INTRODUCTION TO APT: AN ASSESSMENT OF POLICIES TOOL

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CONCEPT OF AN ASSESSMENT OF POLICIES TOOL (APT)

An assessment of policies tool (APT) is envisioned as an instrument whose use can help in the assessment of likely consequences of proposed policies. It is not a substitute either for policy formulation or for the policy selection; rather, its role is to improve these processes in a practical manner by enabling formulation of broader and more comprehensive policies and by increasing the likelihood of success with the policy finally selected for implementation.

Any policy-making process has intuitive and logical components. Intuitive aspects include perceived goals, the interpretation of acquired experience, and learned knowledge, while the logical aspects have to do with the facts and data (numerical, quantitative information) and the logical sequences of events triggered by or affected by policy implementation. The role of APT is to add a new dimension to the second aspect and in so doing also to augment performance of the first.

The objective of this article is to provide enough information for the general use of APT. Like any sophisticated tool, APT can be used on a variety of levels from rather simple to quite intricate. The potential of a well designed tool should be discernible in some simple situations. Only after such potential has been established can one realistically expect that decision makers and policy analysts will invest the time and resources necessary for use of the tool and its possible adaptation for specific situations.

The model embedded in APT which will be described in this article is designed for the assessment of certain types of long term national and regional policies in the global, i.e. world, context. It should be emphasized that many other models, such as urban or subnational regional models, can and have been embedded in APT. In the second section of this report, the types of policies for which the global model has been designed are indicated, major components of the APT tool are specified, and the process of combined use is described. The third section contains a specific example of use in the consideration of certain types of energy policies, while the fourth section contains an example of use for food policy. The concluding section gives more information on a broader domain of applications, on the range of policies for which the tool can be used, and on its flexibility for further extension and adaptation. Further illustration of the use of the global model and APT can be found in the second report to The Club of Rome, published under the title Mankind At The Turning Point (E. P. Dutton, New York, 1974).

Some factors which provided motivation for the development of the APT concept and which guided its design and construction might be of interest here. National policy making has entered a new era of increased difficulties for many reasons, among which are the following:

(a) Complexity: National policy formulation and selection has become increasingly complex in the following two directions. First, interdependence between domestic politics and the foreign politics of bilateral, multi-lateral and global relationships. As Harmon Cleveland aptly put it recently, "every domestic issue is partly international and every international issue is partly domestic." The energy, food, population, development gap, trade, and monetary crises provide ample examples to illustrate the point. Second, interrelatedness between policies traditionally considered, at least in the practice of decision making, to lie in separate domains. To paraphrase Cleveland again, every foreign minister must be a little bit of an expert on energy and food, not to mention economics in general, while every minister of agriculture had better have a grasp of foreign affairs. While separation of policies into different domains was always a poor approximation of reality, it absolutely does not suffice any longer.

(b) Rate and Magnitude of Change: In the past, many (although by no means all) policies could be based on a somewhat experimental approach. By implementing some aspects of policies, one could assess from the resulting trends what the policy would produce if fully implemented over the entire period of time. Such an approach, frequently called incrementalism, or "muddling through," appears both practical and prudent as long as the penalties involved are not unduly high. The rate and the magnitude of changes associated with various current policies make the approach increasingly risky. Technically speaking, one cannot rely on the real world "feedback mechanism" for correction and adjustment, but must try in the best way possible to anticipate the consequences of intended options.

(c) Leadtime: The period between the time when the decision to implement a policy must be made and the time when its beneficial (or harmful) consequences become apparent has lengthened considerably, to the extent that in many vital areas it can be a decade or more. For example, the return on government and private investment in the nuclear energy area can be expected only in a decade or so and depends on both the prevailing conditions at completion time and the ability to sustain a continuous effort (i. e., investment) over a rather long time period with associated uncertainties and changing conditions. Leadtime concerns are related to the rate and magnitude of change concerns mentioned above, and together they indicate a need to take into account the "dynamics of the system in an anticipatory manner."

