy in ordering the Interstate Commerce Commission to eliminate railroad rate discrimination between virgin and recycled raw materials and products. The Committee also recognizes that its findings regarding the existence and degree of discrimination for individual materials must be considered preliminary, given the data on which they rest, and that later review by the ICC using improved statistics may provide more valid estimates.

Most of the members recommend that the Administration file a brief with the ICC, stating the results of the Committee's research and expressing the Committee's interest in achieving compliance with Section 204 of the Railroad Revitalization and Regulatory Reform Act of 1976, the purpose of which is to eliminate discriminatory pricing. Several members feel that the Administration does not need to file the brief because the ICC is under court order to conduct a new investigation into rate discrimination.

One member favors allowing competition to establish the rates, acknowledging that such a recommendation would imply outright deregulation of rates for rail freight carriers. However, other members feel that, whether railroad deregulation has merit or not, the RCC is an inappropriate forum in which to consider this broader question.

Product Regulations

Product regulations — explicit restrictions on the manufacture or use of consumer products — provide a more direct approach to achieving resource conservation than other policies the Committee studied. Most of the other policies use financial incentives that operate through the market system to encourage an outcome (e.g., more recycling or less waste) but not to require

it; individuals retain their freedom to make choices, although they do so under a new set of constraints. The regulatory approach, on the other hand, bypasses the market system and uses the threat of legal sanctions to impose the desired physical outcome directly.

Product regulations, since they apply so directly, could be a powerful tool to encourage resource conservation. But, like any powerful tool, product regulations can raise difficult problems and impose significant costs. Regulations intended to have one effect can have unintended “secondary” effects on other products or industries. Moreover, the burden of making the necessary trade-offs among primary and secondary effects lies directly on the regulator — not on the market, which, in this country, has traditionally been the mechanism for making these tradeoffs.

There are many possible forms of product regulation. The Federal Government could place controls on the volume of sales or on the physical design characteristics of specific products or groups of products. The level of regulation could vary from an outright ban on the sale of certain products (such as bi-metallic cans) or on the use of certain materials (such as those in critically short supply), to more limited requirements (such as specifying the minimum proportion of recycled material to be used in particular products). Even the term “product” allows leeway: it could apply either to a final item of manufacture (such as an automobile or beverage container) or to an intermediate product (such as a refined metal).

The Resource Conservation Committee limited its investigation to those forms of product regulations it believed would have the greatest effect on resource conservation. These forms fall into two broad classes: (1) regulations to promote a reduction in the rate at which we consume resources and generate waste, and (2) regulations to promote the recovery of energy and materials from the waste stream. Staff Background Paper No. 18, “Product Regulation as a Resource Conservation Strategy,” discusses the two classes in detail.

Product regulations in the first class — waste reduction — could be directed at reducing the quantities of materials used per unit (e.g., less glass per bottle), increasing the production of reusable or more durable products (e.g., cloth napkins instead of paper napkins, longer lasting appliances), or minimizing the manufacture or sale of products causing problems in waste management. This last category could encompass products like tires, which may interfere with recovery machinery and which also may cause problems — e.g., shifting — in landfills. The category could also encompass hazardous products — for example, those made with heavy metals (lead, cadmium). The Committee saw promise in coordinating a product regulation aimed at resource conservation with regulations that have other primary purposes, for example, controlling toxic substances or hazardous waste.

Regulations in the second class — resource recovery — could be directed at stimulating either the **supply** of recycled materials (e.g., by controlling product design to eliminate materials or design configurations that inhibit resource recovery) or the **demand** for recycled materials (e.g., by requiring the use of materials recovered from solid waste in the manufacture of new products).

Rather than separately applying individual regulations that fall into one or both classes, the government might establish a comprehensive regulatory framework under which all the characteristics of a product would be screened at one time to ensure consistency with its overall objectives in resource conservation. Such an approach has been proposed in draft Federal legislation, and proposed or adopted in at least two States and two European countries, although it remains to be fully applied anywhere.

Closely related to the direct approach of applying controls on product design and use would be the indirect approach of requiring conservation-related labels on products. The Federal government already requires labels for other purposes; for example, to warn of hazards or to ensure truth in lending. Conservation-related labels could simply provide consumers with better information on which to base their purchase decisions, or they could actively seek to persuade consumers to make purchases that are more conserving of resources. The RCC staff examined labeling in an appendix to Background Paper No. 18; however, since labeling differs in many respects from the direct regulatory approach, it is not incorporated in the full Committee's findings and recommendations on product regulations.

The Effectiveness of Product Regulations

Although product regulations could increase resource recovery in theory, there are a number of design problems which could undermine their effectiveness in practice, among them technical feasibility, enforceability, flexibility, effect on innovation, and ease of modification.

Technical feasibility can pose an obvious limitation on the degree to which recovered materials can be substituted for virgin materials in the manufacture of some products without interfering with the process or changing the characteristics of the product. If too much recycled glass is used to make new bottles, or if the recycled material is contaminated, the quality of the product — its color or durability — may be significantly impaired.

Another important concern is the enforceability of a regulation. Regulations requiring specified proportions of recovered material in new products would not be effective if they were widely ignored or could not be enforced. A regulation requiring newsprint to be made from recycled paper could not be enforced, for example, if not enough newsprint were available at reasonable

cost or if it were too difficult to verify that the newsprint did in fact contain the specified proportion of recycled fiber.

Secondary effects could also diminish or even outweigh a regulation's effectiveness. Assuming that a regulation requiring the use of recovered materials in newsprint could be enforced, its net effect would be small if the recycled fiber were simply diverted from use in other products, like insulation or packaging filler. In addition, if a regulation required that a product be made with a high percentage of recycled materials and this caused product durability to decrease, then the increased demand for the product could cause total virgin material consumption to rise.

Designing regulations with sufficient flexibility is often difficult. The need to keep regulations administratively manageable, for example, encourages regulators to draw them up narrowly; however, that narrowness may limit manufacturers' freedom to design new products or to modify their processes. At a time when lack of innovation has received considerable attention from both the public and private sectors, this limitation poses an especially grave problem.

The regulations may also send "false signals" to manufacturers. For example, regulations that set minimum levels of performance may also have the effect in practice of setting maximums, unless manufacturers are given some incentive to exceed the levels specified. Moreover, variation from the standards contained in the regulation might appear to be a departure from compliance, so that change is discouraged.

Another problem is that product regulations could promote the growth of one particular technology over another, without giving adequate weight to such considerations as economics, energy efficiency, and pollution. For example, if a product regulation required the steel used in a product to have a very high minimum content of recycled material, the regulation could create serious difficulties for some steel mills (e.g., those employing the predominant basic oxygen furnace, in which the temperature-oxygen balance is upset by excess amounts of scrap) while encouraging the expansion of others (e.g., those using electric arc furnaces, which accept larger quantities of scrap). The regulation — by itself — could shift the balance of technologies. The objectives of any mandatory design standard need to be debated in light of other national objectives.

Finally, regulations may be difficult to modify, once established, to meet changing conditions, such as advances in technology. Because it may take several years or more (as well as substantial resources) to complete all the steps required for rulemaking, there is likely to be considerable inertia in the system.

Other Policy Issues

Free Market Principles. By their very nature, regulations controlling the design or sale of products violate the free market principle. Rather than emerging from the decentralized workings of the market system, the outcome of a product regulation is imposed by the regulator.

The “Polluter-Pays” Principle. To a large extent, the way in which a regulation is drafted can determine who pays for its implementation. Thus appropriately-worded product regulations can be entirely consistent with the “polluter-pays” principle, although adjustments that pass on the costs in unexpected (and perhaps undesirable) ways must be guarded against.

Social and Economic Equity. Product regulations could reduce the availability of some products and increase the prices of others, leading to different effects on different groups in society. For example, price increases for products that are normally considered “necessities” (rather than “luxuries”) are likely to be regressive; that is, to have a relatively greater adverse effect on the poor than on the rich. It is difficult to generalize, however, regarding the equity of all product regulations.

Economic Efficiency. Regulations typically impose particular technical solutions rather than relying on producers to exercise creativity in developing least cost solutions. This is not to say that all product regulations would impose more costs than they would yield in benefits; but the benefits of resource conservation in general remain to be fully defined, much less quantified. At the moment, we must use our judgment for each product to decide whether a regulation would, in fact, meet the Committee’s criterion of economic efficiency.

Administrative Feasibility and Cost. The difficulties associated with administering product regulations could make administration time-consuming and costly, especially if rules have to be established, product-by-product, for a large number of products; if the criteria for rule making are not specific; or if, as often happens, the rules are subject to disagreement among interested parties or to protracted litigation.

Because so many different forms of product regulation are available, the RCC found it difficult to generalize about the feasibility and cost of administering the regulations for resource conservation purposes. Many manufacturers are already subject to other regulations (for example, regulations to protect health, safety, and the environment). Regulations with resource conservation in mind would need to be analyzed carefully, case by case, to establish that their costs do not outweigh their benefits.

Committee Findings

The Resource Conservation Committee reached the following conclusions with respect to product regulations:

- Product design regulations could be effectively employed as a resource conservation tool.
- Direct regulation imposes costs on the economy by circumventing the free market system and reducing flexibility; direct regulation may also discourage technological innovation.
- Administration of mandatory design and packaging standards would present enforcement problems and costs and would add to the burden of Federal regulations on the private sector.
- There may be some areas where such direct intervention is appropriate, such as in areas where the risks associated with improper management are very great. (Two examples might be the handling and storage of toxic and hazardous wastes or where certain materials might significantly inhibit resource recovery operations.) In these cases, product design regulations should probably be part of or at least be done in coordination with regulations on toxic and hazardous wastes.
- More research is needed on the following topics before specific proposals can be developed: (1) the identification of objectives to be served by mandatory design standards, (2) materials flow through the production process, and (3) the effects of such regulations.

Committee Recommendations

The full committee agrees that product regulations should not presently be proposed as a general-purpose tool for resource conservation. The members cite problems with administration and enforcement, the burden on businesses, possible inflation effects, and general cost-ineffectiveness.

Nevertheless, all but one of the members agree that the Government should sponsor further research on the use of regulations for resource conservation in the areas of toxic and hazardous wastes and products made with materials that especially impede resource recovery. Half of those members state explicitly that there might be a role for product regulation in the areas recommended for further study; the other half make clear their desire to express general opposition to the idea of product regulations unless the studies show very positive opportunities.

One member recommends against direct regulations in all circumstances.



PRODUCT USE AND DISPOSAL POLICIES

When consumers no longer have any use for a product or its packaging they have three choices of what to do with it: (1) set it aside for reuse, recycling, or special disposal; (2) discard it (“properly”) into the regular mixed municipal solid waste stream; or (3) carelessly discard it as litter.

The preceding chapters have discussed resource conservation policies directed primarily at the production of goods before they reach the consumer and on recycling markets. This chapter presents the RCC’s evaluation of three policies that relate to the consumers’ three choices of what to do with products or packaging when they no longer wish to retain them, namely: mandatory nationwide beverage container deposits, deposits and bounties on durable and hazardous goods, and a national litter tax. The first two policies provide a direct, on-the-spot reward to the consumer for setting a product or packaging aside for reuse, recycling, or special disposal. The litter tax is usually considered to be primarily a revenue-raising device, but it could also be formulated to have anti-littering incentive effects.

A **beverage container deposit** is a fee added to the price of a beverage which is refunded when the container is returned. The containers may then be reused or recycled, although there is no requirement that this be done. Mandatory beverage container deposits for beer and soft drinks have been proposed as a means of reducing solid waste and litter, materials use, energy use, and pollution.

Deposits for durable and hazardous goods would in most respects operate the same way as those on beverage containers. **Bounties** are analogous to refunds (without deposits) and represent subsidies for delivering the items to designated redemption centers. Deposits and bounties have been suggested for durable goods, such as household appliances, and other goods that could be hazardous if not disposed of properly. They would provide an incentive for people to deliver these goods to appropriate recycling centers or approved disposal sites, and they would also encourage scavengers to pick up littered

items and redirect them into the proper channels for recycling or safe disposal.

A **litter tax** is a levy placed on items that are frequently littered. It is generally understood to be a broad-based, ad valorem excise tax applied to consumer goods for the purpose of financing nationwide litter control programs carried out by State and local governments. Such a tax could also be formulated to discourage the production and purchase of items frequently littered. The Resource Conservation Committee studied the litter tax in response to suggestions made at its public hearings that a national litter tax might be a useful alternative to national beverage container deposits.

