Chapter 4

OVERVIEW OF POLICY ALTERNATIVES

Chapter 4.— OVERVIEW OF POLICY ALTERNATIVES

Page

Scope of Policy Alternatives Considered 75
SRI Policy Alternatives 76
The Relevance Tree Approach 76
Policies Analyzed by SR1. 77
Sydec Policy Sets ..**.*.. . . . . .**...*.. 99
Petroleum Conservation 101
Improved Environment 101
Increased Mobility. . .....,.....102
Improved Accessibility.. 103

LIST OF TABLES

Table No. Page

43. Sydec Base Case and Policy Alternatives. . . . 99

LIST OF FIGURES

Figure No. *Page*

19. Relevance Tree for Energy Issues 78
20. Relevance Tree for Environment Issues 82
21. Relevance Tree for Safety Issues 84
22. Relevance Tree formability Issues 90
23. Relevance Tree for Cost and Capital issues.. 94

OVERVIEW OF POLICY ALTERNATIVES

CHAPTER 4

SCOPE OF POLICY ALTERNATIVES CONSIDERED

The automobile assessment considered policies to deal with the five groups of issues: energy, environment, safety, mobility, and cost and capital. As the first step in selecting the policies to be examined, the Office of Technology Assessment (OTA) held workshops attended by advisory panel members, consultants, and contractors. The purpose of these workshops was to identify a range of policy alternatives and to select those that seemed most promising for study. The two contractors reviewed the workshop results and, with the guidance of OTA, made a further selection of those that would be subjected to detailed analysis.

One contractor, SRI, was directed to use a relevance tree approach to policy selection. [1] The relevance tree is a hierarchical classification of issues, response strategies, general policies, and specific measures to implement policies. The array of policies thus identified was very broad—too broad for all to be examined within the time and funds available. In consultation with OTA, SRI therefore narrowed the list of prospective policies to the following sets:

- Energy: Reduction of petroleum consumption and development of alternative energy sources,
- Environment: Reduction of automobile emissions,
- Mobility: Alternatives and complements to the automobile,
- **Cost and** Capital: Highway supply, financing, and pricing decisions and control of consumer costs of automobile use.

No safety policies were considered by SRI.

The System Design Concepts team (which included Energy and Environmental Analysis and The Institute for Safety Analysis) was directed to take a somewhat different approach. [2] Policies were aggregated in four sets, each designed to accomplish a general objective:

- Petroleum Conservation
- Improved Environment
- Increased Mobility
- Improved Accessibility

Policies relating to safety and cost and capital were incorporated in each of the policy sets, but they were not treated as principal and motivating concerns. Potential changes in automobile system technology were also incorporated in each policy set.

[1] SRI International, *Potential Changes in the Use and Characteristics of the Automobile*, Contractor Report, prepared for U.S. Congress, Office of Technology Assessment (Menlo Park, Calif.: SRI International, January 1978).

[2] System Design Concepts, Inc., Energy and Environmental Analysis, Inc., and The Institute for Safety Analysis, Inc., *Technology Assessment of Changes in the Use and Characteristics of the Automobile*, Contractor Report, prepared for U.S. Congress, Office of Technology Assessment (Washington, D.C.: System Design Concepts, January 1978).

SRI POLICY ALTERNATIVES

The Relevance Tree Approach

The relevance trees used by SRI are intended to illuminate the relationships between the automobile system and public policy. Basically, the relevance tree is a classification of types of Government responses to problems, sets of policies appropriate to deal with these problems, specific policy measures within the policy sets, and (if the relevance tree is appropriately extended) effects and impacts that may be expected from the policies. Thus, the relevance tree identifies a hierarchy of elements to be included in the analysis of alternative policies affecting the automobile system. Separate relevance trees were developed for each issue area in the automobile assessment. (See figures 19 through 23.)

In the construction of a relevance tree, successively more specific levels are defined in the progression from issues to policy implementation.

- Level 1: Issue Area.—The issue area or subject of concern is a general class of problems related to the automobile system. For this study, the five areas of greatest concern are energy, environment, safety, mobility, and cost and capital.

- Level 2: Policy-Related Problems.—A policy-related problem is one that may require legislative or executive action to resolve. For example, a policy-related problem in the energy area is the possibility of a gasoline shortage resulting from inadequate supplies of petroleum (due to an embargo, political unrest abroad, or lack of success in exploiting domestic reserves). The problem may be real and present, or potential. There is no shortage of gasoline now, and it is not certain there will be one within the next two or three decades. But the possibility of such **a** shortage exists, and its impacts would be sufficiently severe that anticipatory action should be considered. In genral, a problem is listed on the relevance tree if it meets three criteria: there must be a significant probability that it could occur; if it occurs, the consequences must be severe; and the Government can initiate action to reduce the likelihood of occurrence or the severity of the consequences.

- Level 3: Issues.—An issue is a matter of disagreement or dispute between two or more parties. It involves value judgments and possible jeopardy to the interests of one or more parties. Statement of the issue for the relevance tree requires that it be formulated in a way that identifies possible Government responses.

- Level 4: Strategies.—Entries at this level identify the general strategies that might be adopted to deal with the issue: regulations, taxes and subsidies, Government-sponsored research and development, operation of free-market forces, public information programs, or Government reorganization. These listings will be virtually the same for all issues, since they are simply the common and proven ways of dealing with problems. To limit the number of policies and policy sets included in the relevance trees, primary consideration has been given to the first three strategies listed above,

- Level 5: Policy Sets.—A policy set is a general solution to a problem, within an adopted strategy. It does not include the specific measures that might be employed to implement the policy. For example, in the environmental area, amendment of automobile emission standards would be a policy set within the strategy of regulation. The definition of emission standards for individual pollutants would constitute a specific policy within this set and would be listed at the next level on the relevance tree.

- Level 6: Individual Policies.—In the example just given—amendment of emission standards—it would be possible to devise almost any number of different specific standards for automobile emissions. Judgment must be exercised in choosing a number large enough to cover the spectrum of technical and political possibilities but small enough to avoid proliferation of the relevance tree. The policies listed later in the relevance trees for each issue area are

those that, in the judgment of OTA, represent reasonable and realistic choices. Since others might also be considered appropriate, the policies shown should be regarded as only illustrative.

- Level 7. —Additional levels could be added to the tree to gain either more specificity in the definition of policies or greater comprehensiveness in the structuring of the policy analysis. Sequentially, these levels are:
  - —Implementation methods,
  - —Categories of effects and impacts,
  - —Specific effects and impacts,
  - —Consequences for stakeholders,
  - —Measures to mitigate the adverse impacts of the policy, and
  - —Effects and impacts of mitigation measures.

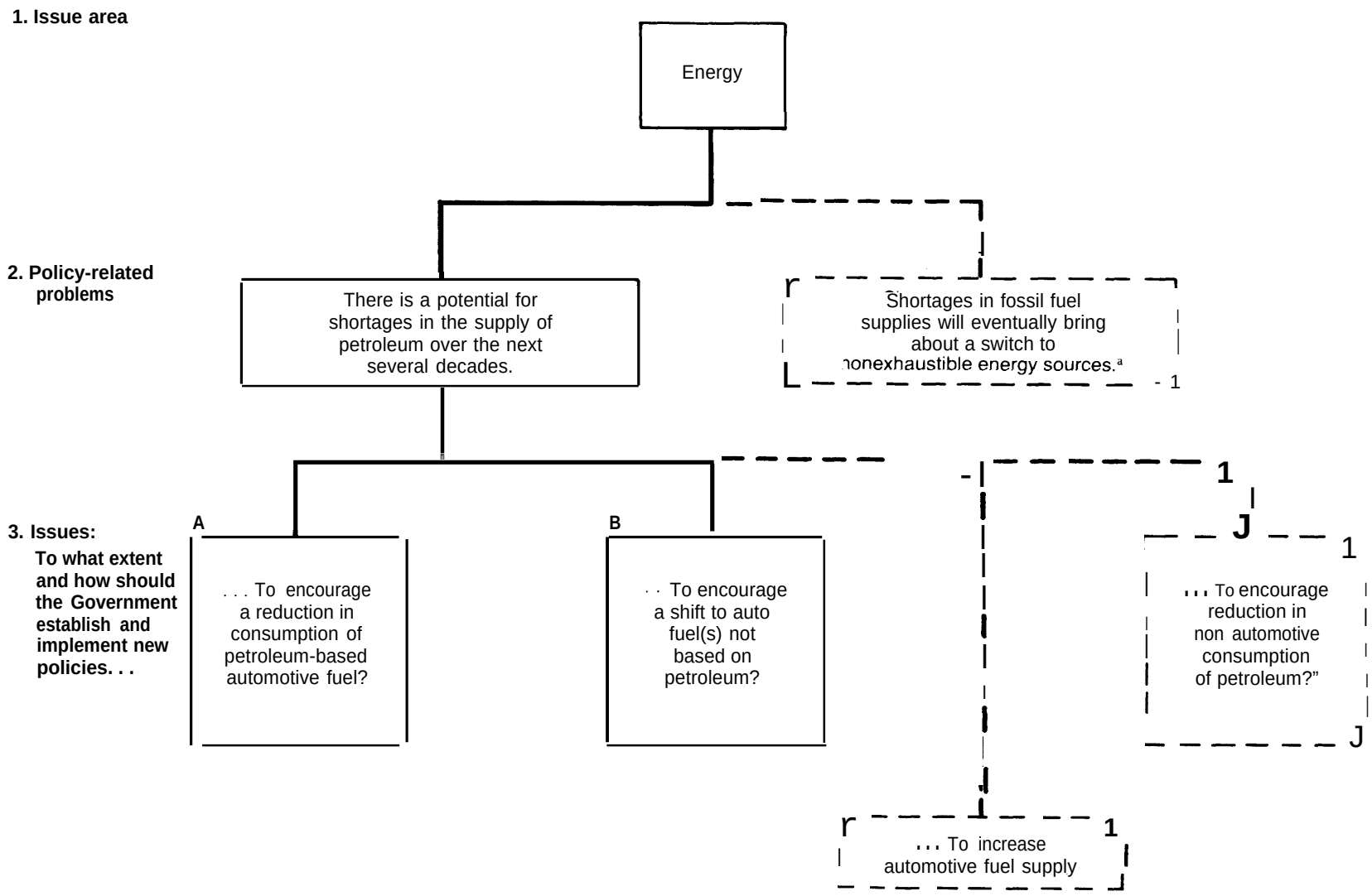
  No attempt was made to elaborate the relevance trees to this detail since the first six levels of the tree were considered adequate to define a wide range of alternative policies affecting the automobile system.

Policies Analyzed by SRI

Figures 19 through **23** show the relevance trees developed for each of the five issue areas. Each tree identifies a range of policy alternatives that could be adopted to deal with the issues. Since the range is broad and the number of individual policies is large, only a few could be treated during the assessment. These are shown by shaded boxes at Level 6 of the relevance trees.