APT and the global model were constructed to assist decision-makers in meeting increasingly difficult decision situations. Some of the factors which have to be considered in the construction and application of APT and the model to assure their use in practice are the following:

(a) Reliability: The construction of the tool has to be based on as many facts and data as are available and to use as much relevant theoretical and practical knowledge as possible. An important decision should not be based on incomplete information.

(b) Comprehensiveness: A rather full spectrum of relevant factors must be covered. For example, there is no point in considering economic implications in minute details while overlooking technical feasibilities and constraints; nor is there much to be gained from analyzing extreme technical possibilities without taking into account the economic and human base and other support for such technology. The task is further complicated by the need for at least general comprehension of the complex set of interrelationships among the large set of factors which have to be considered. This requires a balance in the detail with which each of the related domains (economics, technology, resources, demography, etc.) has to be represented.

(c) Efficiency in Use: This is another point which is also quite readily overlooked. APT, in stressing anticipatory policy making, involves a certain amount of "ball-gazing" and "futures prediction." This is clearly a risky business and one must be especially careful as to what can be said about the future and what can not be said with any degree of certainty. To meet this challenge, APT is built on the concept of assessing the likely future if certain events and policies take place in a given sequence. It is in such an "if-then" context that credible and responsible use of APT takes place. In other words, although APT can become indispensible, its use should be to augment the power of reasoning as employed in present decision making, rather than as a substitute for that process.

APT AND THE PROCESS OF ITS USE

The concept of APT is based on the identification of three components in a policy assessment process:

(i) Explication of the policy in specific and explicit operational terms;

(ii) Selection of the factors in terms of which the success or failure of the policy will be assessed;

(iii) Identification of the relationship between the policy and the factors for assessment of policy success.

The first component becomes part of the APT process through scenario preparation. A scenario, in general, is defined as a feasible sequence of future events and choices (decisions) which could occur or would be made over the future time period of concern. A scenario contains, in essence, assumptions regarding the uncertain future conditions in which the system will operate and assumptions about poorly understood aspects of the system's behavior as well. A scenario is the "if" part of an "if-then" type of futures analysis. Using APT, the explication and specification of a scenario is frequently done by preparing a scenario sheet, i.e., by making choices or "guesses" as to the outcome of certain events and the values of certain variables. An example of a scenario sheet will be given in the next section.

The second component of the APT process is handled in a manner similar to the first, i.e., by a selection of an indicator or variable set in terms of which the response of the system will be judged as good or bad. In practice, it amounts to the selection of the evaluation set from a large set of indicators and variables which are envisioned, in the broadest sense, to be affected by the policy implementation. Examples of such a set will be given in the next section.

The third component of the APT process is materialized by means of a computer model which encodes the cause-effect relationships between the policy variables and evaluation variables. Such a model is nothing more than an "image" which the policy maker (or analyst) has about the outcomes of alternative policy implementations. It should be pointed out that it is the very nature of any decision-making or more general selection process that such an image must exist. It is only in reference to that image that the selection is made. A model, therefore, represents the understanding the decision-maker has (at least at the time when the choice is made) of the plausible outcome of alternative choices. It is to be hoped that the mental model will reflect as many relevant aspects of the real situation as possible and in as accurate a way as possible. When much of the information in the model is numerical and when the model involves a large number of interconnected relationships, it is only natural to use a computer to untangle the exact sequence of events and the flows of influence. Indeed, this is the only practical or even conceivable way in a situation of even moderate complexity.

The total process of policy assessment used in APT, which we refer to as scenario analysis, consists therefore of three steps:

(i) Scenario preparation;

(ii) implementation of the scenario on a computer model;

(iii) evaluation of the policy by the analysis of evaluation indicators.

Of course, the decision maker (analyst) may go through these steps many times in the process of investigating a variety of alternative scenarios (s)he has in mind initially, and/or to explore alternatives which are additionally suggested by the insights gained as the investigation proceeds.