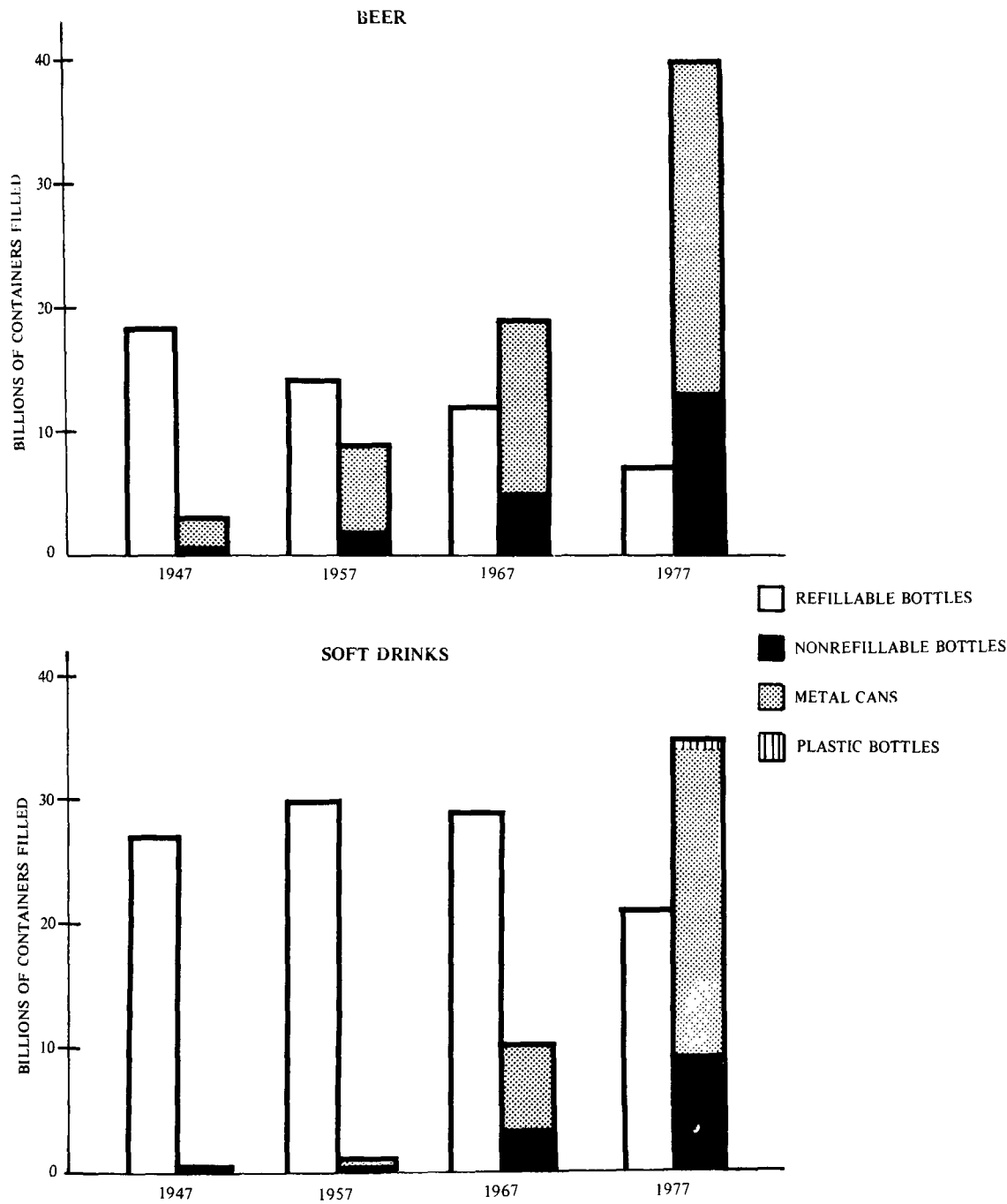
All three of the policies discussed in this chapter address litter, but only the deposit and bounty policies have any significant implications for materials conservation. Beverage container deposits, and deposits and bounties on durable and hazardous goods provide both an incentive (collecting the refund or bounty) to conserve resources by stimulating reuse and recycling, and a disincentive (forgoing the refund or bounty) to regular disposal or to littering. Litter taxes, as generally proposed, do neither of these things; rather, they generate revenues which can be earmarked to finance litter clean-up, public education, or similar programs.

Beverage Container Deposits

Although the metal beverage can and the “one-way” bottle are fixtures in the United States today, they were virtually nonexistent thirty years ago. The increased use of these nonrefillable containers and the decline in the use of the refillable bottle have been dramatic. Introduced as “convenience” containers, not only have metal cans and nonrefillable bottles captured all the growth in the beverage industry since 1947, but they have even caused an absolute decline in the use of refillable bottles. Figure 8 chronicles those developments.

Concern about these trends led to the first “ban-the-can” and “bottle bill” efforts in the early 1950s, and to later attempts to pass less restrictive “deposit laws” at both State and Federal levels. The first deposit law, passed in Vermont in 1953, simply banned the sale of beer and ale in nonreturnable bottles. That law was allowed to expire in 1957, but in 1972 Vermont passed a new law requiring deposits on all beer and soft drink containers. Oregon had passed a container refund the year before; other States have followed with similar laws. A law in Maine went into effect at the beginning of 1978, and a law in Michigan became effective in December 1978. Deposit laws in Iowa and Connecticut take effect in July 1979 and January 1980, respectively, and in Delaware the law becomes effective late in 1980, or 6 months after both Pennsylvania and Maryland enact similar laws, whichever comes last.

Figure 8: THE GROWTH OF NONREFILLABLE BEVERAGE CONTAINERS: 1947 - 1977



Sources: Research Triangle Institute; Beverage Industry Annual Manual, 1978 - 1979.

Early proponents of mandatory deposits were primarily concerned with the frequent appearance of “no-deposit, no-return” beverage containers in roadside litter. Growing national interest in environmental protection and resource conservation — and the “energy crisis” of the 1970s — have created increased interest in beverage container deposit laws because of their poten-

tial for reducing the consumption of steel, aluminum, and energy and the generation of solid waste and industrial pollution.

Over the past several years, various bills have been introduced in the Congress which would create a nationwide retail trade requirement that all beer and soft drink bottles and cans carry a minimum 5 cent refundable deposit. The Resource Conservation Committee has been considering a similar law. Such a national law is not envisioned to ban one-way containers; rather, it would create a financial incentive for consumers not to litter and not to discard their beverage containers into the municipal solid waste stream. Since consumers would have a financial incentive to return the containers to collection points, the deposit law should make it easier to reuse or recycle the containers.

A deposit law could incorporate any of a number of features. The seven State laws passed to date all vary in detail. Two of the States (Oregon and Michigan), for example, encourage the use of "certified" refillable bottles (bottles that may be used by more than one company) with a lower deposit on those bottles. One State (Iowa) also places a deposit on liquor bottles. All seven of the States ban removable "tab-tops" on cans, which is not an element of the national law as considered by the Committee. Four additional States also ban "tab-tops", although they do not have mandatory deposits. Four deposit States (Vermont, Maine, Connecticut, Iowa) either allow or require that retailers be paid a fee (funded out of deposit revenues) to cover the extra costs incurred in handling returned containers.

No serious difficulties have yet arisen as a result of variations in State laws. However, bottlers or distributors that serve two or more States with conflicting deposit requirements do face potential problems, which could increase if more states which are closer together implement different legislation.

Beverage container deposits have aroused more public interest than any of the other policies the RCC studied. Opponents to national deposit legislation argue that industry dislocation, consumer inconvenience and possibly higher prices would outweigh the benefits arising from such a law, and that other alternatives (such as litter taxes, Federal subsidies for resource recovery, increased funding of litter cleanup, and public education) would provide more comprehensive and equitable benefits.

Staff Analysis

Because of the interest in this issue, the RCC staff intensively analyzed the costs and benefits of a national deposit law. This analysis is described in detail in eight Staff papers, the first six of which appear in the Committee's *Second Report*.¹ Table 11 lists the titles and topics of the papers.

¹Staff Background Papers No. 1 through No. 6 were previously published by the Resource Conservation Committee in its Second Report to the President and Congress, *Committee Findings and Staff Papers on National Beverage Container Deposits*, January 1978.

Table 11

**STAFF BACKGROUND PAPERS
ON BEVERAGE CONTAINER DEPOSITS**

1. "Rationale for Beverage Container Deposit Legislation" — The reasons generally put forth for Federal involvement.
 2. "Costs and Benefits of National Beverage Container Deposit Legislation" — A quantitative assessment of likely ranges of costs and benefits, based largely on a computer model of the beverage producing and distributing sectors.
 3. "Issues Regarding National Beverage Container Deposit Legislation" — Design issues such as the size of the deposit and what kinds of containers should be included.
 4. "Transitional Impact of National Beverage Container Deposit Legislation" — Transitional effects of a deposit law on container production, employment, and capital equipment.
 5. "Beverage Container Return Rates" — Assumptions made in the RCC analysis about present and future return rates (the proportion of containers that are returned for deposit).
 6. "Localized Employment Impacts, Glass Industry" — Effects of a deposit law on employment in the glass industry.
 7. "The Sensitivity of Benefit Impacts of Beverage Container Deposits to Variations in Container Return Rate Assumptions" — The effect on benefits of changes in assumptions about the proportion of containers returned.
 20. "Summary of Projected Labor Impacts of a Nationwide Beverage Container Deposit System" — The employment impact of a deposit law, specifically looking at the skill levels of jobs to be gained or lost if the law were adopted.
-

Five major issues emerged in the staff analysis, and are described in the following pages:

- (1) benefits and costs of the policy;
- (2) effect on prices;
- (3) effect on consumers;
- (4) effect on employment; and
- (5) government administrative costs.

The analyses of the five issues, especially the benefits and costs and the employment impacts, were based largely on a computer model of the beverage producing and distributing sectors. The model was originally developed by the Research Triangle Institute (RTI) for use in its 1976 study, "Energy and Economic Impacts of Mandatory Deposits," prepared for the Federal Energy Administration. Many interested parties supplied information and commented on the FEA study prior to its publication.

The RCC staff updated and expanded the RTI model and used new estimates as input to the model. Table 12 contains those assumptions. It shows the situation as of 1977 (the same as in Figure 8) and three projections: a "baseline" continuation of present trends and two "scenarios" that bound the likely range of results of a deposit law. The Low Change Scenario assumes a modest shift to refillable bottles, and the High Change Scenario a fairly dramatic shift. The Low Change Scenario includes more conservative (lower) estimates of return and recycling rates than does the High Change Scenario.

Table 12
ASSUMPTIONS USED IN ESTIMATING COSTS
AND BENEFITS OF A DEPOSIT SYSTEM

Model Input	1977	1985 Projections		
	(Estimated)	Baseline	Low Change Scenario	High Change Scenario
Container Market Share (Percent of Volume)				
Refillable Bottles	27%	20%	40%	60%
Nonrefillable bottles	25	15	10	5
Plastic bottles	0	10	10	10
Metal cans	48	55	40	25
Container Return Rates				
Refillable bottles	91	91	90	92
Nonrefillable containers	—	—	80	86
All containers average	25	18	85	90
Recycling Rates				
Steel cans		10	40	80
Aluminum cans		40	80	95
Glass containers		5	20	50

Source: 1977 estimate by RTI and RCC staff. Baseline projection for 1985 and scenario estimates by RCC staff are based in part on trends projected by the General Accounting Office.

The RCC staff used the RTI model to estimate the quantitative effects of a national beverage container deposit system. The model produced values for material and energy requirements, solid waste generation, employment, and costs to consumers. The staff then employed those values to estimate environmental effects and savings in solid waste management costs. Table 13 summarizes the estimates.

Table 13

**SUMMARY OF BENEFITS OF NATIONAL MANDATORY
FEDERAL BEVERAGE CONTAINER DEPOSIT LEGISLATION
(Estimates for 1985)***

	Low Change Scenario	High Change Scenario
1. Consumer Savings		
Net Direct Cost Savings to Consumer (\$ Million)	656	1,757
Net Savings Per Filling (cents)	0.6	1.5
2. Post Consumer Solid Waste Savings		
Solid Waste Collection and Disposal Savings (\$ Million)	25	50
Litter Reduction	Total litter volume reduced 35%; total items by 15 to 20%	
3. Environmental Benefits		
Industrial Solid Waste Reduction (million cubic feet)	270	450
Atmospheric Emission Reduction (million pounds)	750	1,200
Waterborne Waste Reduction (million pounds)	140	210
4. Natural Resource Conservation Benefits		
Reduction in Bauxite Consumption (million tons)	1.0	1.5
Reduction in Iron Ore Consumption (million tons)	1.3	2.4
Net Energy Reduction (Trillion Btu)	70	130

* Assumed passage of legislation in 1978, effective beginning in 1980.

(1) Benefits and Costs

Based on the model, the RCC staff analysis indicates that a national deposit law for beverage containers would reduce municipal solid waste by 0.5 percent to 1.5 percent (by weight) at projected 1985 generation rates, with annual savings in expenditures for collection and disposal of \$25 to \$50 million nationwide. The law would reduce the number of littered containers by approximately 70 percent. Total litter volume would decrease by about 35 percent and the number of littered items by 15 to 20 percent.

With respect to raw materials, the analysis indicates aluminum savings of approximately 250,000 to 380,000 tons per year by 1985 (5 to 10 percent of estimated 1985 United States annual production) and steel savings of 900,000 to 1,700,000 short-tons per year (1 to 2 percent of U.S. annual production). Deposits should also assist in the conservation of materials used in beverage containers by discouraging production of difficult-to-recycle containers. Bottlers and distributors to whom used containers will be returned will be able to sell easy-to-recycle containers to scrap dealers but may not be able to sell the difficult-to-recycle containers (such as bimetal cans). They, therefore, will have an incentive to sell beverages in easy-to-recycle containers in the first place.

Net energy savings attributable to a nationwide deposit law, as estimated by the RTI/FEA model, would amount to 70 to 135 trillion Btu's per year by 1985, or 20 to 40 percent of the annual requirements of the packaged beverage industry. This savings is equivalent to between 12 to 23 million barrels of oil per year, or about 0.1 percent of total U.S. primary energy consumption. The various segments of the beverage and packaging industry would experience different energy effects. Distribution would require somewhat more energy, both electric and petroleum. These increases, however, would be more than offset, both in terms of total energy and in terms of petroleum use, by savings in other sectors.