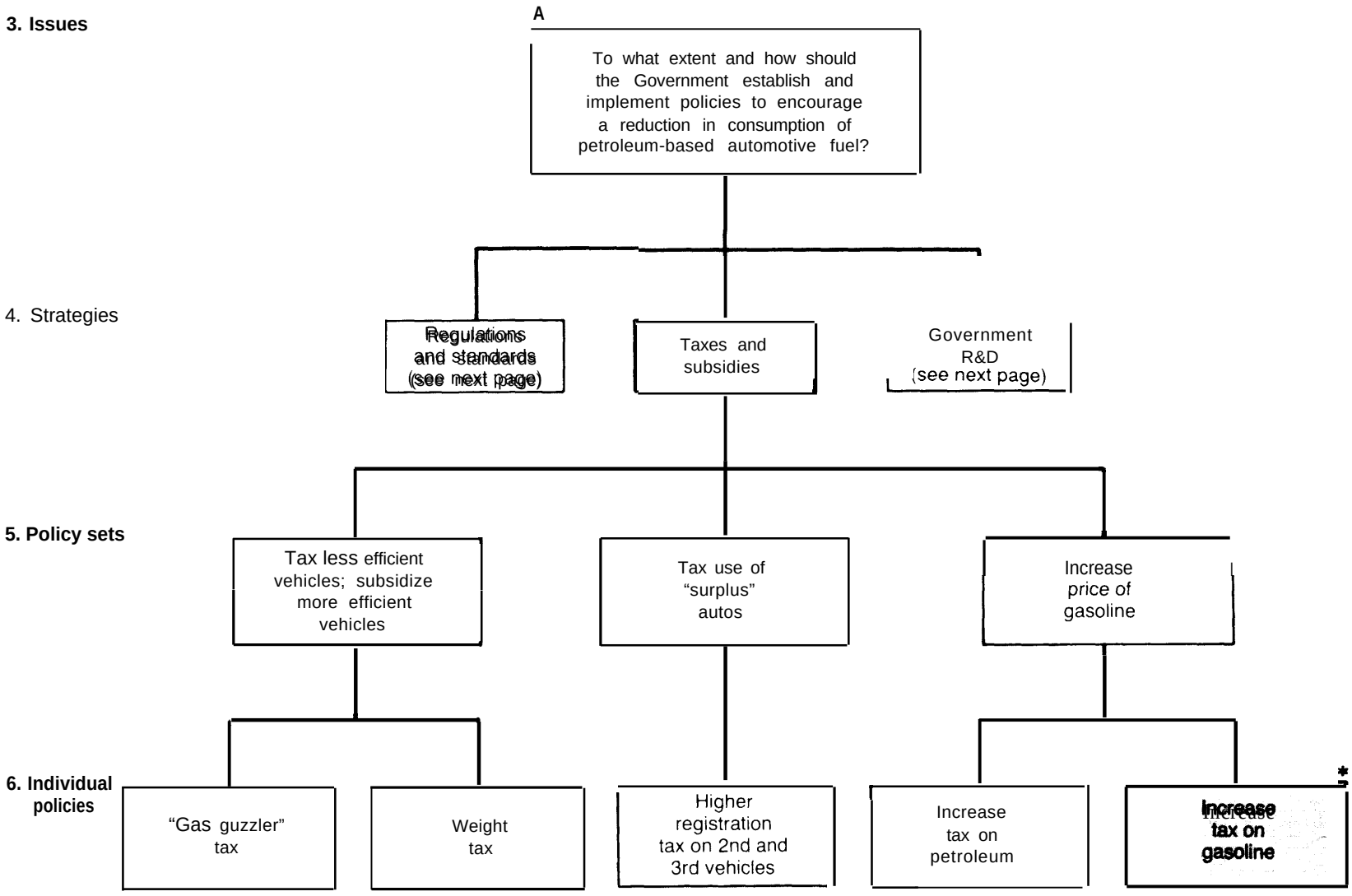
Some of the policies enumerated on the SRI relevance trees were also analyzed by System Design Concepts (Sydec), as described in the following section of this chapter. For reference, the policies examined by Sydec are indicated by an asterisk on the relevance trees.

Figure 19.—Relevance Tree for Energy Issues



Dashed boxes are outside the scope of the study.

Figure 19.–Relevance Tree for Energy Issues (Continued)



"Analyzed by Sydec.

Figure 19.—Relevance Tree for Energy Issues (Continued)

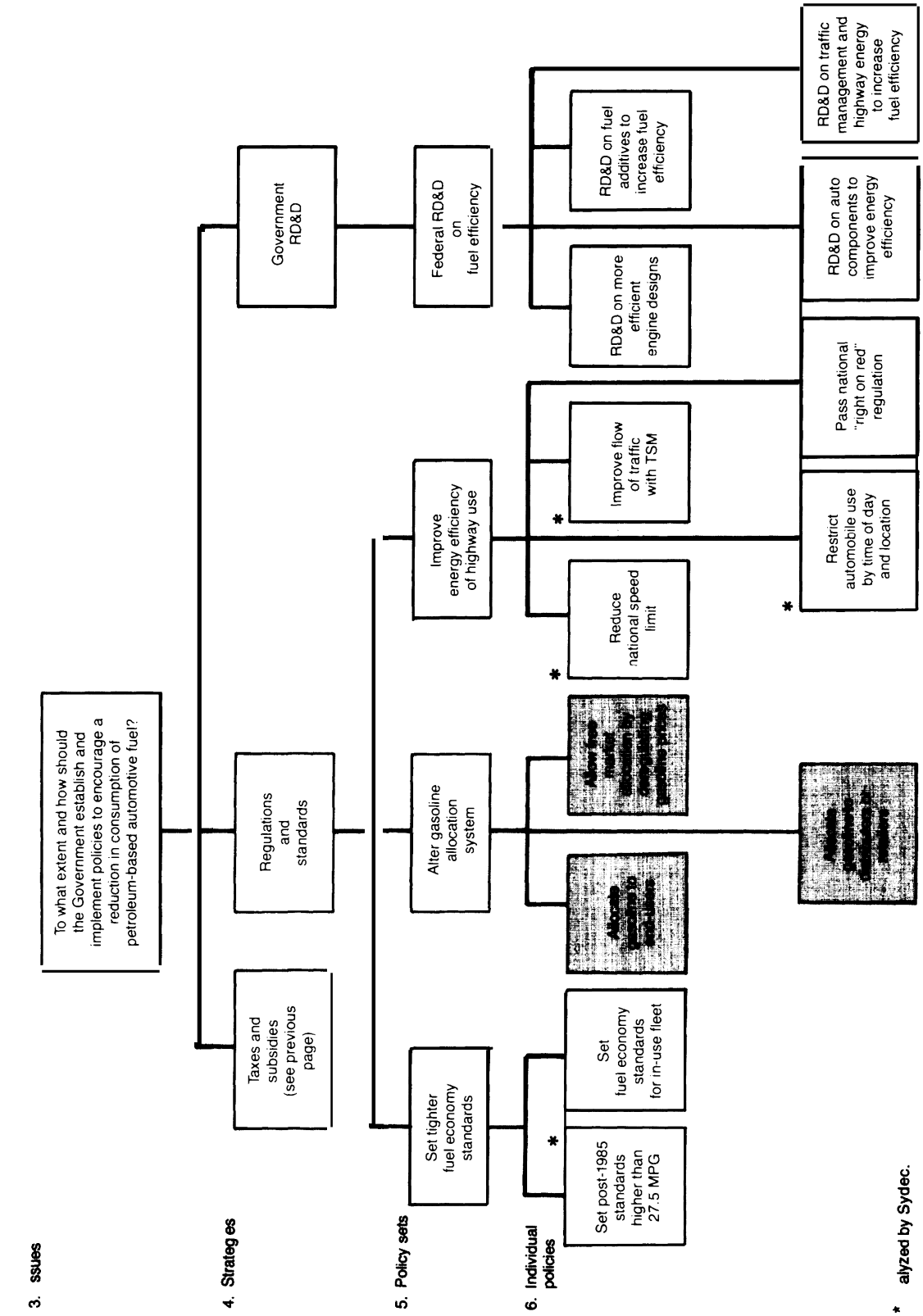
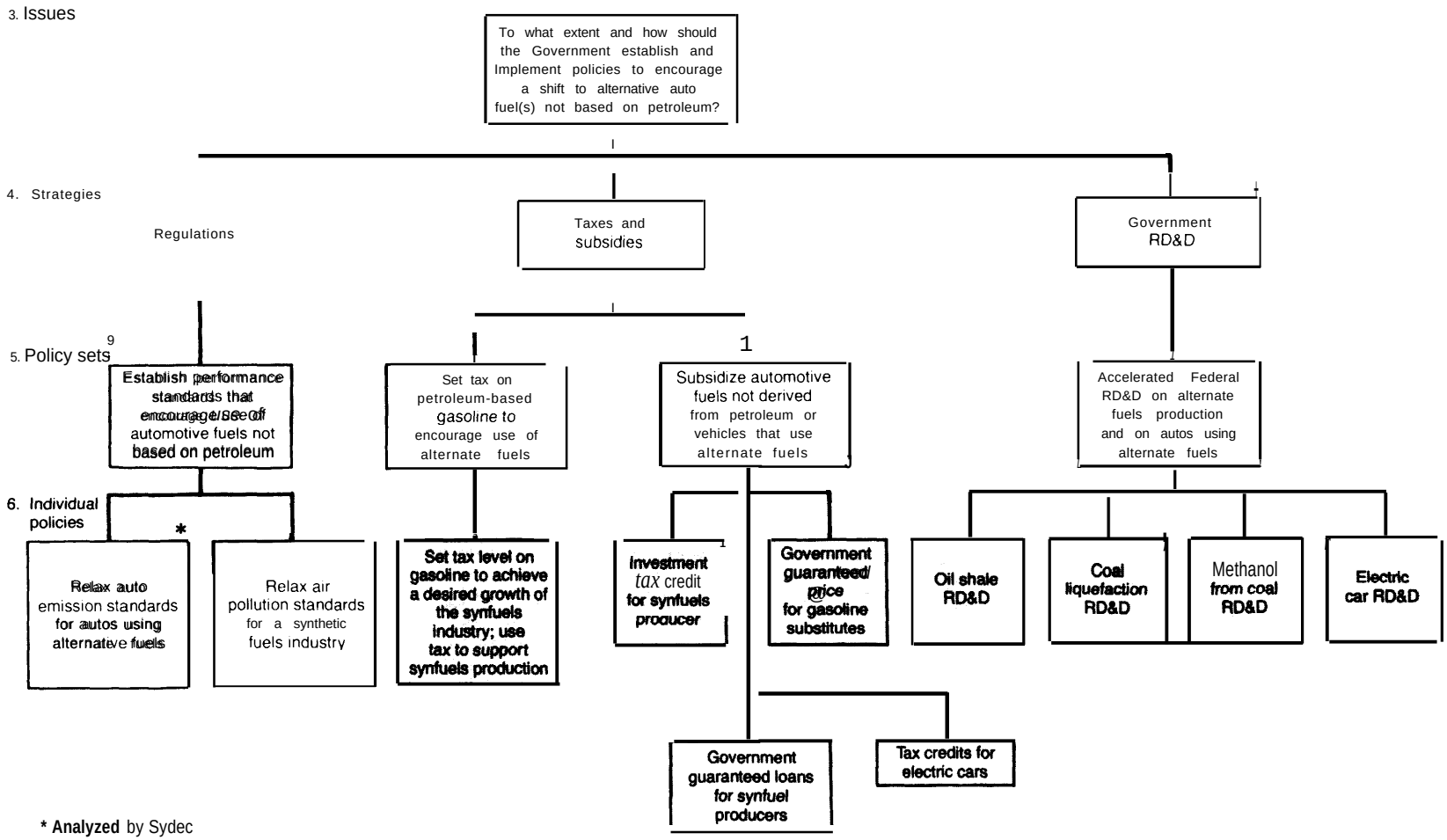


Figure 19.— Relevance Tree for Energy Issues (Concluded)