The crucial importance of the utmost efficiency in scenario analysis should be stressed here. In practice, one has to consider a rather large number of alternatives. Thus, the consequences of implementing any one of these alternatives should be presented in a comprehensive manner and within a sufficiently short span of time so that the policy maker (or analyst) can compare the outcomes --- not only in specific numerical terms, but also by comparing the general behavior and response of the system. It is not unlikely that the final choice will be made on the basis of a feature whose importance becomes apparent only in the process of comparing the outcomes of alternative choices. Also, it is not uncommon that after the response of the system to a set of scenarios is analyzed, new scenarios are conceived or triggered by some features observed in the system's response. It is through such a process that the policy analyst really develops a "feel" for the dynamics of the real world system in question; such an improved understanding in itself can make a significant contribution not only to policy selection, but to the policy formulation process as well. To facilitate the process of scenario analysis, video display terminals are used in the practical implementation of APT.

Some comments on the second component, i.e., the computer model used with APT, are needed here. A full description of that model is clearly outside the scope of this article, but can be found elsewhere (see the Proceedings of the INternational Institute for Applied Systems Analysis Symposium on Multilevel Computer Model of World Development System, Austria, May, 1974). For our purposes here, a general understanding of the basic structure of the model should be adequate.

The computer model is a representation of the long term global world development process. Its principal components are: population development; the world economic system; man-made processes such as energy and materials processing and use, and agricultural processes, resource development, and exploitation, and their ecological impact. In addition, higher level socio-political and value factors are accounted for through scenario analysis (see Figure 1). All these components (which one also refers to as levels, strata, or spheres) are fully integrated as they most certainly are in reality. In order to be able to account for the most crucial problem of today, namely, disparity in developments in different parts of the world, the world system model is represented in terms of regions which again are fully integrated into the

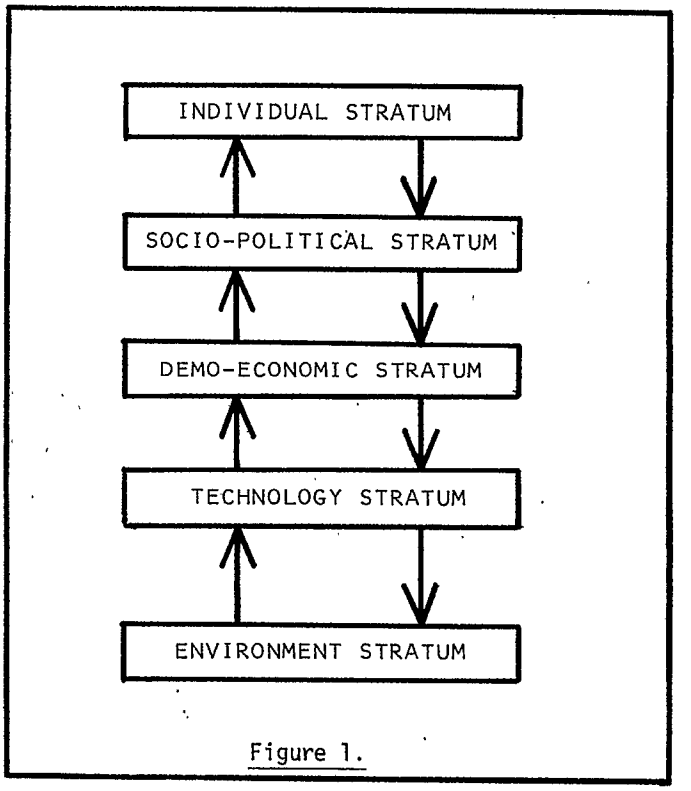

Figure 1.

world system. The first generation of the world model uses ten regions as shown in Figure 2 (given at the top of the next page). Any of these ten regions can be further subdivided into as many as seven subregional or national units for more detailed analysis.

The central role which the conception and construction of the model plays is evident. It must contain sufficient "input" or causal variables so that various policies can be translated into terms needed to influence the evolution of the system in time; it also has to contain a sufficient number of important evaluation or assessment indicators so that choice between alternatives can be made. Needless to say, these policies and indicators ought to be related in a manner fully consistent with all available facts and relevant information and knowledge.