Yet another benefit relates to simplifying the operation of resource recovery systems, although its exact magnitude is difficult to calculate. Because more containers would be recycled, fewer would end up in the waste stream. The reduced amount of glass, in particular, would simplify the operation of some resource recovery facilities — notably combustion-based facilities that must be shut down periodically to remove a hard-to-handle glassy residue, or slag. Staff studies have further determined that any lost revenue from eliminating beverage containers in resource recovery systems would not significantly alter their economic viability.

While the staff is confident that these estimates of return rates and projected national benefits bound the likely effects of the proposed law, the outcome is by no means certain. However, the staff analysis indicates that the principal benefits of mandatory beverage container deposits do not appear to decrease disproportionately with a reduction in return rates. In other words, if return rates fall short of the staff's assumption, the benefits would tend to change in proportion to the shortfall, and not more drastically. In fact, for most of the benefit categories the staff analyzed, benefits change at a slower rate than do nonrefillable container return rates. This subject is discussed in greater detail in Staff Background Paper No. 7, "The Sensitivity of Benefit Impacts of Beverage Container Deposits to Variations in Container Return Rate Assumptions".

One of the reasons for the uncertainty about the impact of the proposed law is that although the experience to date with deposits in two States (Oregon and Vermont) has indicated high levels of both public acceptance and return rates, there has been no experience of comparable duration in industrial States. Thus, the Committee feels that the applicability of this experience to a nationwide deposit system is uncertain.

It is also difficult to predict the exact effect of deposit legislation on the container manufacturing industry, and it would likewise be difficult to measure afterwards. Several factors are making this a changing industry. First, more and more beverage companies are making their own containers, creating less demand among present container manufacturers than there would otherwise be. Second, plastic bottles, many of which are not made by the traditional container manufacturers, are taking a progressively larger share of the market. To the extent that plastic bottles are presently non-refillable and non-recyclable, an increasing market share will decrease the benefits of beverage container deposits, except for litter reduction. The staff analysis of benefits and costs takes these factors into account by projecting a 10% market share for plastic bottles in 1985 and no refilling or recycling. It should be noted, however, that while refillable and/or recyclable plastic bottles are not presently on the market, the industry is working to develop them. If they are successfully introduced, the benefits of beverage container deposits would be correspondingly increased.

(2) Effect on Prices

Concern with inflation has led to strong interest in the effect national deposit legislation would have on consumer prices for beer and soft drinks. It is extremely difficult to project the precise effects of a deposit system on beverage prices, although they are likely to be small.

The RCC staff analysis indicates that consumers should face slightly lower average beverage prices, to the extent that they purchase more lower-cost refillable bottles. This effect will be smaller for beer than for soft drinks. The Committee elected to state in its findings only that experience to date in the two States where legislation has been enforced for several years (Oregon and Vermont) indicates that the effects generally appear to fall "within a range of plus or minus several percent."

The existing data on prices must be used with caution because they are simply too sketchy to extrapolate with confidence. Further staff analysis indicates that shelf prices for individual container types in Oregon and Vermont have at most risen only very slightly as a result of the deposit laws. In both these States, however, many consumers have shifted to refillable bottles. Because beverages in refillable bottles have traditionally been less

expensive than those in nonrefillable containers, this shift has apparently reduced the cost of the total “market basket” of beverages that consumers purchase. The staff analysis predicts a similar shift nationwide — in other words, consumers would spend slightly less in total to purchase the same volume of beverages.

(3) Effect on Consumers

Consumer choice of container types should not be seriously reduced by a deposit law and may be increased. The law the Committee studied would not ban “one-way” containers. Consequently, metal cans should remain available, based on their competitive merits. Refillable bottles are expected to be more widely available than at present, thus expanding the range of choices, especially for consumers who wish to purchase beverages in refillable bottles. If there is an increased demand for refillable bottles it will be satisfied primarily at the expense of non-refillable bottles.

Consumers who currently use refillable bottles or who already recycle nonrefillable containers will find it more convenient to do so because the number of places where they can purchase and return them will increase. For many consumers, though, there will be some added inconvenience because they will have to store and return containers to avoid forfeiting the deposit.

The staff has found no satisfactory method of imputing a monetary value to added inconvenience. In Vermont and Oregon, however, total sales of beverages do not appear to have been significantly affected by passage of deposit laws, suggesting that consumers, at least in these States, do not perceive the resulting inconvenience as a cost that they are unwilling to bear. In polls conducted after deposit laws had been in effect in these States for several years, 90 percent of the respondents in Oregon and 93 percent of the respondents in Vermont favored continuing the deposit system. However, citizens in States which have not tried beverage container deposit systems do not always share this attitude. Statewide referendums to adopt beverage container deposits have been hotly contested in several States during the past few years and in some instances have been defeated.

A national survey, performed for the Federal Energy Administration in February 1975, provides an additional indication of consumers’ perceptions of the value of the inconvenience associated with a deposit law. In that survey, 73 percent of those questioned indicated that they would favor a national deposit law. Those who responded favorably apparently perceive the costs associated with such a law (including inconvenience) to be less than the value of the benefits to be gained.

(4) Effect on Employment

The greatest potential for employment disruption will be in manufacturing of glass bottles and metal cans, with additional but less significant negative effects in industries supplying raw materials. Current studies reviewed and performed by the RCC staff indicate that, in 1985, employment in container manufacturing would be reduced, in comparison with projected 1985 employment, by about 19,000 to 38,000 jobs. The steel and aluminum metal can-stock industries would undergo an additional reduction of about 6,000 to 11,000 jobs, for a total reduction in employment of 25,000 to 50,000. (Lower estimates relate to the "low change scenario" as portrayed earlier in Table 12, the higher estimates to the "high change scenario.") For the maximum case, the staff estimates total job losses of 10,400 at glass container plants (14 percent of the total jobs in 1977), 28,000 in metal beverage can production (about 28 percent of the total in 1977), 5,800 in steel production and 5,100 in aluminum production over a 5-year transition period (1980 to 1985, assuming implementation by 1980). The actual number of workers displaced over the transition period would be somewhat lower, however, since normal attrition and transfer to other container manufacturing jobs would alleviate the impact.

On the other hand, prospective increases in employment in beverage filling, distribution, and retailing are estimated at 80,000 to 100,000 jobs, resulting in a net increase in beverage-related employment of 50,000 to 55,000 jobs for 1985.

It is sometimes assumed that the jobs lost in the primary metals, glass container, and metal can manufacturing industries would be "highly skilled" (and, therefore, earn high pay) and that the jobs gained in other sectors would be "low skilled" (and earn low pay). There is only fragmentary evidence bearing directly on the question of comparative skills among jobs gained and lost, but data on average earnings in the affected sectors suggest that, although valid in some respects, this assumption on relative job skills is only partly true.

The 25,000 to 50,000 manufacturing jobs lost in the metals and glass sectors would involve relatively high average annual earnings (ranging in 1976, for example, from \$12,000 in glass containers to \$15,600 in metal can manufacturing), while the 60,000 to 65,000 jobs gained in retail distribution would be generally low paid (\$4,300 to \$7,400 in 1976). However, many of the 20,000 to 38,000 jobs created in the beverage industry (bottle washing and filling) and in wholesale distribution (inventory management, truck driving) will be relatively highly paid. In 1976 average earnings in these sectors ranged from \$9,100 in soft drink bottling, to \$11,600 in wholesale malt beverage distribution to \$17,100 in breweries.

The Committee places great importance on the projected labor impacts and notes in its findings and recommendations that employment dislocation would need to be addressed as part of any nationwide deposit legislation. The subject of employment impacts is addressed in three Staff Background Papers: No. 4, "Transitional Impact of National Beverage Container Deposit Legislation;" No. 6, "Localized Employment Impacts, Glass Industry;" and No. 20, "Summary of Projected Labor Impacts of a Nationwide Beverage Container Deposit System."

(5) Government Administrative Costs

One of the positive aspects of a deposit system is that it can be self-administered without government being involved directly in operations. If such legislation is adopted, the Federal government will most likely want to limit its role to monitoring effects and providing information and interpretation to Congress, industries, and the general public. The deposit itself can be enforced through a provision in the law for citizen suits, although the costs of such suits cannot be estimated. The RCC staff has estimated that the costs to the government in the initial two to four years of monitoring should not exceed \$1 million per year.

Other Policy Issues

The analysis performed by the RCC staff suggests imposition of beverage container deposits is consistent with all five of the criteria used by the Resource Conservation Committee to evaluate proposed policies:

Free Market Principles. Mandatory deposits penalize consumers for not returning containers and require retailers and distributors to perform certain functions. However, the deposit requirement works within the current market structure by allowing full freedom of choice to producers and consumers in making their production, packaging, and purchasing decisions.

The "Polluter-Pays" Principle. A deposit scheme assigns responsibility for solid waste and litter problems caused by beverage containers to those selling and consuming beverages. This is consistent with the "polluter-pays" principle.

Social and Economic Equity. The deposit mechanism should not impair the long-term vitality of the soft drink and beer industries, as witnessed by the economic health of these groups within States where deposit legislation is in effect. However, some adverse economic impacts would occur during the transition to a more extensive returnable/refillable system. Beverage prices to consumers should, in the aggregate, decrease slightly.

Economic Efficiency. Mandatory deposits would modify the private sector trends in the design and disposal of beverage containers. The best estimates of the RCC staff are that, following initial industry transition, consumers would pay a slightly lower net cost for beverages, indicating that less total national resources would be required to deliver a given volume of packaged beverage (see the cost analysis earlier in this section). At worst, there would be little noticeable change in net beverage costs. In addition, costs of litter pickup and solid waste management would also be somewhat reduced and the population would also enjoy the aesthetic but non-priced benefit of a less-littered environment. These factors all suggest that overall economic efficiency in providing beverages and disposing of container waste would be improved.

However, against this must be counted the decrease in consumer convenience (generally considered the major economic benefit of disposable containers) involved in having to return containers to avoid forfeiting deposits. Those who feel that this (unmeasured) cost is too high a price to pay for the waste management and possible consumer cost savings and environmental benefits will judge the mandatory deposit system to be economically inefficient.

Administrative Feasibility and Cost. The feasibility of administering deposit systems within the private sector has been demonstrated not only historically but also in the States that now have such laws in force. Public sector administrative costs should be negligible since no direct Federal regulatory or fiscal actions are required. The only government costs should be for monitoring the impacts of the legislation.

Committee Findings

Based on empirical studies and economic modeling reviewed or conducted by its Staff, the Resource Conservation Committee made the following findings with respect to national beverage container deposit legislation:

- Imposition of mandatory deposits is an effective means for reducing litter associated with beverage containers.
- Up to two percent of municipal solid waste would be eliminated by the imposition of mandatory deposits.
- Beverage container deposits would result in significant conservation of virgin material and energy resources at a return level of at least 85 to 90 percent.
- The precise effects of a deposit system on beverage prices are difficult to project. However, the experience to date in two States where legislation has been in force for several years indicates that the retail

price effects generally appear to fall within a range of plus or minus several percent. Caution should be used in extrapolating from this data.

- Most consumers would experience some inconvenience as a result of a mandatory deposit system.
- A net increase in jobs would occur, although some industries would experience significant dislocations. Both high- and low-skilled jobs would be affected. While some portion of the higher skilled jobs that would be lost appear to be offset by gains in high-skilled jobs in other sectors, the main effect would be an increase in low-skilled jobs to account for the total net employment increase. The dislocation in the job market needs to be addressed in the event of legislation.
- The deposits would reduce the volume of glass and metal in the waste stream, thus simplifying the operation of certain resource recovery facilities, notably combustion-based facilities in which glass can cause significant slagging problems. Similarly, deposits should help to eliminate difficult-to-recycle containers (e.g., bimetals) since they will induce either recycling of containers or conversion to refillables.
- The benefits of deposits do not appear to decrease disproportionately with a reduction in return rates.
- The experience to date with deposits in two States (Oregon and Vermont) has indicated high levels of both public acceptance and return rates. However, because there has been very little experience in industrial States, the applicability of this experience to a nationwide deposit system is uncertain.

Committee Recommendations

I. Design Recommendations

If beverage container deposit legislation is adopted, there are a number of ways it could be designed. The Committee endorses the following features for a deposit system, if one is adopted.

1. The deposit should cover beer and carbonated soft drinks in sealed containers, with a discretionary option for the EPA Administrator to include others by regulation (subject to guidelines in the law).
2. The deposit should cover all sealed containers for the designated beverages, regardless of material used, with a discretionary option for the EPA Administrator to include or exclude others by regulation (subject to guidelines in the law).

3. The deposit should be a minimum of five cents, indexed to the Consumer Price Index, in full cent increments.
4. The deposit should be specified as a uniform minimum deposit on all beverages and containers.
5. The deposit should begin at the distributor-wholesaler stage of the distribution system.
6. The effective date of any legislation should be two years from the date of passage.
7. Existing Federal employment impact assistance programs should be examined as a possible means to mitigate the adverse affects of job dislocations directly attributable to the introduction of a beverage container deposit system mandated by the Federal Government.
8. Nonrefunded deposits should not be taxed away or regulated (other than as normal contribution to income). No special tax provisions are necessary. The present tax code is sufficient.
9. The legislation should not ban pull tops.
10. Cartons or carriers should not be regulated.
11. No position is taken on the question of whether State and local deposits should be preempted by Federal law.