* Analyzed by Sydec

Source: Office of Technology Assessment

Figure 20.—Relevance

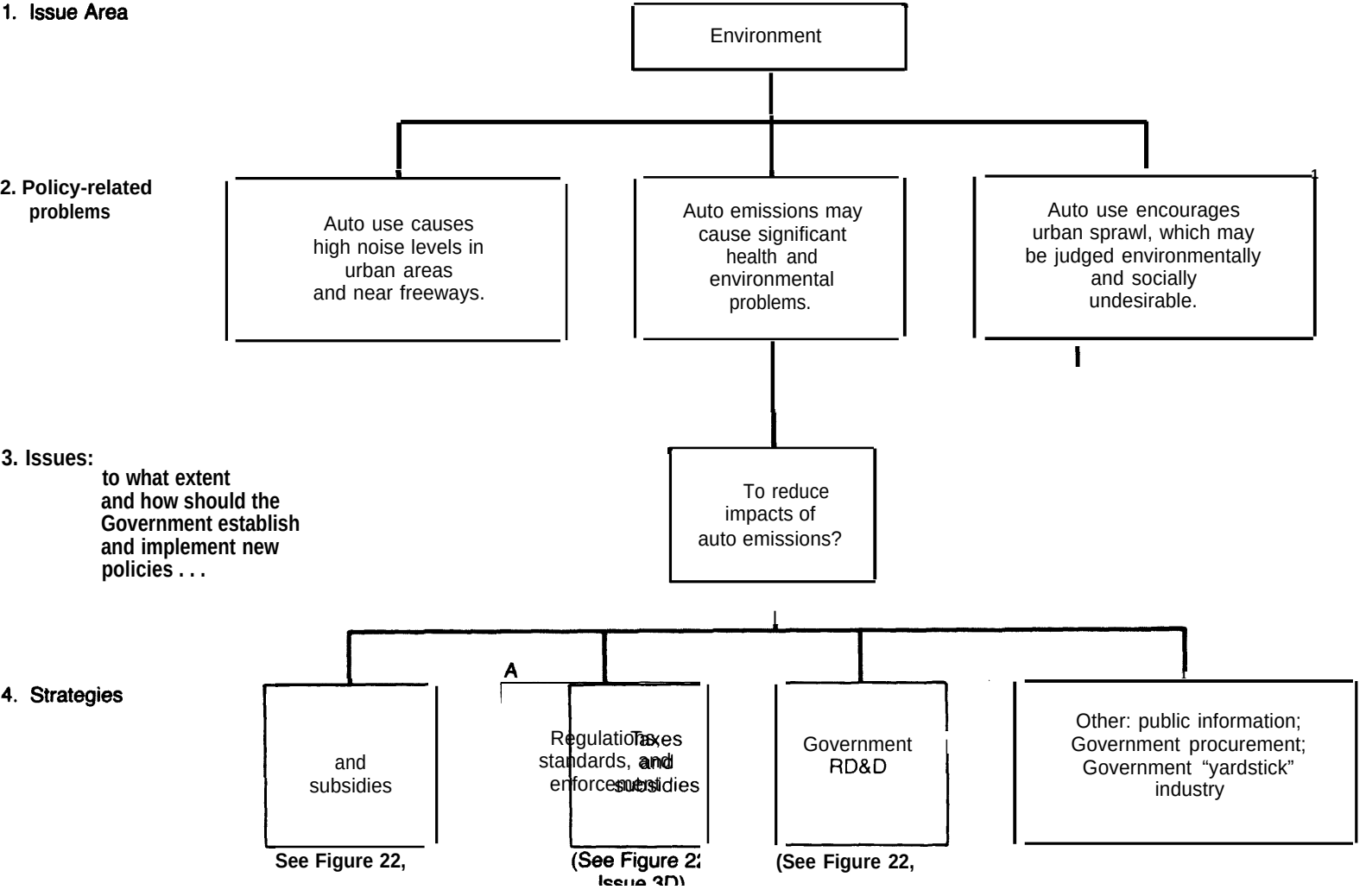


Figure 20
Relevance Tree for Environment Issues Conc uded

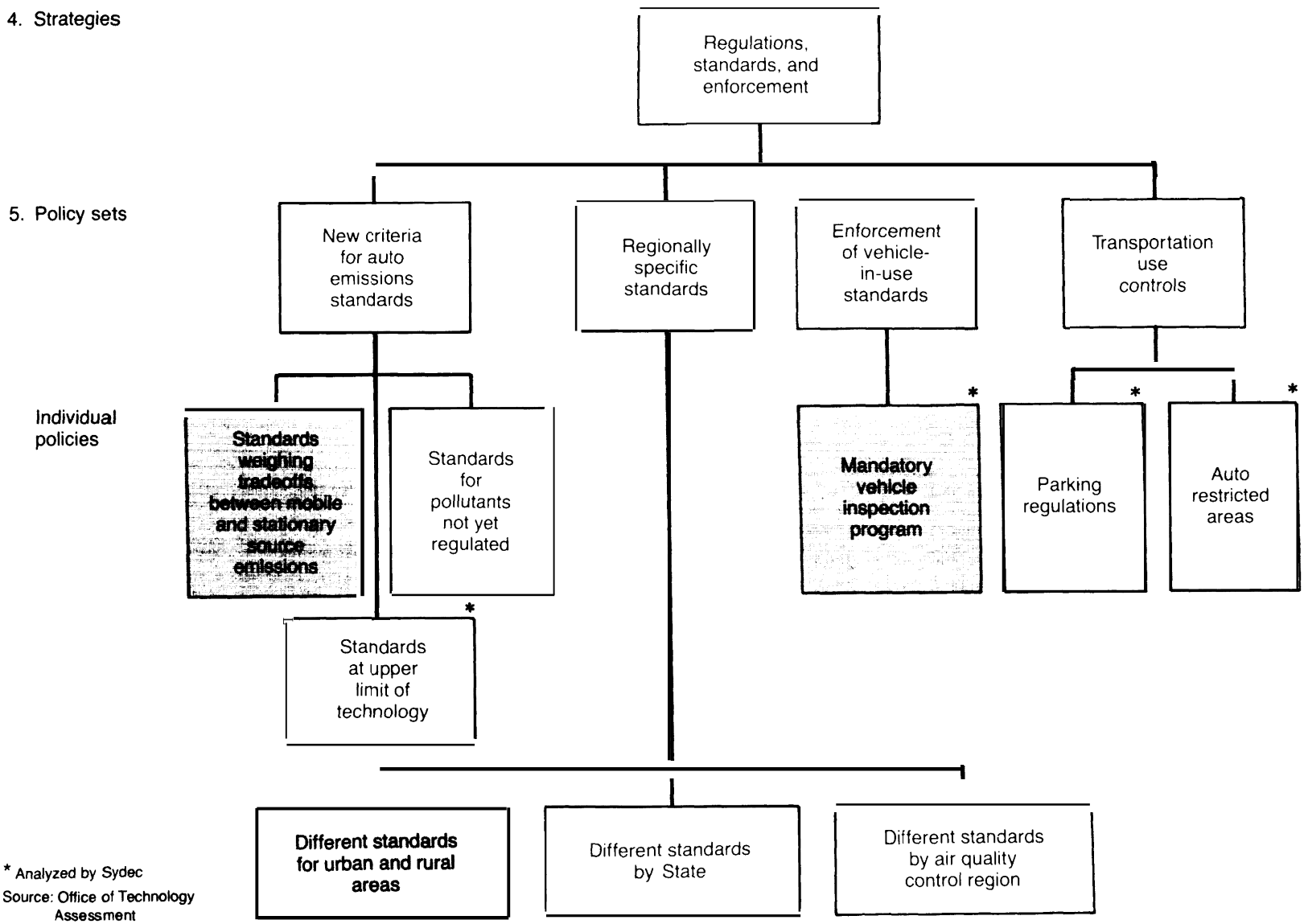


Figure 21.—Relevance Tree for Safety Issues

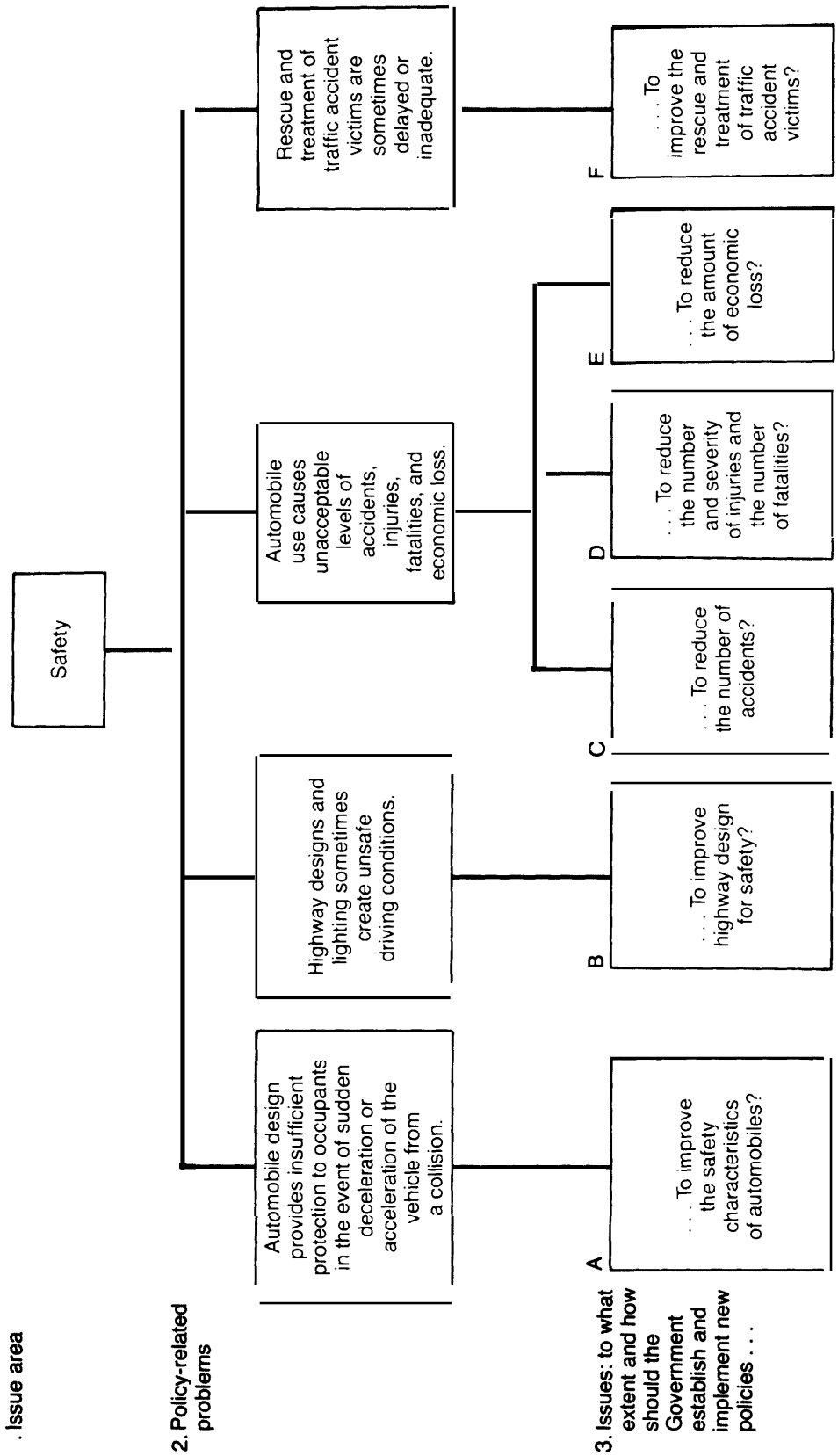
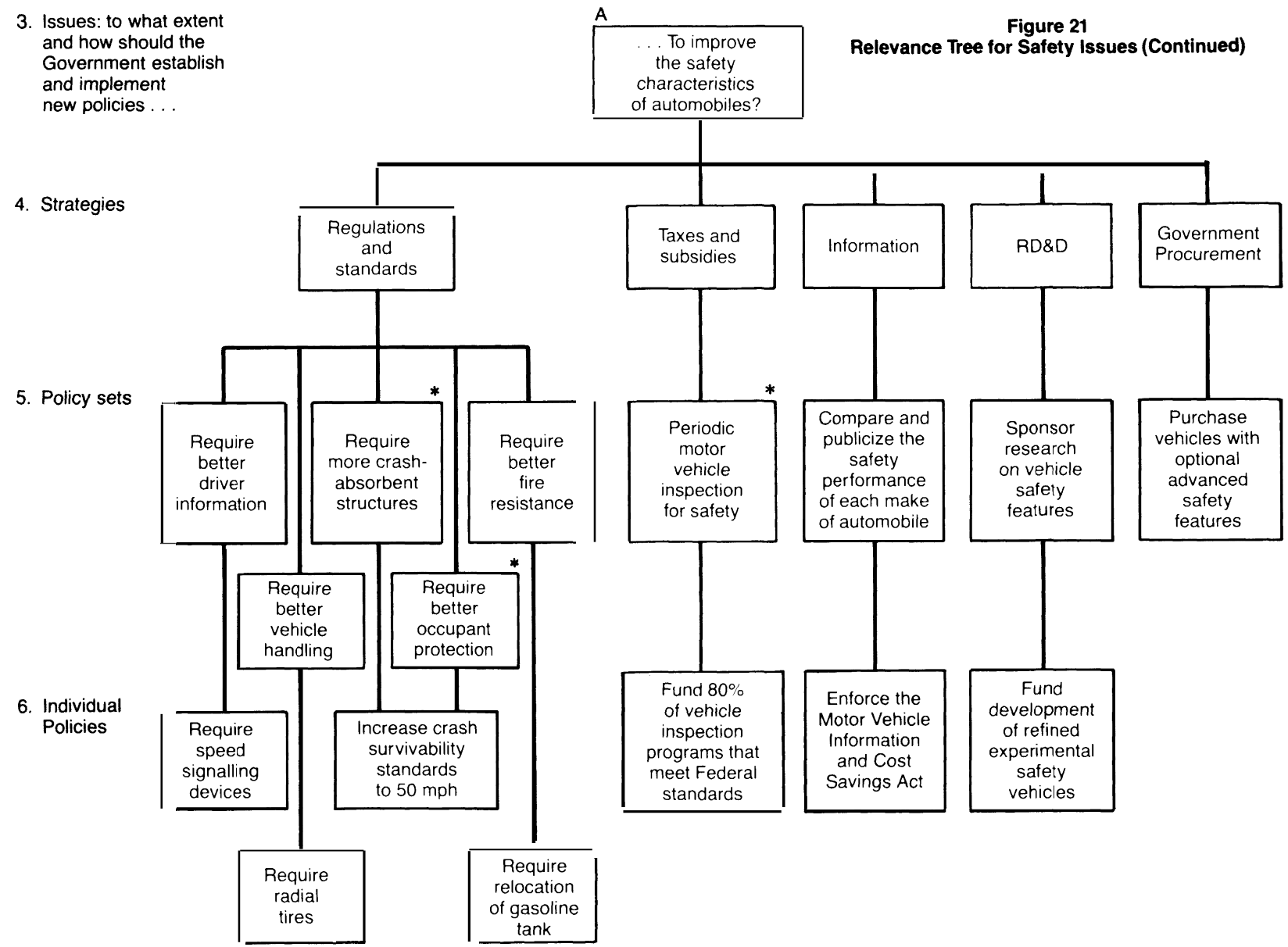


Figure 21
Relevance Tree for Safety Issues (Continued)



Analyzed by Sydec.