USE OF APT FOR ANALYSIS OF OIL ISSUES

The use of APT and the global model will be described in this section by means of a specific example. A completely parallel presentation for the use of APT on food issues will then be given in the next section. Some indications of other uses and potentials for extension and adaptation are given in the concluding sections.

Scenario analysis using APT proceeds in the following steps:

Step 1: Selection of a scenario sheet, and its completion. A scenario sheet contains a list of choices for the analyst which reflect the alternative policies available. A simple form of a scenario sheet is shown in Figure 3 (shown two pages hence). A scenario sheet which facilitates a more detailed analysis of options and policies is too long to include here. Scenario sheets with differ-

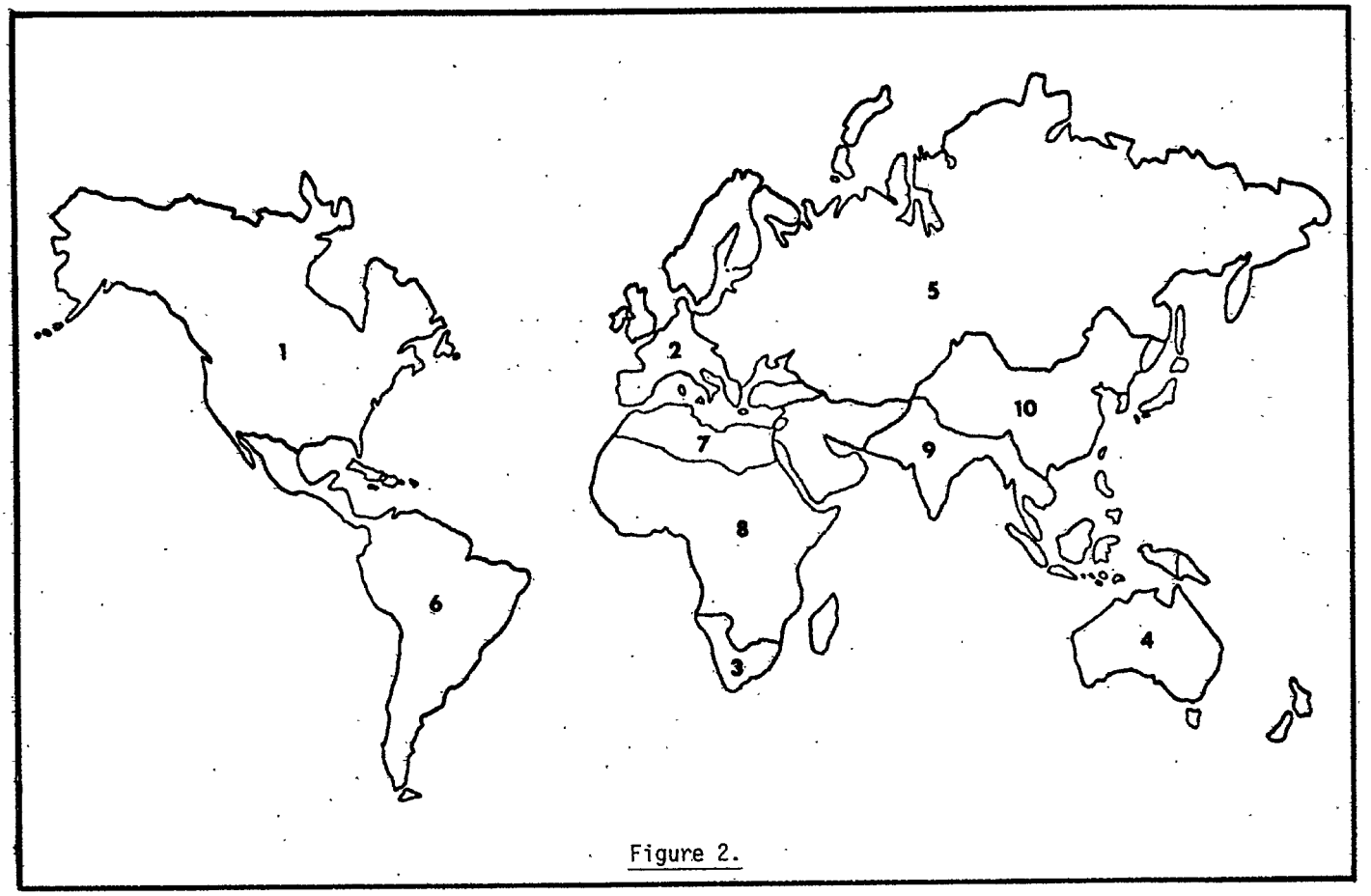

Figure 2.

ent levels of detail are provided. A participant with some experience using APT can design a scenario sheet of his or her own, as long as it is consistent with the set scenario variables (which in the case of analysis of the oil situation number in the hundreds). The scenario sheet of the type given in Figure 3 is completed simply by marking off the selected options with "x"'s. Completion of more detailed scenario sheets requires indication of numerical values or even a consistent sequence of values.

For the sake of illustration, the scenario sheet in Figure 3 is filled in in a manner reflecting somewhat optimistic assumptions about the oil situation.

Step 2: After the scenario sheet has been completed, it has to be "inputted" into the computer in order to provide the model with the assumptions made in policy selection and scenario preparation. One can turn this step over to a technical person. However, simple scenarios of the type given in Figure 3 are exceedingly easy to implement on the computer by using a typewriter console and following instructions that can be mastered in about ten minutes.