One of the members further notes that, although these design features are reasonable, the States should be actively consulted on this subject.

II. Policy Recommendations

Four of the eight members taking a position on national beverage container deposit legislation recommend that it be adopted. Two members recommend against such legislation, two favor postponing consideration of national legislation until there has been more experience at the State level and one member takes no position.

The four members in favor cite expected savings in materials and energy, as well as reductions in expenditures for solid waste management and litter control. They point out that consumer inconvenience appears to be more than offset by the popular support that has been expressed in a number of public opinion polls. Moreover, a national beverage container deposit program is a resource conservation measure that would impose no significant administrative costs on the Treasury. Two members, noting the job losses that might accompany such a program, make a special point of suggesting either that the program be implemented gradually or that the Federal Government give assistance to mitigate any adverse effects on labor.

Two members recommend against beverage container deposit legislation, noting that the costs would likely outweigh the benefits. One of those

members further observes that consumers currently have the opportunity to choose returnable containers and suggests that they could retain that choice without a mandatory deposit system. This member believes that the data generated by different sources interested in this issue, such as that regarding public support and energy usage, are unpersuasive. For example, a number of States in recent years have defeated deposit referenda.

Two members favor postponing consideration of mandatory national beverage container deposit legislation until the State programs in Michigan, Connecticut, and Iowa have been fully implemented and more empirical evidence on the effectiveness of State programs is available. Currently, information is available from only two States – Oregon and Vermont. One of these members further recommends that individual States give full and fair consideration to the enactment of State beverage container deposit legislation, based on a full assessment of the benefits and costs in their areas. The member notes that different legislation in different States probably would not impose undue hardship on the beverage industry.

The final member takes no position on the issue, recognizing the arguments in favor, but noting that sufficient attention has not been paid to the private inconvenience which would result from such legislation.

Deposits and Bounties on Durable and Hazardous Goods

Interest in deposit-refunds or bounties for products other than beverage containers can be traced back at least to the mid-1960s. The focus at that time was on abandoned automobiles, an ugly sight and a costly problem in many areas. Several European countries and the State of Maryland have applied bounty systems to cars, and the Resource Conservation Committee was interested to see if they could be expanded to other items consumers discard, notably durable and hazardous goods.

Deposit-refund and bounty systems create a “market” for goods that no longer serve a purpose for their owners. Redemption centers become the “buyers” of the used goods, and those who redeem the goods become the “sellers.” The purpose of these systems would be to induce separation of wastes at their source and encourage proper channeling of specific wastes, thus contributing to the broader objectives of either resource recovery or proper disposal of toxic and other bothersome wastes. Placing a value on these wastes would also reduce litter and discourage dumping at unapproved locations.

There are several possible roles for government in relation to these systems. The most direct form of intervention by the Government is with **bounties**. Under this system, the Federal Government would establish redemption

centers funded from taxes. Slightly less direct are **mandated deposit-refund systems**, which involve requiring redemption centers to be set up before goods can be sold. The Government would require these centers to redeem goods when returned, using deposits collected on new goods to pay for the redemptions. The third system, currently most prevalent, is already in place to meet special conditions in the private sector. These **independent deposit-refund systems**, which require no Government action, are set up by producers or sellers as a way of inducing the return of the used goods.

The Resource Conservation Committee concluded that deposit-refund systems and bounties could be a useful tool to promote source-separation and reduce improper disposal. The Committee views hazardous materials as especially appropriate candidates. The case for using these tools for durable goods, however, is less clear because most of the possible benefits of these incentives are already being achieved.

The RCC staff also looked briefly at how deposits and bounties might be applied to representative products, in order to evaluate the systems in general but not to develop specific proposals. Most of the Committee was willing to recommend deposits and bounties in principle, and agreed to recommend further research to see how these ideas might be applied.

Durable Goods

Current estimates indicate that about 15 million tons of used durable goods, excluding automobiles,¹ are discarded annually as waste, and in their current disposal pattern have little potential for reuse or recycling. These consumer durables — stoves, refrigerators, furniture, and the like — constitute about 11 percent of total household and commercial waste and 20 percent of the nonfood packaging and product waste stream.

Large items, with or without hazardous constituents, are usually delivered or collected separately. When they are included in mixed waste during collection, they are traditionally separated before final disposal. Even when bulky items are not part of the formal collection system, disposal operators still try to keep them separate from other refuse.

Bulky wastes are not always disposed of properly, but the incidence of improper disposal or littering appears to be relatively low. Published estimates indicate a range of 1 to 15 percent, depending on product type. Minnesota, for example, reports that about 10 percent of the motor vehicles retired each year in that State are abandoned.²

¹ Automobiles, retired at the rate of 8 to 9 million per year, represent an additional 10 to 15 million tons of material. In general, autos are stripped for usable parts, and the hulks are shredded to produce steel scrap.

² Personal communication with Mr. Sam Hasson, Administrator of the Minnesota abandoned motor vehicles program, December 14, 1978.

In other words, the existing voluntary systems for disposing of bulky wastes work successfully for 85 to 99 percent of the waste, and that which is delivered for disposal — because it is usually separated from other wastes at the site — is in a condition almost as amenable to resource recovery as it would be if delivered to a redemption center.

These facts undermine the cost-effectiveness of bounty systems for bulky wastes, because the improvement in disposal of these wastes may not be sufficient to justify the cost of the program. Abandoned automobiles are a case in point. At least in one State, 9 out of 10 junk autos are already being delivered to a proper disposal site. If a bounty of, say, \$100 per car is offered by the government and this succeeds in bringing in all 10 cars, the government would in effect be paying \$1,000 in order to entice delivery of the tenth car.

Hazardous Goods

Hazardous products and materials in post-consumer solid waste are those which can be harmful to workers involved in solid waste collection and processing, to the equipment used to process solid waste, or to the environment after they are disposed of. Materials in question include pesticides, organic chemicals, petroleum products, and heavy metals. Table 14 identifies some of these materials and the components of the waste stream — batteries, waste oil, pesticide containers, refrigerators, small electrical appliances, and other products — that contain one or more of these substances.

Deposits or bounties could reduce the risk of these hazardous wastes by encouraging the public to separate them from the mixed waste stream. Tackling this contamination problem with an incentive system might reduce any need for product regulation, another policy the Committee examined.

Yet another benefit of deposits or bounties arises in the processing of mixed waste for resource recovery. For example, excessive amounts of waste lubricating oil in mixed waste can require additional control measures: if the wastes are burned, the incinerator might need additional pollution controls. A system for separating out hazardous wastes may also reduce problems in the design and operation of environmentally acceptable landfills.

Additional advantages of separation result from the revenues received for recovered materials, plus the savings from not having to pay for disposal of items that are recycled or reused.

Other Policy Issues

The Committee noted that controlling the waste flow does not, in itself, create or guarantee either resource recovery or proper waste disposal. Deposits and bounties should be viewed as general purpose incentives for controlling categories of materials. As conservation measures, they are more

Table 14

SOME HAZARDOUS COMPONENTS IN SOLID WASTE*

Contaminant	Possible Source	Hazard
Pesticides	Household and commercial pesticide containers	Nervous disorders. Some are known carcinogens.
Polychlorinated biphenyls	Small electric appliances	Toxic; accumulates in tissue
Fluorocarbons	Refrigerators, air conditioners	Claimed to harm ozone layer
Petroleum Products	Waste crankcase oil	Heavy metals, ground water contamination
Lead	Automobile batteries	Nervous disorders
Cadmium	Batteries	Kidney and reproductive damage

* Not all of the possible sources contain these contaminants.

suitable to product-by-product applications as a “fine tuning” device within the context of a broader waste management setting that also includes provisions for regulated disposal or recycling.

Free Market Principles. Bounty or refund programs allow individuals to exercise free market choices.

The “Polluter-Pays” Principle. Under a deposit or bounty system consumers who dispose of their wastes improperly forfeit their rights to the deposit or bounty. This loss is equivalent in effect to a pollution penalty, so that the system is consistent with the polluter-pays principle.

Social and Economic Equity. Because of the general nature of the Committee’s investigation of deposits and bounties, it is not possible to evaluate them from the point of view of social and economic equity.

Economic Efficiency. The degree of economic efficiency will be determined by the total price that is paid to bring about an incremental improvement in waste disposal or resource recovery; it will vary with each product and return scheme.

Administrative Feasibility and Cost. Like a beverage container deposit system, deposit systems for durable and hazardous goods should be relatively easy to administer. Government-financed bounties would be more difficult because of the normal restrictions relating to expenditure of public funds. In all cases, the costs will vary with different products and different systems.

Committee Findings

The Resource Conservation Committee concluded the following with respect to deposit and bounty systems for consumer durables and hazardous goods:

- Deposits and bounties could be effective in
 - achieving source separated delivery of durable and hazardous goods to specific points;
 - reducing improper disposal;
 - reducing uncontrolled dumping.
- The extent of the problem of littering and improper disposal of durable and hazardous goods is unclear.
- Hazardous materials appear to be the most likely candidates for this approach in the future.

Committee Recommendations

Because the Committee has not studied any specific applications of deposits or bounties for durable or hazardous goods, none of the members is prepared to recommend that the Federal Government apply either of these tools to specific products. Nevertheless, most of the members endorse the concept as potentially useful. Several members express special interest in using these tools for hazardous products, and one member endorses the general concept, while expressing reservations about mandatory national programs. All the members join in recommending further research on the subject.

National Litter Tax

Although litter is a highly visible and irritating problem in many communities, it is not a major issue from a material conservation or resource recovery standpoint because, even in the aggregate, it involves relatively small quantities of material. From an environmental perspective, litter is primarily a problem of “aesthetic insult” rather than a threat to public health or a major ecological hazard. Nevertheless, it is a problem of some importance in terms of the high costs of controlling it (estimated at over \$500 million per year) and the aesthetic costs related to failure in control. In these terms, it is a significant, if often overlooked, aspect of solid waste management, and deserving of special attention.

The Resource Conservation Committee thus gave serious consideration to litter problems as part of several of its policy studies. Most importantly, the Committee looked at litter when assessing the potential costs and benefits of a

national beverage container deposit policy. Litter is also an important aspect of the analysis of the use of deposits and bounties on durable and hazardous goods. Congress also instructed the Committee to consider the costs of litter pickup as an element in evaluating the appropriateness of solid waste disposal charges.

Several States currently employ dedicated litter taxes as a means for financing State litter control programs, and the concept of a Federal litter tax was suggested to the Committee, both as an alternative and as a complement to other policies, especially beverage container deposits. Thus, the Committee conducted a brief evaluation of litter taxes while recognizing that litter might be of little relevance to its central focus on resource conservation.

The Committee considered two different concepts for a national litter tax. The first is that of a broadly based tax on consumer goods designed to raise revenues to support a nationwide program of litter cleanup, education, and other control efforts. This is similar in purpose and form to litter taxes recently enacted in at least six States: California, Colorado, Connecticut, Kentucky, Virginia and Washington. Generally these taxes amount to a small fraction of one percent of sales.

The second concept for a litter tax is that of imposing selective excise or product taxes as an anti-litter incentive by raising prices on extensively littered products. This is a quite different approach. Various options are open in this regard, and several were briefly evaluated by the RCC staff.

While acknowledging that it would be feasible to raise revenues by levying a dedicated litter tax, the Committee was not favorably disposed towards the idea of a national litter tax in either its revenue raising or disincentive formulations. Moreover, the Committee found that a national litter tax would not be an effective substitute for beverage container legislation. By offering a reward, deposit systems not only provide a more direct incentive for the public to clean up accumulated litter, but also more effectively discourage litter in the first place.

Committee Analysis

The Committee found that a broad-based litter tax could be an effective revenue-raising mechanism to finance litter control activities at the local, State, or Federal level. However, conceived of solely as a funding mechanism, a litter tax would not have a direct effect on resource conservation: an excise tax designed to raise revenue does not necessarily provide an incentive to reduce the consumption of materials, increase recycling, or otherwise reduce the amount of waste. (See Staff Background Paper No. 14, "Preliminary Analysis of a National Litter Tax.")

Another difficulty with a litter tax designed primarily to raise revenue is that it is very hard to determine either current litter control costs nationwide

or future expenditure requirements. The Committee staff estimates that current expenditures for litter pickup nationwide may run at about \$500 million annually; this figure is probably too low, since it excludes expenditures associated with penalty enforcement, provision of receptacles, public education, and anti-litter advertising.

The Committee did not, however, explore the specifics of revenue expenditure. The question of how generated revenues might be used to pay for litter control activities at various levels of government raises a number of issues which go beyond the scope of Committee review. These issues include the problem of accurately estimating the cost of litter control at the local, State and Federal levels, as well as the problem of administering what would amount to a dedicated revenue transfer program where funds are earmarked for litter control. These important elements of a litter tax proposal would clearly warrant closer examination if a decision were made to proceed with a national litter tax.

A litter tax could also be designed to have an indirect effect on resource conservation, principally as a disincentive to littering. Conceived in this way, a litter tax would aim to reduce litter by causing prices to be higher for selected "litter prone" products. Consumers could respond by reducing their purchases of those products, while producers could respond by redesigning product and packaging characteristics to eliminate particularly litter-prone features and thus escape the tax. However, even if designed in this manner, a national litter tax would be a difficult means of reducing the rate of litter generation at the source — i.e., the consumer. As a practical matter, it would obviously be impossible to tax the individual act of littering, simply because most littering is surreptitious.