Figure 21.–Relevance Tree for Safety Issues (Continued)

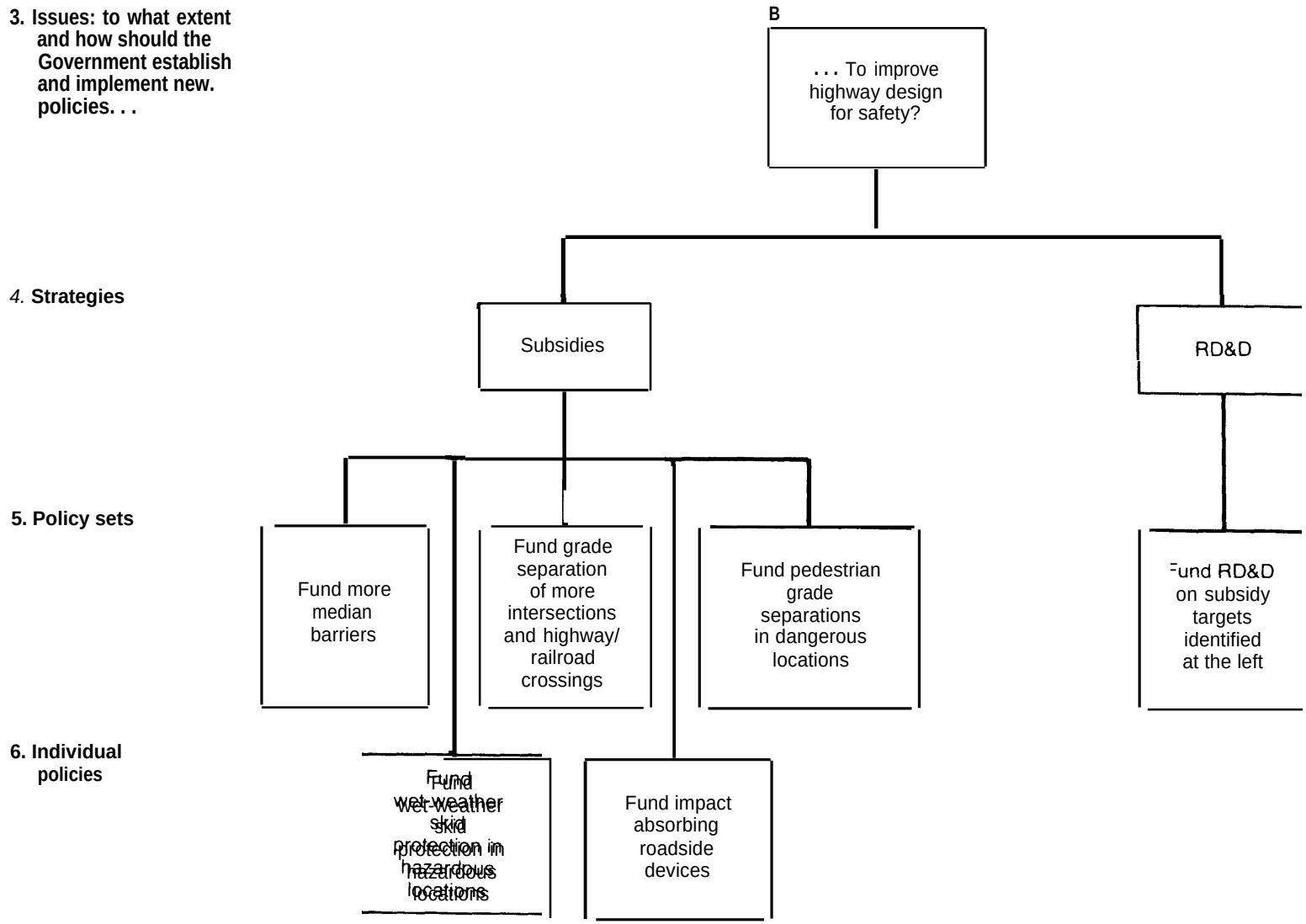


Figure 21.—Relevance Tree for Safety ssues (Continued)

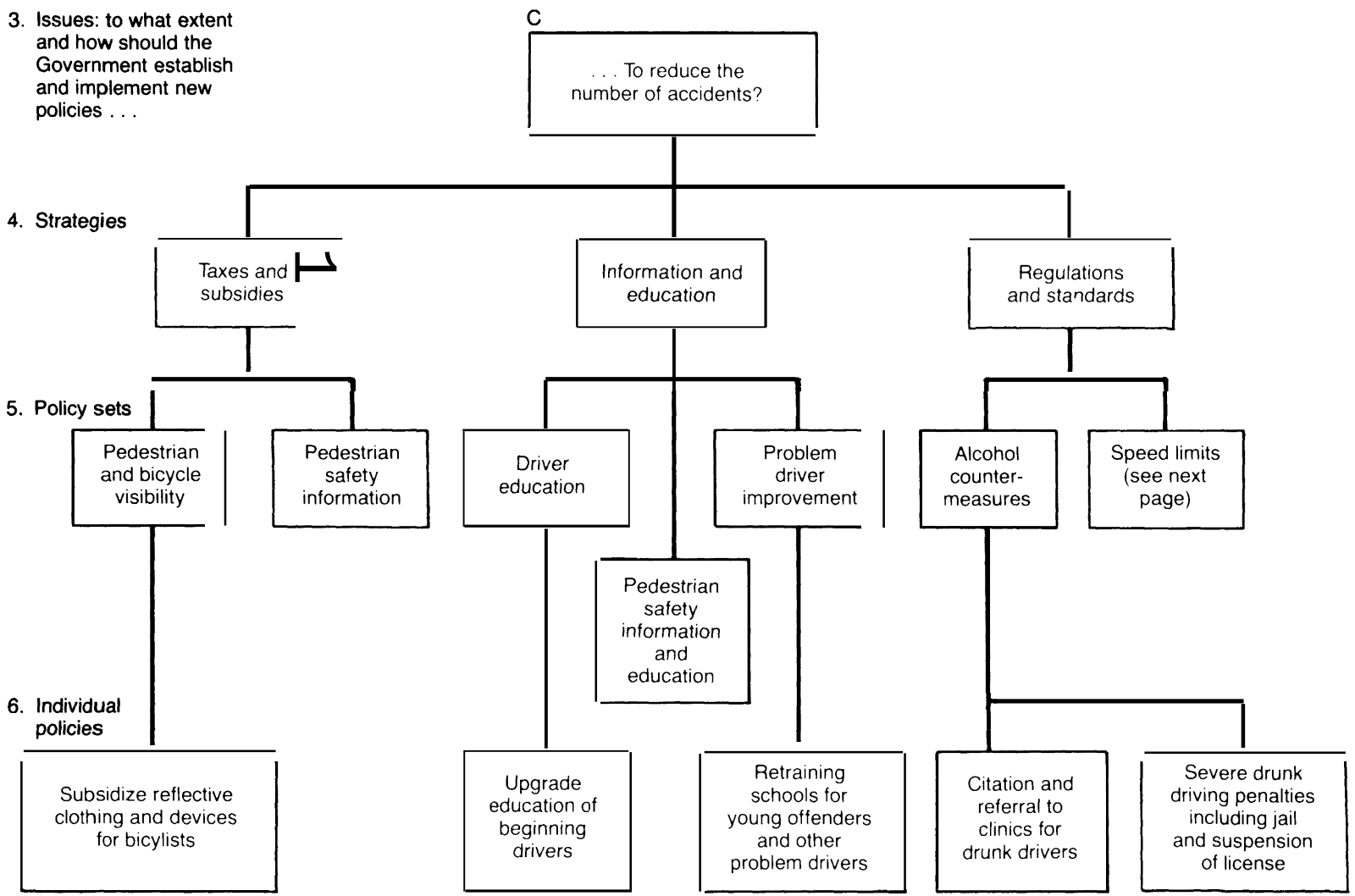
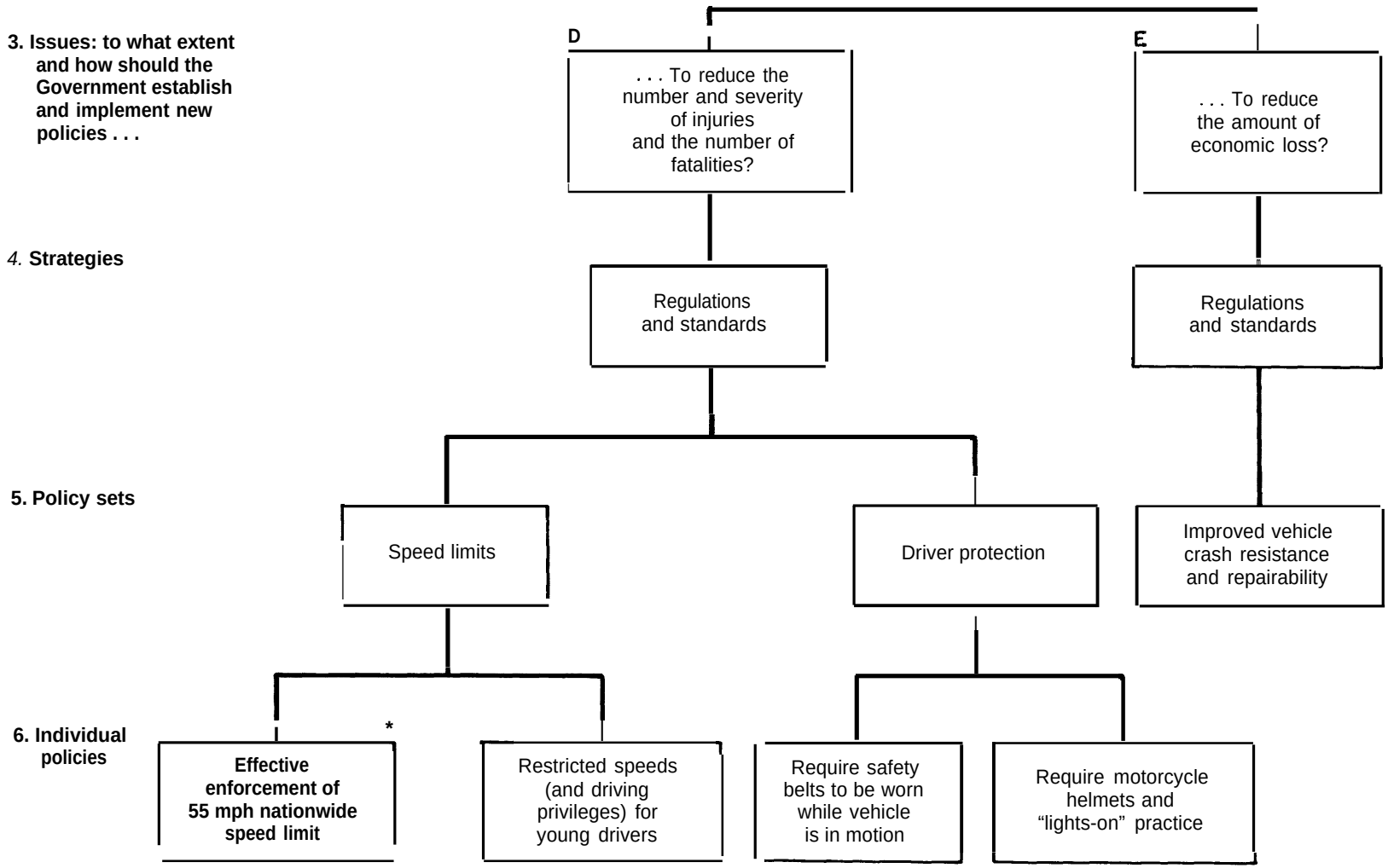
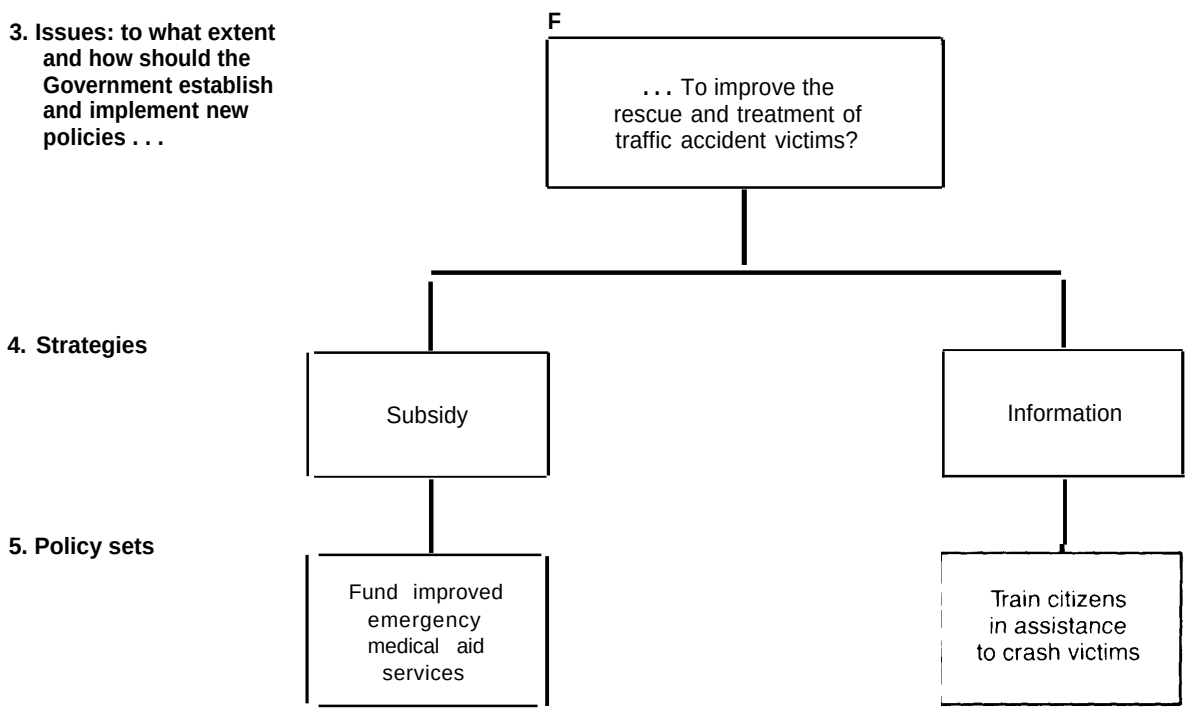


Figure 21.—Relevance Tree for Safety Issues (Continued)



*Analyzed by Sydec

Figure 21.–Relevance Tree for Safety Issues (Concluded)



SOURCE: Office of Technology Assessment.

Figure 22.—Relevance Tree for Mobility Issues

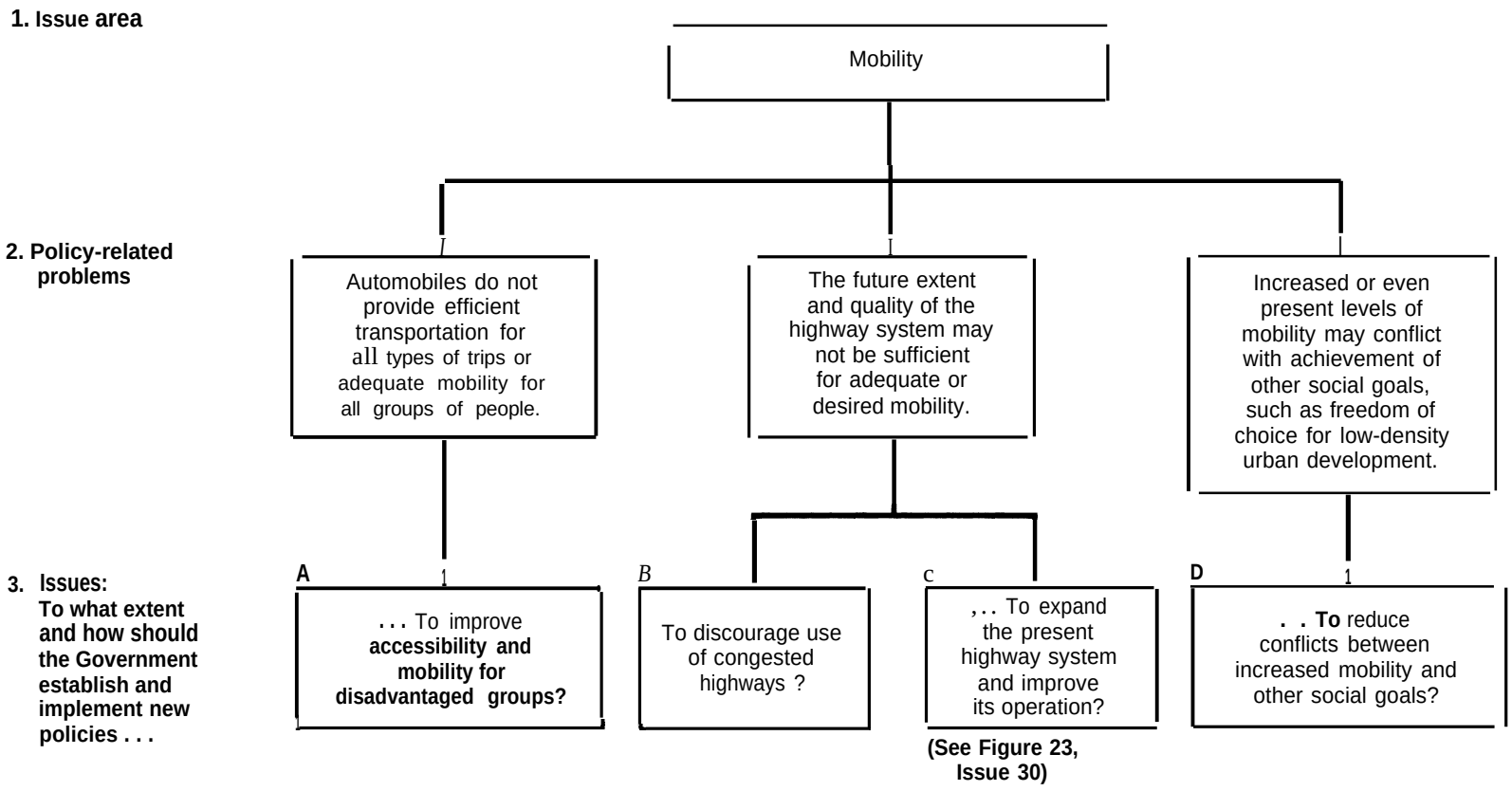


Figure 22.—Relevance Tree for Mobility Issues (Continued)

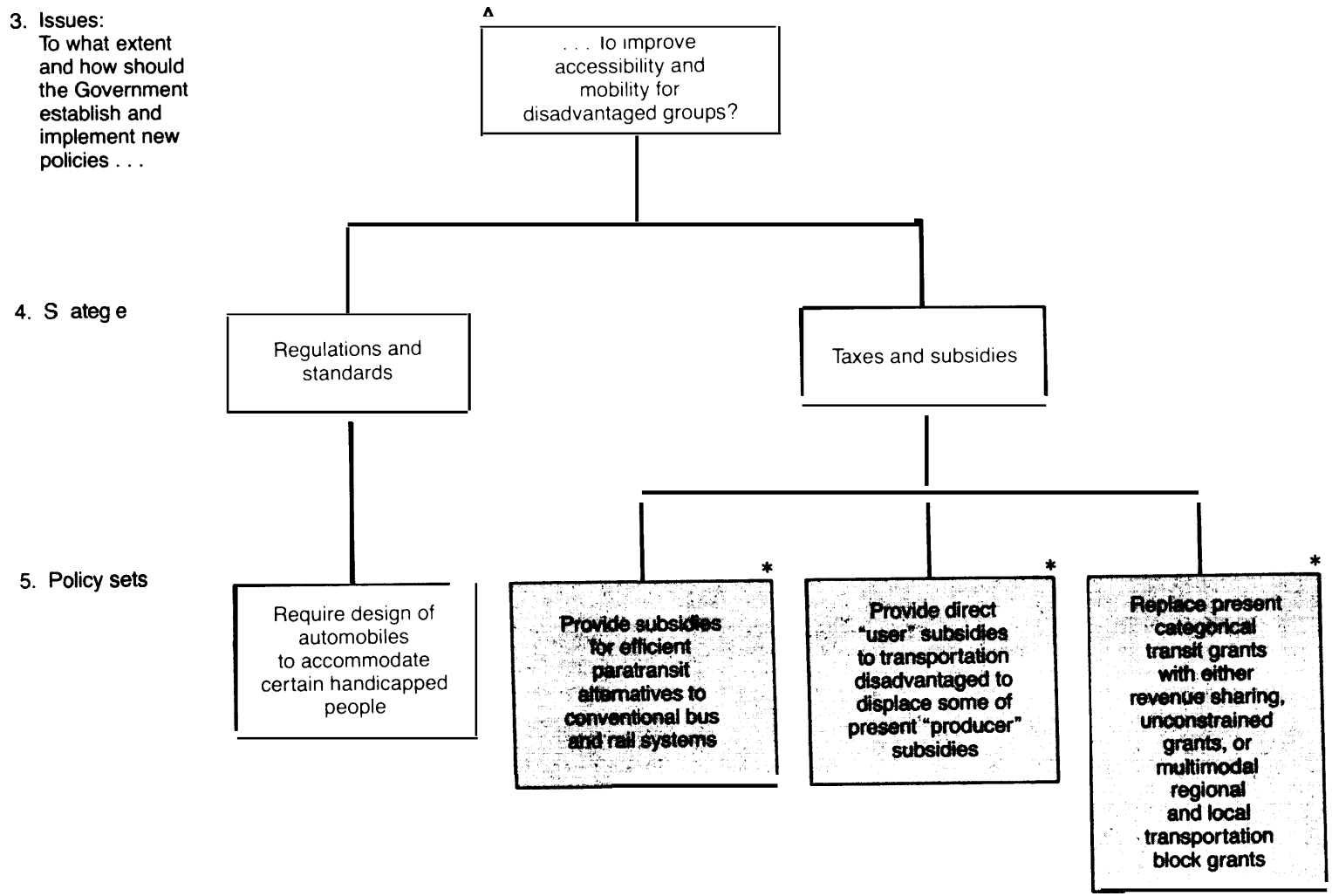


Figure 22.-Relevance Tree for Mobility Issues (Continued)