Although a national tax could be designed specifically to discourage littering, such a levy would probably be ineffective unless the tax rate were extremely high. The reason is that consumer demand for products potentially subject to a litter tax appears to be relatively unresponsive to prices. Technically speaking, price elasticities of demand for such products are seldom much higher than 1.0, and are frequently as low as 0.5. This means, for example, that a reduction in consumption (and presumably also of litter) of 20 percent would generally require price increases on the order of 20 to 40 percent or more for the individual products. Price increases of that magnitude would probably be considered inflationary. It is improbable that the nation would want to approach its litter problem via a general reduction in consumption.

Moreover, even if the higher prices would be tolerated, the litter tax would be economically inefficient. The tax would raise the price of all targeted goods to keep a small fraction from being littered. A cost-benefit analysis would show that a great deal of tax would have to be collected for each item not littered.

An alternative to a general litter tax would be a tax on specific design, packaging, or marketing features rather than the product itself. Such an approach would require a detailed product-by-product treatment. This approach would resemble product regulation, since the taxes would be used to induce administratively determined changes in product characteristics.¹ With few exceptions, such as the issue of beverage can “ring tabs,” the relations between product/packaging design aspects and littering has not been studied sufficiently to draw general conclusions about the feasibility or effectiveness of such a selective approach.

Other Policy Issues

Although the Committee did not examine the litter tax in terms of how the revenues obtained from it would be used, it did evaluate the economic efficiency, equity, and administrative aspects of using a litter tax as a revenue-raising device.

Free Market Principles. A national litter tax would not ban the production or sale of any product. It would alter the relative prices of selected products, but consumers would remain free to adjust to those price changes in a decentralized fashion.

The “Polluter-Pays” Principle. A litter tax would be generally inconsistent with the polluter-pays principle: all consumers of litter-prone products would have to pay the tax in order to reach the “polluters” — the minority who actually litter.

Social and Economic Equity. A national litter tax without complicated rebates would be regressive with respect to personal disposable income. Although the products most likely to be covered under a litter tax (candy, gum, soft drinks, beer, and cigarettes) are generally minor items in consumer budgets, expenditures on these items tend to increase as a percentage of disposable income for those with less personal income.

Economic Efficiency. Strictly as a revenue raising measure, a litter tax would not improve the efficiency of resource allocation in the economy. By changing effective market prices, the tax would direct resources away from the products subject to the tax and toward other products for reasons unrelated to any particular failure of the market.

If taken as a means of superimposing litter control costs on product prices — internalizing those costs — a litter tax would theoretically generate marginal improvement in resource allocation. The shift would therefore improve economic efficiency, since it would represent a movement from partial to full cost pricing. Operational problems might negate this advantage; however, the tax must be placed on the right products and at the right

¹ For discussion of product regulations, see the section on product regulations in Chapter 5 and also Staff Background Paper No. 18, “Product Regulations as a Resource Conservation Strategy.”

amount in order to avoid upsetting the balance of the market. A litter tax designed to internalize litter control costs could improve efficiency in resource allocation in theory, but there is no assurance that it would in practice. The tax would probably be too small to change many decisions.

A litter tax made high enough to affect the rate of litter generation would be economically inefficient. A great deal of tax would have to be collected for each item not littered.

Administrative Feasibility and Cost. A review of State experience with litter taxes indicates that tax collection costs have been relatively low, ranging from 1 to 5 percent of revenue yield. Generally, litter tax assessments have been added onto existing State sales or excise taxes, a procedure often called "piggybacking." Since there are no Federal sales taxes, and few Federal selective excise taxes, the State experiences probably provide little guidance in estimating the costs of administering a national litter tax. Moreover, even if there were Federal sales taxes, the State experiences might not provide very good guidance.

Committee Findings

(Findings on the national litter tax relate only to litter taxes as they might be used to raise revenue and to provide incentives against littering; they do not address funding of litter control programs.)

- A broad-based litter tax is an effective means of raising revenue to fund litter collection and abatement programs but is generally regressive and may be inflationary.
- At the national level, the income tax provides a more equitable means of revenue raising.
- A litter tax provides no incentive for either cleaning up litter or reducing the rate of litter generation.
- Unless the tax is extremely high, and thus unrelated to the cost of litter control, it would have no effect on resource conservation.
- A litter tax is generally inconsistent with the "polluter-pays" principle.
- Without prejudging the merits of a beverage container deposit system, a litter tax is not an effective substitute for a beverage container deposit system.

Committee Recommendations

The Committee unanimously recommends against national litter tax legislation, having found that a litter tax would not provide any incentive to clean up litter or reduce the rate of litter generation, and that a litter tax is not an effective substitute for a beverage container deposit system. One member further asserts that litter should be considered a State problem and not a Federal problem. Because the subject of litter has not been well analyzed at the national level, two members also recommend further study of the litter problem.



PRICING POLICIES FOR MUNICIPAL SOLID WASTE

When we buy an item marked “59¢” in a store, we pay just that for it — not “59 cents plus the costs for adequate disposal of the item and its packaging.” Some economists and others have argued that the current system prevents us (as a society) from allocating resources efficiently. Generally we pay for municipal solid waste management through property taxes or as a uniform charge each month. The costs of disposal are distant from our decision to purchase; the costs do not vary with how much we throw away. As a result, from producers to consumers we ignore those costs in deciding which products to produce and purchase.

Because disposal costs are not included in purchase prices, we do not have an incentive to “economize” on disposal services. We have little motivation to separate and recycle usable waste materials or to select types of packaging (e.g., returnable bottles) which need not end up as solid waste. The result can be an overuse not only of the resources needed directly for disposal (e.g., land for sanitary landfills), but also of the materials used in consumer goods and packaging which are then thrown away.

The Resource Conservation Committee examined two methods of assigning prices to solid waste management services, local user fees and a national solid waste disposal charge, to determine their appropriateness and feasibility as resource conservation policies.

Local solid waste user fees are charges paid by users of municipal solid waste collection and disposal services which relate directly to the amount of service provided. If a household discards less waste, it would pay less for waste management services. Several researchers have hypothesized that the widespread introduction of quantity-based solid waste user fees could have important implications for resource conservation by providing an economic incentive to households and commercial establishments to reduce waste and increase recycling.

A **solid waste disposal charge** (or “product charge”) would be a national excise tax on the virgin materials in consumer products and packaging that enter the municipal solid waste stream. Though varying in specific design, most proposed product charge schemes have included (1) a weight- or unit-

based Federal excise tax on consumer products and packaging tied directly to projected costs for disposal (e.g., \$X per ton or Y¢ per container); (2) an exemption from the tax for secondary (recycled) materials used in products and packaging; and (3) redistribution of the revenues obtained from the tax to local governments.

The idea behind a solid waste disposal charge is a fairly simple one: it is a way of charging for disposal at the time a product is purchased. Since disposal costs are normally not included in the price of the product, neither producers nor consumers of goods pay more for disposal when they are responsible for generating more waste: producers do not pay at all, and consumers pay only in the aggregate, in most instances through their local property taxes or through flat fees. A national disposal charge can be formulated to include these costs in the price of the materials, thereby “internalizing” them, so that decisions to use the materials will take all costs into account.

Although local user fees and a national solid waste disposal charge are both methods of adding in the costs of solid waste management services, they differ in several important respects, specifically: (1) in their point of application, (2) in the level of government that applies them, (3) in how closely the charges can reflect the costs they are intended to cover, and (4) in the incentives they create to change the use of materials in the nation. In spite of their differences, however, incremental quantity-based local user fees and a national solid waste disposal charge are basically alternatives for achieving the same ends. Imposing both at once would have a larger effect on resource conservation than imposing only the charge or the fee, but it would be double-charging for the provision of solid waste management services, which may be just as detrimental to economic efficiency as not charging at all.

Local User Fees

Very few local waste collection systems actively encourage users to discard less waste. Only about a quarter of collected waste is subject to **variable** user fees — fees which change in relation to the costs that consumers impose on the solid waste management system. Of these variable fees, most are **service based** (change when the frequency of collection or the location of pick-up change), rather than **quantity based** (change in relation to the amount of waste discarded), and thus create little or no incentive for reducing the amount of waste. Local jurisdictions collect revenues for the remaining three-quarters of the waste through local property taxes or flat-rate fees, which provide no incentive for conservation.

There are feasible methods by which local jurisdictions can use the quantity of waste to determine the price of waste collection. Several public

and private collectors already do this, although most of their methods are relatively simple. Some organizations charge fees based on the number or average size of refuse cans which discarders regularly want emptied over the course of a long-term contract. A few use a more precise method to monitor volume: "metered bags." Under this system, the service supplier or an authorized distributor sells pre-labeled plastic bags; the price of the bag includes the cost of pickup and disposal of the contents. Metered bags appear to be the most precise and practical method presently available for charging quantity-based fees, and their use appears to cause collection costs to be lower than they would be with refuse cans from households in single-family residences. A variation on this method has been tried in Europe, where stickers have been sold for attachment to refuse containers.

A quantity-based variable fee makes sense as an incentive for resource conservation only if households and commercial establishments can in fact respond by reducing the amount of waste they put out. The RCC analysis suggests that they can. They can shift their purchases of goods (and packaging) toward low-waste items (e.g., reusable containers and tableware, longer-lived goods). They can also seek out opportunities for recycling: composting leaves and clippings in their own yards, taking metals, glass, and paper to local recycling centers, and (for larger commercial or institutional establishments) entering into contracts with dealers in secondary raw materials for specialized source-separated collection of corrugated paper or high-grade office paper. In the longer run, households and commercial establishments might, through changes in what they buy, encourage producers to create products and packaging that are less wasteful and more readily recyclable.

Effectiveness of Variable User Fees

Although quantity-based local user fees are feasible, the crucial test of their usefulness is whether consumers will actually reduce the amount of waste they put out for collection, without, of course, resorting to uncontrolled "midnight" dumping. Several studies have been performed in an attempt to determine whether the presence or absence of incremental fees affects the quantity of waste discarded. (These studies are described in Staff Background Paper No. 13, "Local User Fees for Solid Waste Services as a Resource Conservation Policy.")

Some of the studies suggest that variable local user fees do lead to changes in waste generation. But there is also evidence to suggest that the user fees charged in the past have had little or no such effect. Thus, while one cannot make an unequivocal case for local user fees as a resource conservation measure, the documented experience to date does suggest that they may be a useful tool. There is still a need, however, for more carefully designed field studies on this subject.

There are benefits other than resource conservation associated with the variable fees. In theory, a user fee based on the incremental cost of providing service should improve the efficiency with which the municipal solid waste management system operates. System operators have noted, for example, that charging for each container (i.e., a volume-related fee) causes households to pack more waste into each container. The result is fewer containers and less time spent on collection, enabling the same level of service at a lower total cost — unless, of course, the tightly-packed containers become too difficult to handle. Uncontrolled, “midnight” dumping, another potential drawback to local fees, has generally not been a problem in this country, although it has been reported as a problem in Europe.

Variable fees could also make it economically and politically feasible to offer a broader array of services. Individuals who demand a costlier level of service (e.g., more frequent collection or pickup in the back yard rather than at the curb) would be able to purchase it. Of course, too many service options with different fees could overload the administration of the system, so there is a practical limit to what could be offered.

Administering Local User Fees

The cost of administering user fees depends on the type of fee system used. Because some sort of billing is required with a fee system, it is more expensive, other things being equal, than a tax-supported system. A metered bag system, however, is relatively inexpensive to administer. For most types of fees, billing costs run less than 5 percent of the total cost of collection and disposal (about \$2 per ton for billing, on the average) when billing for solid waste is combined with billing for other municipal services such as water and sewer. Completely separate billing can run as high as 10 to 15 percent of total waste management costs in some cases.

With variable fee systems other than metered bags, monitoring is required in addition to billing. The collector must keep records so that the household is charged the correct rate, and the crews must be told who has purchased what service. The route books and updates typically involved will be costly only if the collection crews have to consult them regularly; however, in practice, this does not appear to be a problem. The available evidence suggests that the crews usually know who has purchased what service and can provide it without constantly referring to the route books.

Two final impediments, aside from administrative cost and monitoring, discourage local officials from adopting local user fees. Both are existing Federal policies. The first is that user fees are not deductible from income taxes. Users must pay the fee out of after-tax income, while local taxes — for example, the property taxes often used to pay for solid waste management — are deductible from income taxes. The second policy is related to Federal

revenue sharing: user fees cannot be used in the formula to calculate the local tax base. (The amount of Federal revenues a community receives is based in part on the level of local taxation — high local taxes mean more revenue sharing, but user fees cannot be counted.) While the Committee did not study in any detail the implications of altering or removing these policies, it is clear that such study is necessary.

Other Policy Issues

The RCC staff analysis suggests that making the costs of solid waste management more explicit through incremental user fees is consistent with at least four of the RCC's five criteria for evaluating proposed policies. Only the costs of administration may interfere.

Free-Market Principles. Because the charge to each discarder is related to the cost of providing the service, discarders can decide how much service they want and can pay only for that service. When they respond to the now-explicit price signals, they have the opportunity to make their decisions just as they do in other free markets.

The "Polluter-Pays" Principle. With quantity-related incremental user fees, consumers can pay for service in proportion to the costs of preventing environmental damage from the waste they generate (i.e., the costs of disposing of waste in an environmentally acceptable fashion).

Social and Economic Equity. User fees improve the general "fairness" of the waste management system, since people who make more costly demands on the waste management system would bear a greater share of the costs. It is not clear whether user fees would generally be more regressive or progressive than the present local property tax systems.

Economic Efficiency. With an incremental fee system, people would have the opportunity to order service geared to their own real needs, saving resources which might otherwise be needlessly spent. A flat fee system, however, would not be an improvement over a tax-supported system in this respect.

Administrative Feasibility and Costs. It is difficult to make a judgment with respect to this criterion. Administrative costs for incremental fee systems appear to be reasonable, judging by the communities that already use them. (It is fair to assume that those communities feel that the benefits from the fee system outweigh its costs.) We cannot generalize this conclusion to all communities, however.

Committee Findings

Based on a review of the theoretical basis supporting local user fees to finance collection and disposal of municipal solid waste and the studies of actual experience to date, the Resource Conservation Committee has concluded:

- Quantity-based local user fees have the potential to stimulate a reduction in the quantity of waste put out for collection and disposal by individuals, and to increase the amount of waste material separated and recovered.
- There is some empirical evidence that quantity-based local user fees can cause reductions in the generation of municipal solid waste.
- Administrative costs of existing local user fee systems are generally low.
- Local user fees which vary based on services provided offer a means of payment for waste collection and disposal that is more consistent with the polluter-pays principle than are the predominantly used flat-fee and local-tax-financed systems.
- Federal tax and revenue-sharing policies discourage the adoption of local user fees by encouraging localities to use taxes rather than user fees to finance municipal solid waste collection and disposal.

Committee Recommendations

The Committee unanimously endorses the concept of local user fees for solid waste management. By "local user fees," the Committee means variable fees that change according to the quantity of waste put out for collection. (In addition, such fees can also vary according to the frequency of service and other major determinants of the actual costs of collection and disposal.) The Committee's endorsement is based on evidence that variable fees may encourage more economical use of solid waste management services.

The Committee also unanimously recommends additional study of Federal policies that inhibit local user fees, including the non-deductibility of fees for Federal personal income tax purposes and the current exclusion of user fees from the local tax base calculation used for Federal revenue sharing. Nevertheless, the Committee has decided not to recommend precisely how these disincentives should be removed because the options for removing them and the implications of those actions have not been studied in sufficient detail.

Finally, although the Committee members agree that the present state of knowledge makes it premature to create positive incentives for local governments to adopt user fees for solid waste management, they unanimously recommend that the Federal government provide localities with information and/or technical assistance on local user fees.

Some members of the Committee suggest stronger Federal action. One member recommends not only that Federal disincentives be studied but also that the Committee go ahead now and recommend ending them. Two other members recommend further studies that would include demonstration programs involving, among other things, source separation of materials for resource recovery in conjunction with variable fees.

National Solid Waste Disposal Charge

The Committee found similar theoretical justification, but more practical difficulties, in an alternative to local user fees — the national solid waste disposal charge. Under this policy, the Federal Government would charge producers directly for disposal at the time they manufacture a product; the cost would then be passed on to consumers. The money collected under this plan would then be distributed to local governments. The principle behind this policy, as in local user fees, is that consumers and producers should be made to realize that disposal is not free.

The principal difference between local user fees and solid waste disposal charges is their point of application: the disposal charge would incorporate the cost of disposal into the price of a product, rather than charging when it is discarded. As visualized by the Committee, the charge would apply only to virgin material content and not to recycled material content (on which a charge presumably had already been paid once). This method would raise prices more for high-waste items, thus discouraging consumers from buying these items in preference to low-waste items, and encouraging the use of recycled materials.

As a result, the incentives of the disposal charge are directed toward decisions on production and consumption rather than toward disposal: the local user fee encourages recycling by charging consumers for the materials they do not recycle; the disposal charge encourages recycling by charging only when primary materials are used and thereby changing the relative prices of primary and secondary materials.

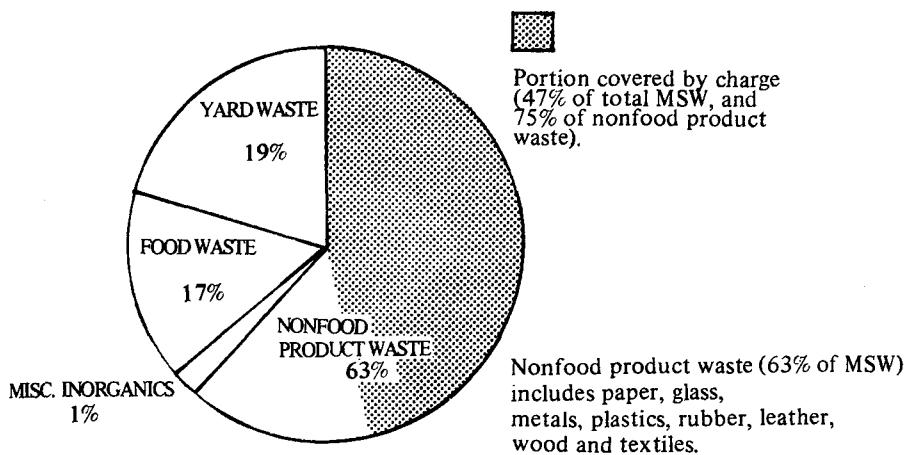
The Resource Conservation Committee concentrated on the disposal charge as a way of incorporating the cost of disposal into decisions on resource use. However, the disposal charge could also serve objectives that the Committee did not study. For example, the charge could have the objective of increasing recycling or resource conservation per se; or it could compensate for existing government policies which encourage the use of virgin materials (such as tax subsidies for virgin materials or freight rates which discriminate against recovered materials). Although the Committee addressed the issues associated with these objectives, it did not evaluate the disposal charge as a means of achieving these objectives.

Design Features

Disposal charges are inherently complex. Striking a balance between administrative feasibility and effectiveness for waste reduction, decreasing virgin material use, and recovery involves the interplay of many interrelated design options. Staff Background Paper No. 9, "Solid Waste Disposal Charge Design Issues" discusses these issues.

The national disposal charge that the Committee studied would apply to 75 percent of the non-food component of municipal solid waste, or just less than half of total municipal solid waste, including food and yard wastes (Figure 9). The charge would apply to plastic, metal, paper packaging, and other (non-packaging) paper products.

Figure 9: COMPOSITION OF MUNICIPAL SOLID WASTE (1976), SHOWING PORTION THAT WOULD BE COVERED BY SOLID WASTE DISPOSAL CHARGE EVALUATED BY THE RCC



Source: Environmental Protection Agency and Resource Conservation Committee Staff.

The principal consumer products excluded, other than food, were durable goods. Durable goods — e.g., appliances and furniture — differ from non-durables principally in that they are not discarded for many years after purchase, making the appropriate charge rate difficult to determine. Because these goods are sometimes littered or abandoned in alleys or along the roadside, a deposit or bounty mechanism appeared to be a more suitable way to deal with them than a solid waste disposal charge.

Ideally, a disposal charge would be levied on everything entering the municipal solid waste stream. In practice, however, a national solid waste disposal charge could be levied only on items which are sold as products, excluding other items in the waste stream such as lawn trimmings, leaves, dirt, and construction debris.

It appeared from available information that the only feasible basis for a product disposal charge would be to make it a weight-based charge, rather than a volume-based charge.

The Committee decided that the most appropriate level for a disposal charge designed to improve economic efficiency would be to make it equal to

the national average cost of collecting and disposing of an additional quantity of municipal solid waste (i.e., the marginal, or incremental cost of solid waste management). A uniform charge for all products, rather than a product-specific or location-specific charge, would be the only administratively feasible approach for a national-level charge. Using averages, however, causes the charge to lose precision and effectiveness as a means to improve resource use. The incremental cost of collection and disposal differs from location to location and from product to product and a charge based on averages does not capture these differences.

It is difficult to estimate the national average incremental cost of solid waste management. The available estimating procedures are crude, and there is considerable uncertainty regarding the quality of the basic data. After considerable analysis, the staff determined that the national average incremental cost of municipal solid waste management is approximately \$15 per ton in 1978 dollars, and this was the charge level that the Committee staff used to evaluate quantitative impacts. This estimate was based on statistical and engineering modeling, and is discussed in detail in Staff Background Paper No. 11, "A Cost Analysis of the Solid Waste Management Industry."

An exemption from the charge for the secondary (recycled) material portion of consumer products and packaging was another important feature of the proposal studied. The recycling of waste material avoids some disposal costs, and the exemption would provide an incentive for producers to make greater use of recycled materials.

The final important design feature of the proposal studied by the Committee relates to the use of the revenues generated by the charge. Feasible options examined by the staff included: simply allocating the revenues to the general fund of the Federal treasury; returning the proceeds to households through income tax rebates; and transferring the funds to State and local governments through some form of revenue sharing system. The staff analysis looked most closely at General Revenue Sharing as a model. When the money reaches local governments it would become part of "general funds," and the localities would be able to lower their taxes (or at least not raise them in the future) or increase local services by the amount received. Thus, although the charge would increase prices of certain consumer goods, it would also most likely be reflected in decreases in other types of taxes.

Analysis and Implications

Although the Committee found the concept of including disposal costs in the price of products to be theoretically justifiable, the staff's analysis indicated that, in practice, under current conditions the introduction of a \$15 per ton solid waste disposal charge would probably produce only modest resource conservation and would probably be only a little better than a break-even proposition, at best, from an economic standpoint. A complete analysis

of the benefits and costs of a \$15/ton disposal charge is contained in Staff Background Paper No. 12, "Benefits and Costs of a National Solid Waste Disposal Charge."

In performing this analysis, the RCC staff used a computer model of the paper and packaging industries developed specifically to evaluate the effects of a series of different charges on waste generation and recycling and on the use of virgin materials in affected industries.

Based on the policy design features described, the estimates developed with this model projected that recycling would increase by approximately 1.2 million tons and waste generation (before recycling) would decrease by about another 1.2 million tons, compared with their respective 1985 baseline levels, for a total net decrease in municipal solid waste disposal of 2.4 million tons below what it would have been otherwise. This reduction would represent approximately 1.2 percent, by weight, of total municipal solid waste, or approximately 2.7 percent of the products directly subject to the charge. Net disposal of wastepaper would be reduced by about 1.3 million tons (2.3 percent), glass by 880,000 tons (5 percent), steel by 220,000 tons (4 percent), and other materials by lesser amounts.

In other words, a \$15/ton disposal charge would probably have only a relatively small overall effect on resource conservation and solid waste.

The measurable economic benefits from a national solid waste product charge would be primarily attributable to local community savings in solid waste collection and disposal costs. At an average incremental cost savings of \$15 per ton, the reduction in net waste disposal of 2.4 million tons would achieve a nationwide saving in solid waste costs of about \$33 million per year. Against this, however, would have to be subtracted the direct governmental costs of administration, roughly estimated at about \$10 million per year.

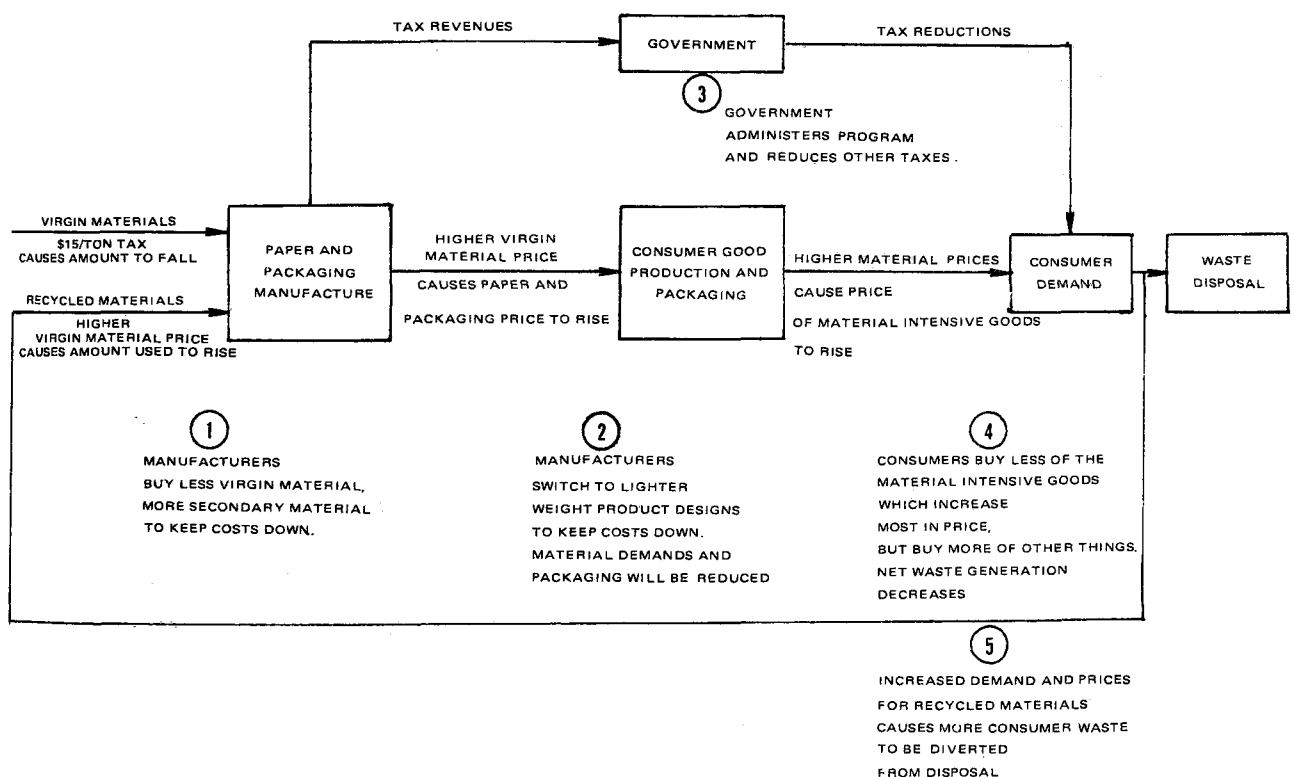
In addition there are other reductions that should be made to correct the benefit estimate for market inefficiencies and consumer losses introduced by the charge itself. As discussed in the staff background paper on "Benefits and Costs," these involve factors such as using a national average rather than locally specific charge rates. Although the size of these technical adjustments is difficult to estimate, under certain assumptions they could be large enough to reduce the economic benefits of imposing the charge to zero or even cause them to become negative.