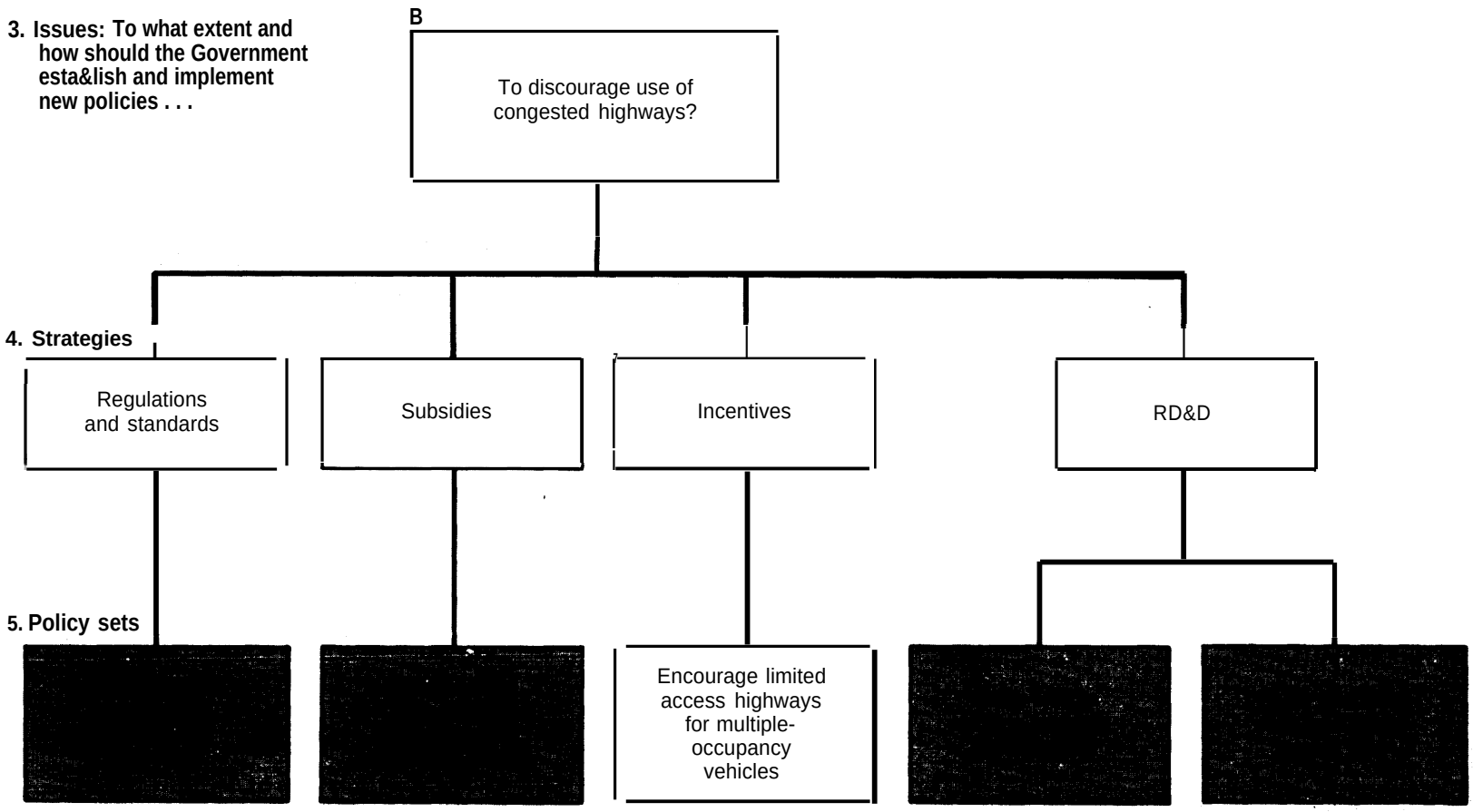
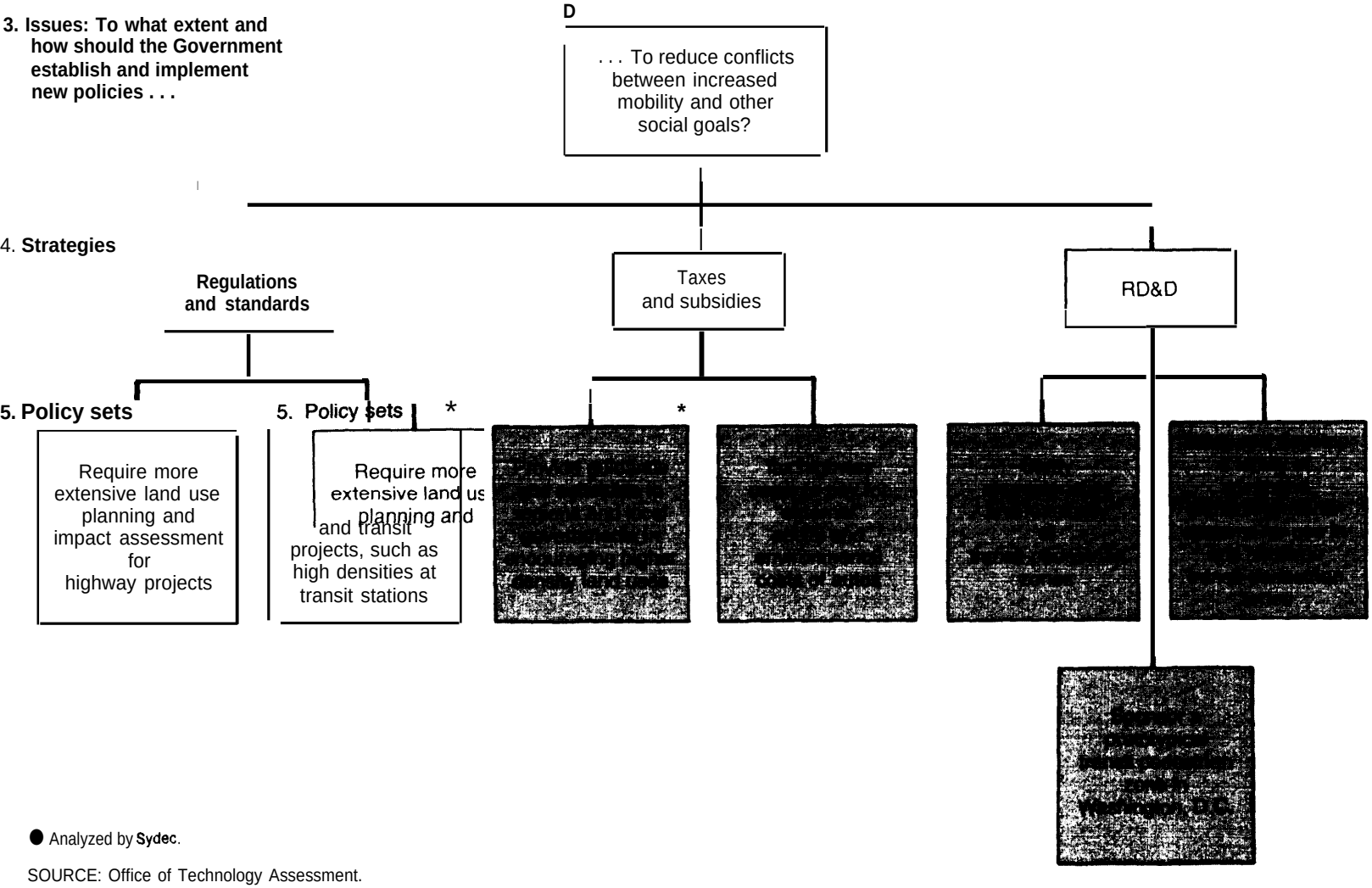


Figure 22.–Relevance Tree for Mobility Issues (Concluded)



● Analyzed by Sydec.

SOURCE: Office of Technology Assessment.

Figure 23.-Relevance Tree- for Cost and Capital Issues

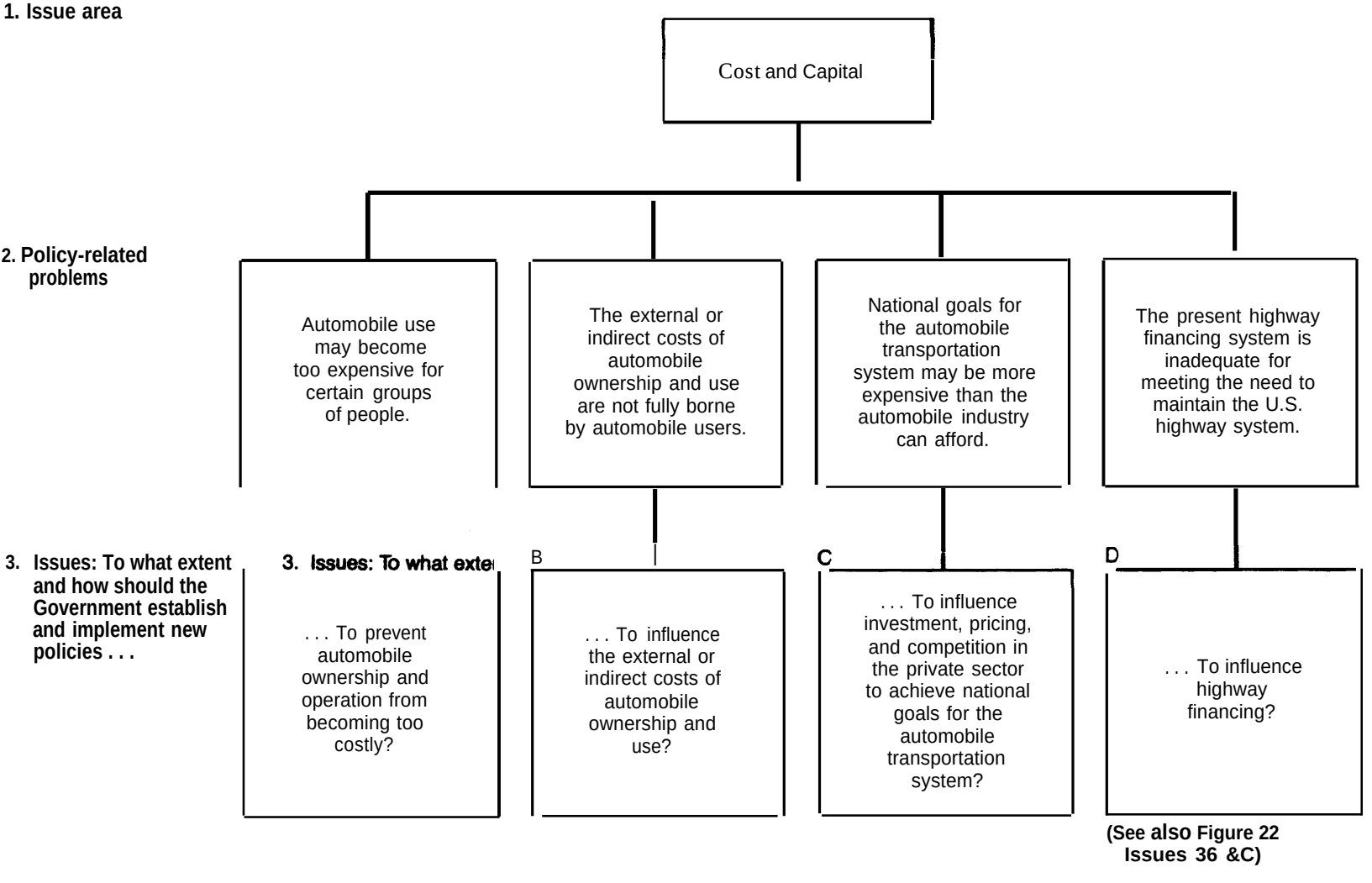


Figure 23.–Relevance Tree for Cost and Capital Issues (Continued)

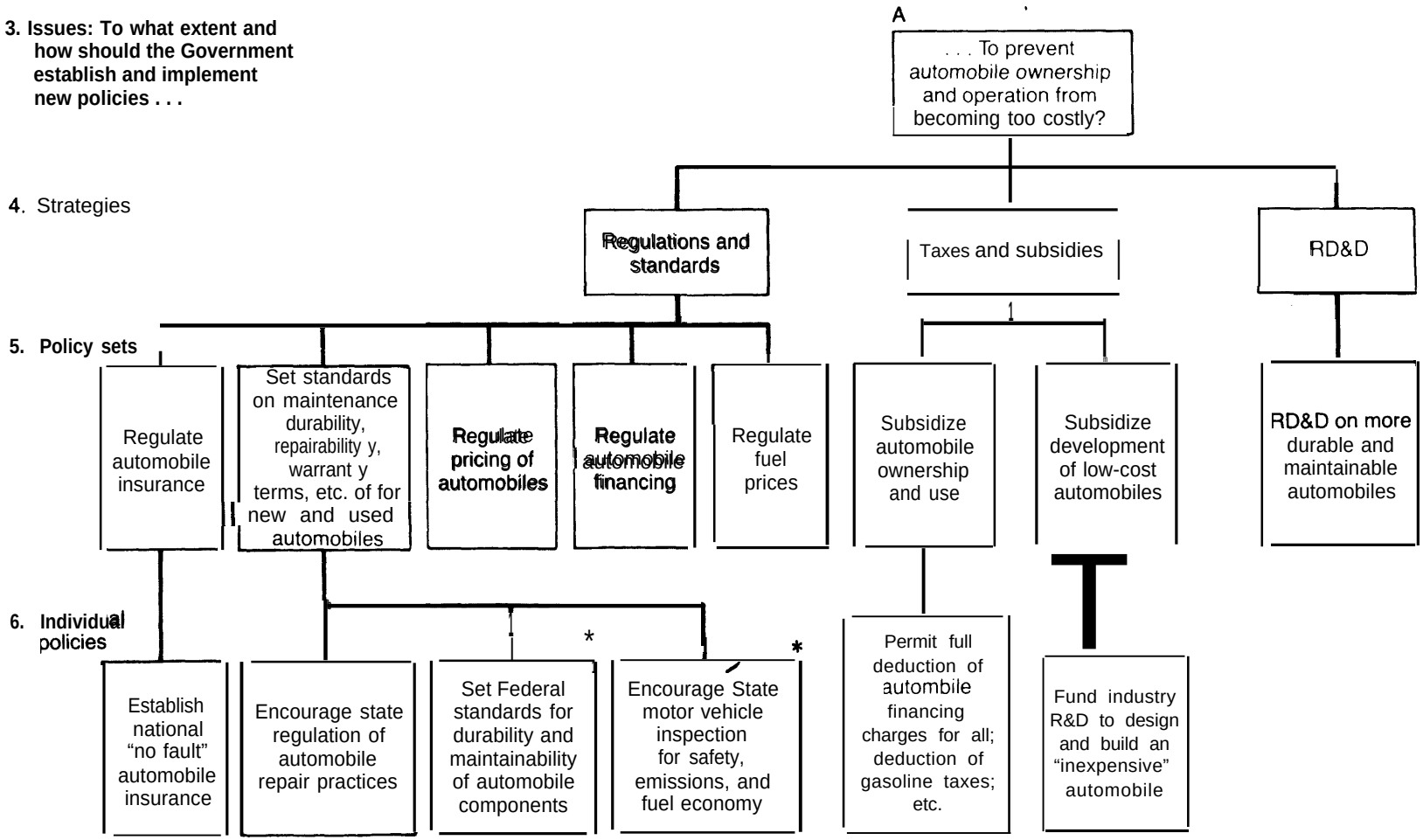
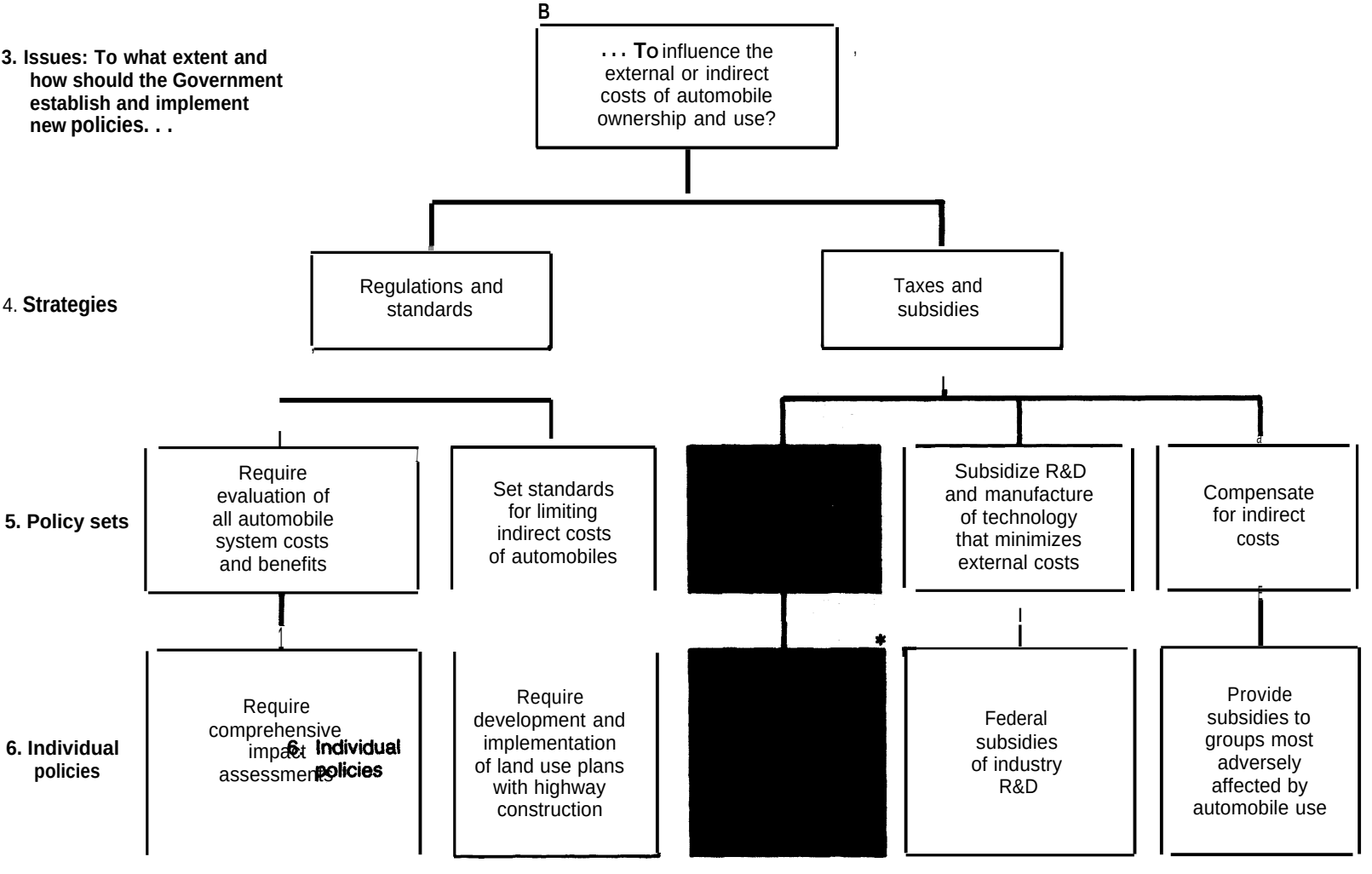


Figure 23.-Relevance Tree for Cost and Capital issues (Continued)



● Analyzed by Sydec.

Figure 23.—Relevance Tree for Cost and Capital Issues (Continued)

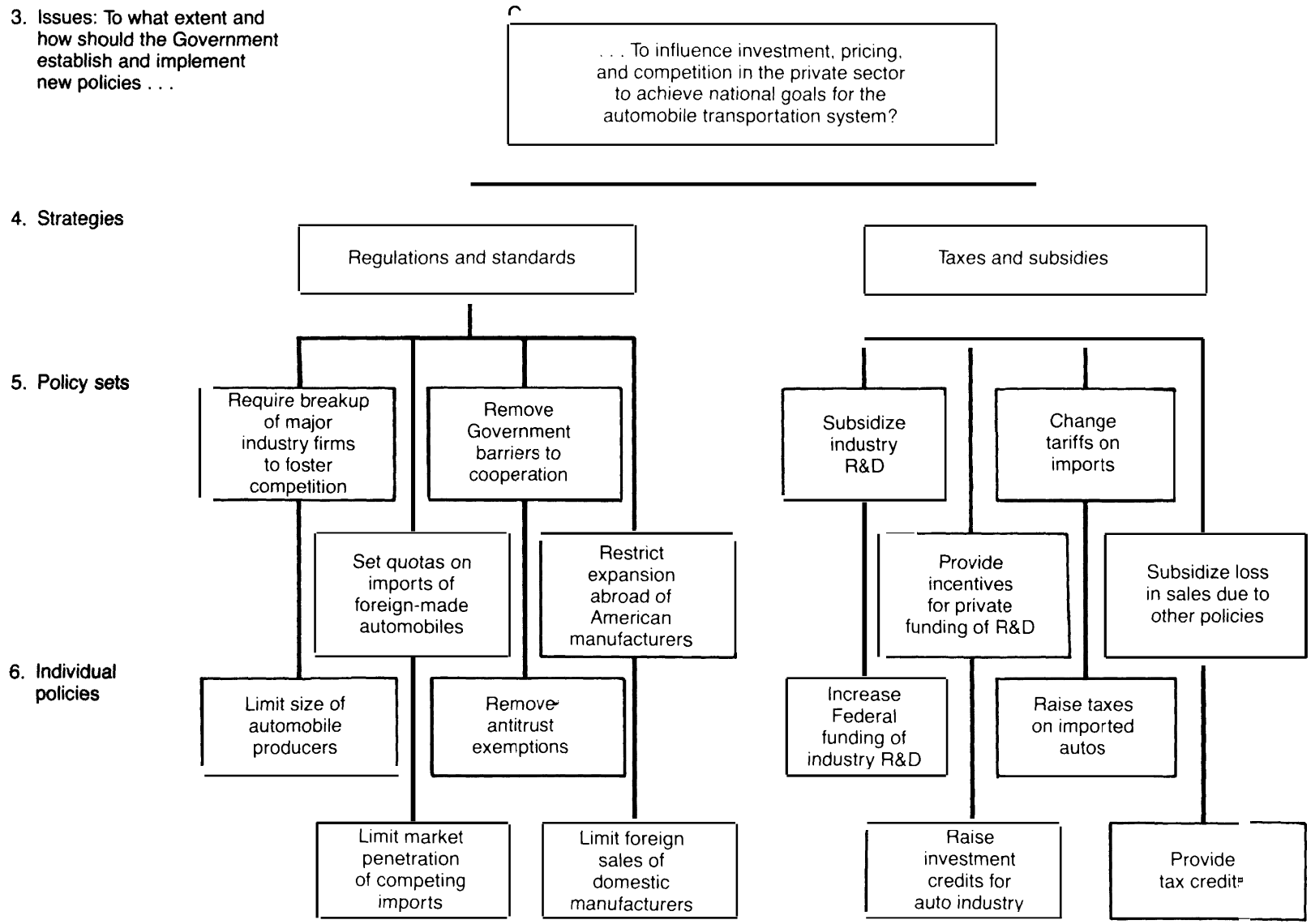
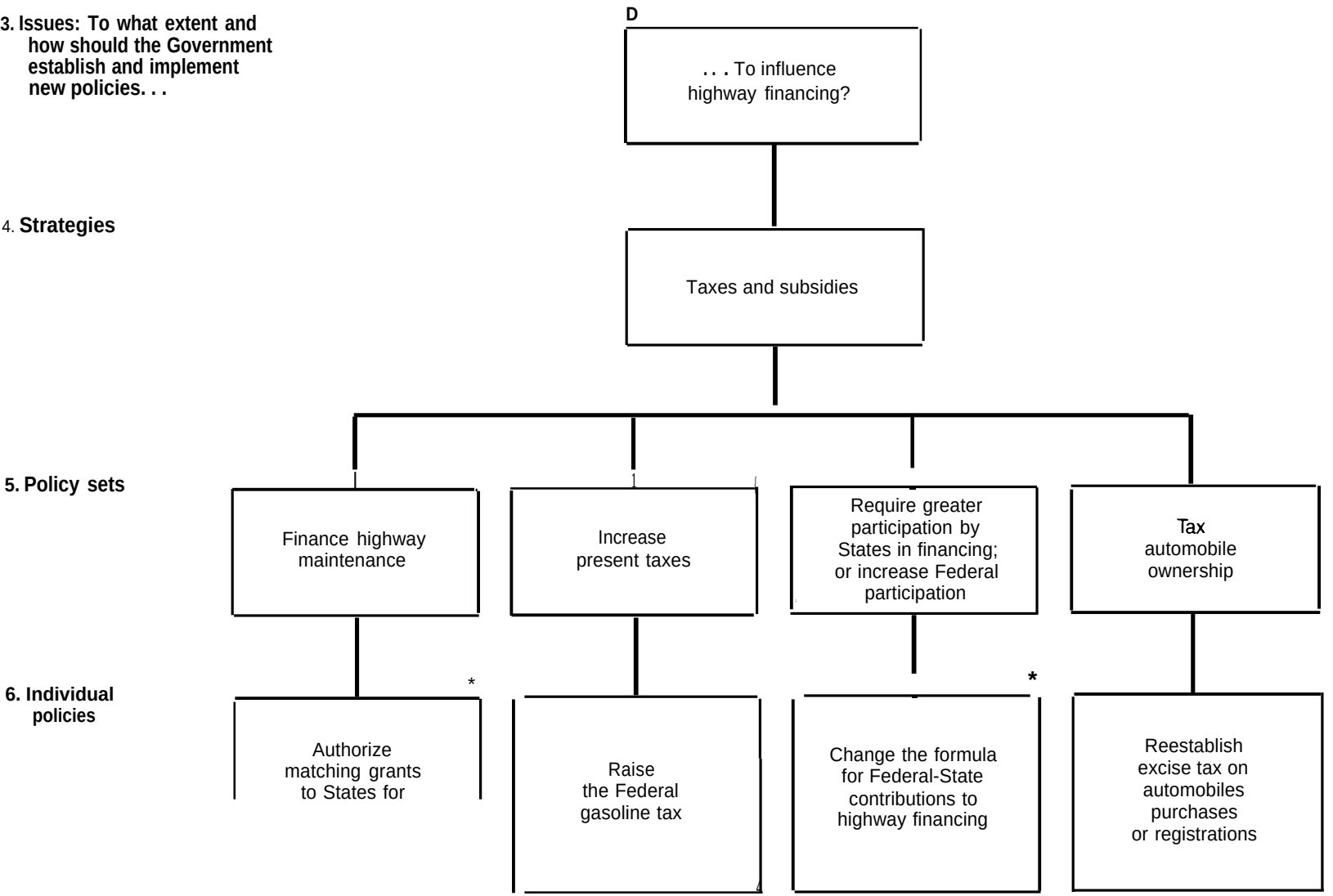


Figure 23.-Relevance Tree for Cost and Capital Issues (Concluded)



● Analyzed by Sydec.

SYDEC POLICY SETS

System Design Concepts was directed to take a somewhat more comprehensive approach to the definition of policy sets. Sydec assembled four "packages" of policies that attempted to address several concerns and issues simultaneously. Each policy had a major direction or thrust, such as energy conservation, but it also included measures addressed to other issues, such as environmental protection, safety, or mobility. The four policy packages formulated by Sydec were:

- Petroleum Conservation
- Improved Environment
- Increased Mobility
- Improved Accessibility

Each policy package was designed to be internally consistent, in that the individual policies were mutually supportive and compatible in terms of their effects. A second important feature of this approach was systematic variation of supportive policies among policy packages. This facilitated the analysis of effects and impacts. Both of these features—internal consistency and systematic variation—can be seen by examining the components of the four policy packages and the Base Case, which are given in table 43.