Even if we discount these technical reductions, however, net economic benefits would not be substantial enough for the policy to have much more than a break-even prospect from an economic perspective. The most important factor underlying this conclusion is the apparent low response that can be effected in the materials industries and packaging markets to the imposition of the charge.

The changes in the use of materials following introduction of a disposal charge depend partly on the responsiveness of consumers to higher prices for

consumer products and, more importantly, on the responsiveness of manufacturers and raw material suppliers to changes in recycled and virgin material prices. Figure 10 shows the process by which material use would change. Despite the fact that the RCC staff and several private contractors spent considerable time attempting to quantify these relationships (technically known as "price elasticities"), the magnitudes of these factors remain highly uncertain. The staff generally believes that the elasticities used understate the true long-run responsiveness of the market. However, the results of the available statistical estimating methods do not support higher elasticities. Additional research is needed. The estimates of these elasticities are presented in Staff Background Paper No. 12, and contractor reports are available which document their development.

Figure 10: EFFECT OF A NATIONAL DISPOSAL CHARGE



The imposition of the national disposal charge would raise the price of goods and services that use paper and packaging. For example, the \$15 per ton charge would increase the cost of paper products and packaging materials by \$1.35 billion (1978 dollars) in 1985, which would be about 1/20 of one percent of GNP,¹ and approximately this amount would be collected in Federal revenues and, less administrative costs, transferred to local govern-

¹ A \$1.4 trillion GNP (1974 dollars) in 1974 growing at 3 percent annually would reach \$2.6 trillion in 1978 dollars by 1985.

ments as revenue transfers. These revenues would be almost entirely returned to consumers through net tax reduction or increases in government services at the local levels. Consequently, the charge should not be inflationary from a macroeconomic standpoint.

The RCC staff also investigated the effects of a \$30/ton disposal charge. Although the higher charge level would approximately double the waste reduction and recycling effects, it could be less efficient economically because more people would be overcharged for solid waste services.

Other Policy Issues

In addition to analyzing the resource conservation effects of a national disposal charge, the RCC also evaluated the policy in terms of economic efficiency, social and economic equity, and administrative cost.

Free Market Principles. A solid waste disposal charge would incorporate the cost of disposal into the price of certain consumer products and packaging. Consumers and producers would retain their freedom to make choices, but they would do so under a new set of constraints (prices) — constraints which reflect the national average costs that their choices impose on the waste management system. Thus, a disposal charge would be entirely consistent with the free market philosophy.

The “Polluter-Pays” Principle. A disposal charge conforms to the “polluter-pays” principle by forcing those who buy and sell products to bear the costs of disposal. However, to the extent that some disposers already pay directly for waste services, it would not be totally consistent with the “polluter-pays” principle.

Social and Economic Equity. As a percentage of income, the product charge would appear to fall more heavily on lower income families which spend a greater portion of their income on packaged food, clothing, pharmaceuticals, and other necessities which use paper than higher income families do. However, the average impact for all families would only be about \$25 a year, and the impact on lower income families would be less. More importantly, if the revenues collected are returned to municipal governments the net effects would be either neutral or “progressive” with respect to different income groups. Finally, it should be noted that the present system for financing municipal solid waste collection and disposal largely out of property taxes is already regressive and may be more regressive than a disposal charge.

Economic Efficiency. By forcing consumption and production activities to bear the full costs of municipal solid waste management, a disposal charge would improve economic efficiency. If consumers do not face any penalty for disposing of the goods they buy, they will tend to buy more goods requiring disposal than they would otherwise. Similarly, if producers face no penalty

for manufacturing high-waste products, they will continue to produce them at higher rates than they would otherwise. A disposal charge would force both these groups to realize that disposal is not free and would induce choices on both their parts that are more efficient economically. However, for those who already pay directly for waste management it would be less efficient economically.

Administrative Feasibility and Cost. The disposal charge system that the Committee staff analyzed appears to have high administrative costs relative to the benefits it would generate. The costs (about \$10 million per year) would probably more than offset any gain attributable to the policy.

Committee Findings

Based on the staff's analysis of the national solid waste disposal charge (a Federal excise tax on consumer products and packaging designed to reflect their contribution to local community solid waste management costs), the Resource Conservation Committee found:

- There is a theoretical justification for internalizing municipal solid waste management costs.
- The analysis of the likely effects of a disposal charge based on national average marginal costs for municipal solid waste management indicates that the net economic benefits and impact on materials flows would be low in practice.
- There is no definitive evidence that the failure to include the cost of disposal in the price of materials which enter the municipal solid waste stream has a measurable effect on consumption of virgin materials.
- Data on which the analysis is based, particularly price elasticities and marginal cost of municipal solid waste, are highly uncertain.
- The variability of municipal solid waste costs between communities significantly reduces the potential benefits of a uniform national charge.
- The design of a disposal charge which could achieve the theoretical objectives would be complex in practice.

Committee Recommendations

None of the members of the Committee recommend legislation at this time to institute a national solid waste disposal charge. Members cite the low projected impact on materials use, recycling, and disposal; the complex administrative problems that would be involved; the difficulty of designing a charge that would achieve the theoretical objectives; and the inefficiencies that might result from its application at the national level.

Although none of the members is in favor of legislation at this time, a few indicate that the uncertainties in the empirical analysis make it imprudent to recommend entirely against the general concept of a national disposal charge. These members note that the basic concept of including disposal costs in decisions on use of materials is consistent with achieving a better balance between conservation and other social goals. Even though they agree that the current analyses show only small gains in resource conservation from imposing a charge, they feel that the uncertainty in the data and the possibility that conditions could change make it desirable to “leave the door open” to reconsideration of the proposal at a later date.

APPENDIX A

RESOURCE CONSERVATION COMMITTEE LEGISLATIVE CHARTER

The RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (Public Law 94-580)

Section 8002(j)

As Amended by the Quiet Communities Act of 1978 (Public Law 95-609)

"(j) **RESOURCE CONSERVATION COMMITTEE.**—(1) The Administrator shall serve as Chairman of a Committee composed of himself, the Secretary of Commerce, the Secretary of Labor, the Chairman of the Council on Environmental Quality, the Secretary of Treasury, the Secretary of the Interior, *the Secretary of Energy, the Chairman of the Council of Economic Advisors*, and a representative of the Office of Management and Budget, which shall conduct a full and complete investigation and study of all aspects of the economic, social, and environmental consequences of resource conservation with respect to—

"(A) the appropriateness of recommended incentives and disincentives to foster resource conservation;

"(B) the effect of existing public policies (including subsidies and economic incentives and disincentives, percentage depletion allowances, capital gains treatment and other tax incentives and disincentives) upon resource conservation, and the likely effect of the modification or elimination of such incentives and disincentives upon resource conservation;

"(C) the appropriateness and feasibility of restricting the manufacture or use of categories of consumer products as a resource conservation strategy;

"(D) the appropriateness and feasibility of employing as a resource conservation strategy the imposition of solid waste management charges on consumer products, which charges would reflect the costs of solid waste management services, litter pickup, the value of recoverable components of such product, final disposal, and any social value associated with the nonrecycling or uncontrolled disposal of such product; and

"(E) the need for further research, development, and demonstration in the area of resource conservation.

"(2) The study required in paragraph (1)(D) may include pilot scale projects, and shall consider and evaluate alternative strategies with respect to—

Pilot scale
projects.

"(A) the product categories on which such charges would be imposed;

"(B) the appropriate state in the production of such consumer product at which to levy such charge;

"(C) appropriate criteria for establishing such charges for each consumer product category;

"(D) methods for the adjustment of such charges to reflect actions such as recycling which would reduce the overall quantities of solid waste requiring disposal; and

"(E) procedures for amending, modifying, or revising such charges to reflect changing conditions.

"(3) The design for the study required in paragraph (1) of this subsection shall include timetables for the completion of the study. A preliminary report putting forth the study design shall be sent to the President and the Congress within six months following enactment of this section and followup reports shall be sent six months thereafter. Each recommendation resulting from the study shall include at least two alternatives to the proposed recommendation.

Study design.

"(4) The results of such investigation and study, including recommendations, shall be reported to the President and the Congress not later than two years after enactment of this subsection.

Report to
President and
Congress.

"(5) There are authorized to be appropriated not to exceed \$2,000,000 to carry out this subsection.

Report to
President and
Congress.
Appropriation
authorization.

APPENDIX B
RESOURCE CONSERVATION COMMITTEE
REPORTS AND RECORDS

Contents

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I. COMMITTEE REPORTS TO THE PRESIDENT AND CONGRESS¹

Implementation Plan for the Resource Conservation Committee. April 1977. Order No. SW-618

Committee Findings and Staff Papers on National Beverage Container Deposits. January 1978. Order No. SW-733

Status Report on Solid Waste Disposal Charge Analysis. July 1978. Order No. SW-708

Choices for Conservation: Final Report of the Resource Conservation Committee. June 1979. Order No. SW-779

II. TRANSCRIPTS OF PUBLIC TESTIMONY PRESENTED TO THE COMMITTEE AT SCHEDULED PUBLIC MEETINGS AND WRITTEN COMMENTS SUBMITTED FOR THE MEETING RECORDS¹

Public Comments on the Draft Implementation Plan for the Resource Conservation Committee. (Printed as an Appendix to the *Implementation Plan*). Meeting held April 6, 1977, in Washington, D. C. Order No. SW-618

Public Meeting of the Resource Conservation Committee on Beverage Container Legislation. October 19, 1977, in Washington, D. C. Order No. SW-654

Public Meeting of the Resource Conservation Committee on Solid Waste Product Charge Issue

November 17, 1977, in Washington, D. C. Order No. SW-662

November 18, 1977, in Cincinnati, Ohio. Order No. SW-672

November 21, 1977, in Portland, Oregon. Order No. SW-664

Public Meeting of the Resource Conservation Committee on Other Policy Topics

June 23, 1978, in Chicago, Illinois. Order No. SW-739

June 26, 1978, in Washington, D. C. Order No. SW-720

June 30, 1978, in San Francisco, California. (Copies no longer available)

III. RESOURCE CONSERVATION COMMITTEE STAFF BACKGROUND PAPERS²

No. 1	Rationale for National Beverage Container Deposit Legislation	November 5, 1977
No. 2	Costs and Benefits of a National Beverage Container Deposit System	November 7, 1977

¹ Copies available from: Solid Waste Information, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268

² The 20 background papers have been compiled in a single volume (order no. SW-788); a limited number of copies are available from Solid Waste Information, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268. Papers 1-6 also appear in the Committee Report *Committee Findings and Staff Papers on National Beverage Container Deposits* (SW-733), and papers 8-10 appear in the Committee Report *Status Report on Solid Waste Disposal Charge Analysis* (SW-708). The compilation of papers will be permanently available for purchase from the National Technical Information Service, Springfield, Va. 22161.

No. 3	Issues Regarding National Beverage Container Deposit Proposals	November 5, 1977
No. 4	Transitional Adverse Economic Impacts of National Beverage Container Deposit Legislation: An Analysis of the Worst Case	December 20, 1977
No. 5.	Beverage Container Return Rates	November 6, 1977
No. 6	Localized Employment Impacts, Glass Industry	December 20, 1977
No. 7	The Sensitivity of the Benefit Impacts of Beverage Container Deposits to Variations in Container Return Rate Assumptions	June 1, 1978
No. 8	Rationale for National Solid Waste Disposal Charge Legislation	June 15, 1978
No. 9	Solid Waste Disposal Charge Design Issues	June 26, 1978
No. 10	A Review of the Current Status of Municipal Solid Waste Management	July 10, 1978
No. 11	A Cost Analysis of the Solid Waste Management Industry	December 11, 1978
No. 12	Benefits and Costs of a National Solid Waste Disposal Charge	February 6, 1979
No. 13	Local User Fees for Solid Waste Services as a Resource Conservation Strategy	November 17, 1978
No. 14	An Evaluation of National Litter Tax Concepts	October 10, 1978
No. 15	Federal Subsidies for Recycling	September 25, 1978
No. 16	Deposits and Bounties for Controlling the Flows of Durable and Hazardous Consumer Product Wastes	November 6, 1978
No. 17	Compendium of Selected Findings and Recommendations by Predecessor Commissions, Committees, and Associations on Resource Conservation Issues	December 18, 1978
No. 18	Product Regulations as a Resource Conservation Strategy	March 18, 1979
No. 19	A Conceptual Evaluation of a National Virgin Material Extraction Tax as a Resource Conservation Policy	May 3, 1979
No. 20	Summary of Projected Labor Impacts of a Nationwide Beverage Container Deposit System	January 25, 1979

IV. CONTRACTOR AND CONSULTANT REPORTS AND TECHNICAL MEMORANDA¹

CHAUNCEY BELL AND ASSOCIATES, INC.