Table 43.—Sydec Base Case and Policy Alternatives

Policy alternatives	Trend: Base Case	Petroleum Conservation	Improved Environment	Increased Mobility	Improved Accessibility
Highway Total highway expenditures	Increase with inflation (stable in constant dollars).	Increase at 1/2 of inflation (declines 40% by 2000 in constant dollars).	Same as Base Case.	Increase 47°/0 over Base Case.	Same as Base Case.
Highway construct ion	Decreases from 50% of total highway expenditures to 25%. in 2000.	Same as Base Case.	Same as Base Case.	Increases to high expenditure level of late 1960's (48% of total in 2000).	Same as Base Case. Emphasis on community cirrculation.
Highway maintenance	Increases from 50%. of total highway expenditures to 75% in 2000.	Same as Base Case.	Same as Base Case.	Same constant dollar level as Base Case (50°/0 of total in 2000).	Same as Base Case.
Transportation system management	Existing policies — no funding program.	Same as Base Case.	Separate funding program: $200 million/year emphasizing high occupancy vehicle movement.	Funded at $1.5 billion per year in real dollars, emphasis on general traffic movement efficiency.	Same as Improved Environment (emphasis on pedestrian and bicycle movement and paratransit services).
Mass transportat ion: capital improvements	Increase current dollar funding 10°/0 per year to 1985. Hold constant in real dollars to 2000.	Increase current dollar funding 15 "/0 per year to 1985. Hold constant i n real dollars to 2000.	Same as Petro leum Conservation.	Same as Petroleum Conservation. Emphasis on services for transit dependent groups.	Same as Base Case.
Operations	Increase current dollar funding 10% per year to 1985. Hold constant in real dollars to 2000.	Double funding ini tially. Increase 1 5°/0 per year to 1985. Increase 10"/0 per year 1985-2000 (all current $).	Same as Petro leum Conservat ion,	Same as Petroleum Conservation. Emphasis on services for transit dependent groups.	Same as Petroleum Conservation (emphasis on community - oriented transit services).
'Auto performance	EPCA 27.5 mpg through 2000.	33 mpg by 1990,40 mpg by 2000, Mpg minimum on all new autos.	Same as Petroleum Conservation.	Same as Base Case.	Same as Petroleum Conservation.
Highway speed	Moderate enforcement (present average of 62 mph).	Rigid enforcement of 55 mph limit.	Same as Base Case.	Same as Base Case.	Same as Base Case.

Table 43.—Sydec Base Case and Policy Alternatives—Cont.

Policy alternatives	Trend: Base Case	Petroleum Conservation	Improved Environment	Increased Mobility	Improved Accessibility
Taxes	Fuel taxes increased to maintain 1975 revenue levels (12.3$/gal. in 1985; 14.OC/gal. in 2000, constant 1975 dollars).	Increased gas tax to hold constant fleet fuel cost per VMT and to equalize gas and synfuel prices. Gas guzzler tax on new cars.	Increased gas tax to hold constant fleet fuel cost per VMT. Gas guzzler tax on new cars.	Same as Improved Environment.	Same as Improved Environment.
Air pollution					
Vehicle emissions	Attain 1977 Clean Air Act Standards for CO, HC, and NO_x (NO_x waiver for diesels at 1.5 gpm 1981-83.	Same as Base Case.	CO and HC same as Base Case Tighten NO_x, standard to 0.4 gpm. Two-car strategy (electric).	Same as Base Case.	Same as Improved Environment.
Inspection and maintenance	No mandatory program (negligible improvements in deterioration rates).	Same as Base Case.	Mandatory programs nationwide.	Same as Base Case.	Same as Base Case.
Transportation controls	Negligible traffic reduction effect.	Same as Base Case.	Parking management. Vehicle use restraints.	Same as Base Case.	Emphasis on auto-free zones.
Noise					
Vehicle emissions	Emission standards for trucks and buses.	Same as Base Case.	Emission standards for autos and light trucks.	Same as Base Case.	Same as Base Case.
Noise abatement	Continue existing policies.	Same as Base Case.	Continue existing policies and expand funding to include soundproofing.	Same as Base Case.	Same as Base Case.
Occupant restraints	Airbags or t heir equivalent on new vehicles as scheduled.	Mandatory seat belt use only.	Same as Base Case.	Same as Base Case.	Same as Base Case.
Vehicle crashworthiness	Existing standards.	Same as Base Case.	Level 1.	Level II.	Level I with emphasis on frontend auto design and pedestrian and cyclist safety.
Propulsion	15% diesel by 1985; 40%. diesel by 2000.	25%. diesel by 1985; 600/. diesel by 2000. Electric car introduction by 2000.	Same as Base Case, except diesels phased out after 1990.	Same as Base Case.	Diesel penetration same as improved Environment.
Fuels	5.6% diesel by 1985; 31 .30/0 diesel by 2000.	Increase % of diesel fuel; accelerate transition to synfuels. Potential for gas rationing.	Same as Base Case, except accelerate penetration of electric cars.	Same as Base Case.	Accelerated transitions to electric cars.

SOURCE Sydec/EEA

Petroleum Conservation

Consumption of energy, particularly petroleum products, continues to increase in the United States, despite dwindling domestic supplies of crude oil. Oil imports now represent almost **50** percent of total consumption. A continuation of this trend into the *1980's* could lead to import levels of **60** percent or more, increasing the threat to national security and economic stability. Oil imports are a major factor in the present balance of payments deficit, which is at a record level.

Notwithstanding present efforts in Congress to enact major new energy policies aimed at both conservation and increased energy supplies, it is likely that energy policy will be a continuing concern and an issue for the American people and their elected officials for many years to come.

Energy supplies, and particularly petroleum products, are important to many areas of American society. Attention is focused here on the transportation sector because it accounts for about 50 percent of petroleum consumption. The automobile system alone is responsible for between **25** and 30 percent of petroleum use in the United States.

Policies to promote reduced energy consumption by the automobile system are analyzed in the Petroleum Conservation Case, which contains the following major elements:

- The minimum fuel efficiency level for the auto fleet would gradually increase to 23.5 mpg in 1985, leading to an average fuel efficiency of 30 mpg in **1990** and 35 mpg in 2000.
- The gasoline tax would increase gradually to hold the fuel cost per vehicle mile constant and to stimulate the introduction of synthetic fuels. (The existing Federal and State gasoline taxes—which average 11.65 cents per gallon would be increased by 13 cents in 1985 and 18 cents in 2000, in **1975** constant dollars. This would raise the price of gasoline to 91 cents per gallon in 1985 and $1 .39 per gallon in **2000.)**
- Total expenditures for highways would decrease, primarily in construction funds but with a slight decrease in maintenance funds as well. (Total highway expenditures from all levels of government would decrease from $28.2 billion in 1975 to $22.4 billion in **1985** and $16.8 billion in 2000.)
- Federal funding for mass transit capital improvements (facilities and equipment) would increase from $1.2 billion in 1975 to $2.4 billion in **1985,** and with funding held constant at that level until 2000. (Federal funds for operating subsidies would also be increased from a base of $300 million in **1975** to **$2** billion in **1985** and $4.8 billion in 2000.)

Improved Environment

The Clean Air Act Amendments of 1970 established the objective of a 90-percent reduction in emissions of specified pollutants from automobiles as a primary measure to improve air quality. These reductions have proven difficult to achieve. By both executive and congressional action, auto manufacturers have been granted extensions in meeting emission standards. The delays in meeting standards, as well as questions of whether the full 90-percent reduction is necessary for public health, continue to be matters of intense public debate.

While the objective has not yet been reached, major reductions have been made in the emission levels of new automobiles being produced. Still, most projections indicate that air quality standards will not be met in many places within the next few years and that standards for photochemical oxidants may not be met in some regions even by the year 2000.

A factor that complicates the question of automobile emission standards is that control devices have been shown to deteriorate over the life of the vehicle much more rapidly than expected. It must also be recognized that many automobiles are driven more than the **50,000** miles covered by the manufacturer's warranty for emission control devices. Further, it has been established that emission levels are higher in vehicles that are not adequately maintained. These considerations raise the question of whether programs to control vehicles in use may be necessary.

The potential conflict between reduced emis-

sions and petroleum conservation further complicates the problem and will be a significant factor in propulsion technology for autos of the future. For example, a diesel engine is significantly more fuel efficient than the present spark-ignition engine. The diesel-powered auto can meet established carbon monoxide and hydrocarbon standards but may not be able to meet the nitrogen oxide standard. Electric cars have no known harmful emissions, but the powerplants that produce electricity to charge the batteries may foul the air.

Potential policies to reduce automobile emissions are tested in the Improved Environment Case:

- The standards and implementation schedule for carbon monoxide and hydrocarbon emissions as approved by Congress in the 1977 Clean Air Act Amendments would be maintained. (The nitrogen oxide standard would be reduced from 1.0 to **0.4** gram per mile.)
- Mandatory inspection and maintenance would be imposed for all automobiles and light trucks.
- A program of parking management and auto-free zones would be instituted, primarily in center cities where there is a greater potential for providing alternative transportation through mass transit.
- Federal funding for mass transit capital improvements and operating subsidies would be at the same high levels as in the Petroleum Conservation Case.
- Transportation System Management would be funded at a rate of $200 million per year to provide special expressway and arterial street lanes for transit, carpools, and vanpools. (Special parking privileges would be provided for high-occupancy vehicles.)
- Total national highway expenditures would be held constant at 1975 levels. (Capital expenditures would decrease as maintenance requirements increased.)

Increased Mobility

Throughout the history of the United States, public policy has placed great value on mobility. The transportation of people and goods has been supported by public funds and by measures to regulate the availability and price of transportation services. Sustaining or expanding this transportation network and the personal mobility that it affords will become an increasingly difficult task. The mobility that is now enjoyed may be threatened by energy restrictions, environmental concerns, and the problems of auto system safety.

Thus, there is an important set of issues relating to the extent to which the Federal Government should continue to promote general mobility and the means by which this is to be accomplished. A further issue is whether the Federal Government should attempt to change the distribution of mobility by undertaking policies to aid the transportation disadvantaged.

These issues are addressed by policies which substantially increase the level of Federal funds for highway construction and maintenance and which create a higher level of funding for highway and street improvements under a transportation system management program. In order to provide increased mobility for the transit dependent, increased Federal funding for mass transit also is provided, with a significant amount earmarked for special services for the elderly and handicapped.

The policies and programs in the Increased Mobility Case are:

- Highway expenditures would increase from a total of $28 billion in **1975** to **$37** billion in 1985 and to $41 billion in **2000.** (This level of funding would provide **$20** billion a year for construction between 1985 and 2000, a level about the same or slightly lower than that during the height of the highway program in the late **1960's.** Maintenance funds would increase from $14 billion in **1975** to $17 billion in 1985 and **$21** billion in **2000.)**
- A transportation system management program would be funded at a level of $1.5 billion per year by 1985 and would continue at that level to **2000.** (The program would

emphasize removal of congestion points in the highway and street network, safety improvements, and improvements to increase the average speed of traffic flow.)

- Federal funding for mass transit capital improvements and additions would be increased from the level of $1.2 billion in 1975 to $2.4 billion in **1985** and thereafter. (Federal assistance for transit operation would be increased from $300 million in **1975** to $1.6 billion in 1985 and $4.4 billion in 2000.)
- **$500** million per year would be allotted to a special program to provide transportation for the elderly and handicapped. (The Federal share would be 80 percent, with State and local funds making up the remainder. The **$500** million funding level would be reached in **1985** and continued to 2000.)
- Motor vehicle fuel taxes would increase gradually to keep the average fuel costs per vehicle mile constant for the fleet.

Improved Accessibility

The auto system has contributed to the dispersion of manufacturing and commercial and residential development in patterns that are referred to as urban sprawl. The automobile-highway system has encouraged residential land development in suburban and exurban areas where land is relatively inexpensive and where developers can market housing with more amenities than could be obtained in center cities. Local officials, hard-pressed to provide more public services for growing communities, have willingly provided the infrastructure necessary for this development in order to increase the tax base.

The highly automated processes associated with modern manufacturing and the ready availability of truck transportation have led industry to seek the outlying areas for expansion and replacement of older multistory center city buildings. Commercial enterprises, particularly retail stores and service organizations, have followed the people to the suburbs. In recent years, there has been a substantial movement of commercial offices to the suburbs.

While the phenomenon of urban sprawl is complex, its effect on transportation and particularly the automobile system is well-known and well-documented. Public concern over energy problems, environmental degradation, and other social and economic issues has intensified the debate over land use and the spatial distribution of society's activities.

These problems are addressed in the Improved Accessibility Case, which includes the following policies:

- Quantified and measurable criteria for land use and transportation integration would be established. Meeting the criteria would be a condition for Federal assistance in planning and development.
- The Federal Government would participate directly in development of high-accessibility areas and integrated transportation networks to serve them.
- Highway funding would be held constant at $28.1 billion for the period 1985 to 2000, with a decreasing level of funding for construction and a reorientation to emphasize community circulation. (Capital expenditures would decrease from $14.3 billion in **1975** to $11.2 billion in **1985** and $7 billion in **2000.** Highway maintenance would increase from $13.9 billion in 1975 to $17 billion in 1985 and $21.1 billion in 2000.)
- Federal funding for capital improvements of transit would increase from $1.2 billion in 1975 to $1.7 billion in 1985 and after. (Federal assistance for transit operation would be increased from $300 million in 1975 to $2 billion in 1985 and to $4.8 billion in 2000. Funding for operating assistance would emphasize community-oriented transit services.)
- Air quality standards for carbon monoxide and hydrocarbons would be held at the levels approved in 1977, with the standard for nitrogen oxides tightened to 0.4 gram per mile.
- Air quality control plans would emphasize auto-free zones.