Revenue Transfer Mechanisms: An Analysis of Options for EPA's Product Charge Initiative, February 21, 1978.

GERARD M. BRANNON

Tax Provisions for Non-Energy Minerals and Timber, 1977.

ECODATA, INC. (BARBARA STEVENS)

Price Index for Solid Waste Collection and Disposal, September 29, 1977.

Pricing of Solid Waste Collection and Disposal, September 29, 1977.

Density of Residential Solid Waste, October 3, 1977.

Cost Indexing for the Product Charge, October 5, 1977.

Reporting Requirements for Local Jurisdictions, October 5, 1977.

Distribution of Revenues from a Disposal Charge, December 5, 1977.

Short and Long Run Tradeoffs in Refuse Collection Production Functions, December 30, 1977.

Cost of Refuse Collection and Disposal, March 1, 1978.

Regression Analysis of Quantity Based User Fees, December 27, 1978.

ENVIRONMENTAL LAW INSTITUTE

Constitutional Aspects of Economic Disincentives With Emphasis on Product Charges, by Ivan J. Tether, July 21, 1978.

An Analysis of Scrap Material Supply and Demand, by Robert Anderson, Roger C. Dower, and Elizabeth H. Granitz, May 1979.

FRANKLIN ASSOCIATES, LTD.

Extra-Industry Recycling Issues, by Robert Hunt, September 27, 1977.

Analysis of Specific Product Categories for Inclusion Under Product Charge Schemes, by Robert Hunt, Jacob Beachley, September 27, 1977.

Alternative Bases for Product Charge, by Robert Hunt, William Bider, December 14, 1977.

Energy Impacts of Product Charge Legislation, by Robert Hunt, William Bider, December 14, 1977.

Preliminary Design Considerations of Recycling Incentives Accompanying Product Charge Legislation, by Robert Hunt, William Bider, and John Trievolla, January 10, 1978.

¹These reports and memoranda are on file and available for perusal in the offices of the Technical Information Staff, Office of Solid Waste, U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C.

Post-Consumer Solid Waste Resource Recovery Baseline (Draft report), April 6, 1979.

Post-Consumer Solid Waste and Resource Recovery Baseline—Working Papers (Draft), May 16, 1979.

Impact of Product Charge on Selected Consumer Purchases (Memorandum), October 4, 1977.

Should Recycling Incentives Accompany Product Charges? (Memorandum) October 7, 1977.

Establishments Involved in Extra-Industry Recycling (Memorandum), October 7, 1977.

Product Charge Incentives for Energy Recovery (Memorandum), October 17, 1977.

Energy Conservation from Product Charge Legislation (Memorandum), October 21, 1977.

Effects of Product Charge on Energy Consumption (Memorandum), October 27, 1977.

Energy Impacts From Product Charge Legislation (Memorandum), November 7, 1977.

Background Data for Packaging Product Systems (Memorandum), November 7, 1977.

Compaction of Flat Paper Products and Aluminum Foil in Solid Waste Processing (Memorandum), December 12, 1977.

Certificate Program for Recycling Incentives (Memorandum), January 20, 1978.

Preliminary Data on 1976 Waste Paper Supply and Demand (Memorandum), February 17, 1978.

Preliminary Data on Cullet Supply and Demand (Memorandum), February 17, 1978.

Preliminary Data on 1976 Post-Consumer Ferrous Scrap Supply and Demand (Memorandum) February 17, 1978.

Rail Transportation Costs for Secondary Materials (Memorandum) February 18, 1978.

Theoretical Waste Paper Surplus and Deficiency by Geographical Region (Memorandum), February 21, 1978.

Theoretical Glass Container Cullet Surpluses by Geographical Region (Memorandum), March 1, 1978.

Theoretical Steel Scrap Surpluses by Geographical Region (Memorandum), March 1, 1978.

Assessment of Contamination in Glass Cullet (Memorandum), March 3, 1978.

Contaminants in the Recovered Ferrous Fraction of Municipal Solid Waste (Memorandum), March 3, 1978.

Assessment of Contamination in Waste Paper (Memorandum), March 3, 1978.

The Significance of Imports and Exports in a Product Charge System (Memorandum), April 5, 1978.

Costs of Recovering Waste Paper by Mandatory Recycling (Memorandum), April 28, 1978.

Resource Recovery Plant Costs: Semisuspension Incinerators and Small Modular Incinerators With Materials Recovery (Memorandum), May 22, 1978.

Detailed Analysis of Specific Product Categories for Inclusion Under Product Charge Schemes (Memorandum), June 7, 1978.

ICF, INC.

Recycling the Materials in Municipal Solid Waste: Estimates of the Elasticities of Secondary Material Substitution and Supply, January 31, 1979.

Resource Conservation and Industrial Solid Waste, February 1979.

META SYSTEMS, INC.

Deposit and Bounty Systems for Controlling the Discard of Durable Goods and Hazardous Items in Post-Consumer Waste Flows, by Meta Systems, Inc., April 1979.

PUBLIC INTEREST ECONOMICS FOUNDATION

Evaluation of Research on the Solid Waste Disposal Charge, by Steve Buchanan and Leonard Lee Lane, September 1977.

Analysis of Solid Waste Disposal Charge Design Issues, by Steve Buchanan, March 10, 1978.

Comparing the Efficiencies of Financing Municipal Solid Waste Services from Property Tax and Solid Waste Charge Revenues, by Steve Buchanan, September 7, 1978.

PUTNAM, HAYES & BARTLETT, INC.

Effectiveness and Efficiency of Environmental Regulations, by Stephen A. Besse, June 23, 1978.

RESEARCH TRIANGLE INSTITUTE

Beverage Consumption and Container Requirements: 1947-1985, by Jerome Olsen, March 1978.

The Supply of Secondary Aluminum Cans, by Jerome Olsen and James Watts, April 1979.

An Econometric Analysis of Secondary Ferrous Supply, by J. Lew Silver, April 1979.

Estimates of Secondary Materials Supply from Municipal Solid Wastes: A Process Analysis, by Taylor H. Bingham, Curtis Youngblood, and Philip C. Cooley, April 1979.

Modeling the Effects of a Product Disposal Charge, by Allen K. Miedema, Curtis E. Youngblood, and Philip C. Cooley (Draft final report), April 1979.

HAROLD SAMTUR

Litter Prevention and Abatement Strategies, Draft Report, Winter 1978.

RICHARD E. SLITOR

Overview Report on Waste Disposal Charge System: Implementation, Administration and Enforcement Issues, November 21, 1977.

Overview Report on Waste Disposal Charge System: Economic Impact Issues, December 16, 1977.

Overview Report on Waste Disposal Charge System: Conceptual, Legal, and Definitional Issues, December 27, 1977.

Overview Report on Waste Disposal Charge System: Evaluation of Treasury Department Comments on Overview Report on Waste Disposal Charge System, February 16, 1979.

URBAN SYSTEMS RESEARCH AND ENGINEERING, INC.

Review and Synthesis of the Literature on User Charges for Water Supply, Sewers, and Solid Waste, by James Hudson, Draft, March 15, 1977. (Final draft included in #6.)

Review and Synthesis of the Literature and On-Going Studies on the Distributional Impacts of Materials Conservation Policies, by Elizabeth Lake and James Hudson, May 22, 1978.

Review and Evaluation of Employment Impact Assessment Techniques and Data Sources for Materials Conservation and Materials Recycling Policies, by Christopher Pleatsikas, August 11, 1977.

Litter: Cost, Measurement and Control, by Clark Binkley and James Hudson, July 11, 1977.

Estimates of Employment Impacts of Product Charge on Product Packaging and Paper-Paperboard Intermediate Product Sectors, by Christopher Pleatsikas, February 12, 1978.

Issues in Pricing Solid Waste Management, by James Hudson, August 14, 1978.

Industry Issues in Designing Solid Waste Charge Systems, by Elizabeth Lake et al., November 30, 1977.

Design of Local User Charge Systems, by James Hudson, January 15, 1979.

Projections of Solid Waste Management Costs, by James Hudson and Michael Alford, February 11, 1979.

A Model of Sanitary Landfill Costs, by James Hudson, January 25, 1979.

V. PAPERS PRESENTED AT THE BROOKINGS INSTITUTION CONFERENCE ON ISSUES IN THE CONSERVATION OF NON-FUEL MINERALS AND TIMBER, JANUARY 15-17, 1979, WASHINGTON, D.C.¹

On January 15 through 17, 1979, the Brookings Institution conducted a Conference on "Issues in the Conservation of Non-Fuel Minerals and Timber," sponsored through a grant from the Resource Conservation Committee. The purpose of the conference was to establish a dialogue between those responsible for making public policy for conservation of resources and those who are most directly affected by that policy. Approximately 75 senior officials representing the Federal Government, industry, labor, environmental and conservation groups, and academia attended.

¹ These papers are on file and available for perusal in the offices of the Technical Information Staff, Office of Solid Waste, U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C.

A series of papers were presented at the Conference, of which the following have been printed and are available with the other papers of the Resource Conservation Committee.

Remarks by the Honorable Douglas M. Costle, Administrator, U.S. Environmental Protection Agency.

Timber's Future — Conservation Through Use, Dr. M. Rupert Cutler, Assistant Secretary of Agriculture for Conservation, Research, and Education.

Remarks by Joan M. Davenport, Assistant Secretary — Energy and Minerals, U.S. Department of the Interior.

Remarks by George H. R. Taylor, Director, Department of Occupational Safety & Health, American Federation of Labor and Congress of Industrial Organizations.

Impact of Public Policies on Non-Fuel Minerals, Simon D. Strauss, Vice Chairman, ASARCO Incorporated, New York, New York.

The Entropic Obligation to Future Generations, Congressman James G. Martin.

Issues in Resource Recovery, John G. Whitaker, Vice President, Union Camp Corporation.

Resource Conservation: Taking The First Steps Towards a More Secure Future, Honorable Barbara Blum, Deputy Administrator, Environmental Protection Agency.

Remarks by Emery Castle, Vice President, Resources for the Future.

Issues in Minerals Conservation, Dr. Alan V. Kneese, Resources for the Future.

APPENDIX C

ACKNOWLEDGEMENTS

The Resource Conservation Committee wishes to express its gratitude to the many people who have assisted it in its work.

All of the statutory Members of the Committee were assisted by a "Principal" and a "Senior Advisor" from their Departments and Agencies. The Principals, who were generally officials at the rank of Assistant Secretary, met several times to approve the Committee work plan and decide on the official findings and recommendations which the Committee members for whom they worked would send to the President and Congress. The Senior Advisors met regularly (weekly during some critical periods) throughout the life of the Committee to discuss policy issues in detail with the staff and to prepare the findings and options for recommendations. The Principals and Senior Advisors are listed in the front of this report.

The Administrator of the Environmental Protection Agency, as Chairman of the Resource Conservation Committee, provided the Committee with a staff and funds for research assistance. The principal members of the staff are listed in the front of this report. In addition, the following summer interns assisted the Committee staff: Carol Friedman (1977), Mary Gompers (1978), Michael Abrams (1978), Janet Armitage (1978), Richard Bleicher (1978), and Gail Kendall (1978). EPA personnel who assisted in other capacities included Frans Kok, Albert A. Peter, Jr., Marion Thompson, Clara Jones, Sarah Davis, Carol Lawson, Tom Williams, and Dotz Darrah.

Marshall Peterson provided valuable advice to the staff on several occasions.

The many contractors and consultants who provided technical assistance to the staff are listed in Appendix B, together with the titles of their main written reports.

Several non-governmental groups assisted the staff in its public participation activities: the League of Women Voters, the National Association of Counties, the National League of Cities, the Environmental Action Foundation, and the National Wildlife Federation.

Numerous individuals, private corporations, trade associations, and other organizations testified at the Committee's public meetings and provided written commentary on staff papers. Both the list of those who testified and the testimony itself are available with the other papers of the Committee (see Appendix B, "Resource Conservation Committee Reports and Records.") Lists of those who testified and many written comments are reprinted in the Committee's First, Second, and Third Reports to the President and Congress.

On January 15 through 17, 1979, the Brookings Institution conducted a Conference on "Issues in the Conservation of Non-Fuel Minerals and Timber," sponsored through a grant from the Resource Conservation Committee. A list of the papers presented is included in Appendix B, part V. The Brookings staff that planned and led the Conference included Walter G. Held, Director of the Advanced Study Program, Barbara D. Littell, Bradley H. Patterson, Jr., and Warren I. Cikins, Senior Staff Members of the Advanced Study Program, and Robert W. Crandall, Senior Fellow of the Economic Studies Program.



RESOURCE CONSERVATION COMMITTEE

ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF COMMERCE
DEPARTMENT OF ENERGY
DEPARTMENT OF THE INTERIOR
DEPARTMENT OF LABOR
DEPARTMENT OF THE TREASURY
COUNCIL ON ENVIRONMENTAL QUALITY
COUNCIL OF ECONOMIC ADVISERS
OFFICE OF MANAGEMENT AND BUDGET