Step 3: Selection of the assessment indicators. The benefit from any given policy has to be assessed in terms of indicators which reflect the response of the system. For the sake of simplicity, "standard" sets of indicators are prepared so that one can indicate the set or combination about which one would like to get information. For example, they include an oil physical information set, an oil monetary information set, a basic economic indicators set, etc. The list of the simplest and most commonly used indicator sets for oil analysis is given below:

OILPRT	WORLD OIL DATA--PRINT
ODEPLT	WORLD OIL DEFICIT/SURPLUS--PLOT
MONPLT	MIDEST OIL MONEY--PLOT
SCEPRT	SCENARIO RESULTANT ECONOMIC DATA--PRINT
YPRT	GROSS REGIONAL PRODUCT (Y) -- PRINT
WECPLT	WORLD ECONOMIC SUMMARY--PLOT
POPPRT	POPULATION--PRINT
RYPRT	CHANGE IN GRP (Y) -- PRINT
RPOPRT	CHANGE IN POPULATION--PRINT
ODOPRT	OIL DOLLAR FLOWS--PRINT

In the examples provided here, the oil and economic indicators are selected in both graphical and numerical form. A participant with some experience using APT can select the indicators of his or her own from the truly large set available.

Step 4: Activation of the computer run. This step

POLICIES AND PARAMETERS				Code For Computer Implementation
1. Potential Resource Estimates	high	(3000 billion barrels)	( )	P11
	*medium	(2500 billion barrels)	(x)	P12
	low	(2000 billion barrels)	( )	P13
2. Oil Demand Reduction with Price Increase	high	(.45)	( )	P21
	*medium	(.225)	(x)	P22
	low	(.15)	( )	P23
3. Oil Supply Increase with Price Increase	high	(1.0)	( )	P31
	*medium	(.75)	(x)	P32
	low	(.5)	( )	P33
4. Annual Increase in Oil Prices	high	(5%)	( )	P41
	medium	(3%)	( )	P42
	*none		(x)	P43
	decrease	(-%)	( )	P44
	other	(exogenous)	( )	P45
5. Upper Limit on Oil Prices	high	($16.50)	( )	P51
	*medium	($13.50)	(x)	P52
	low	($10.50)	( )	P53
6. Oil Consumption Reduction	substantial	(15%)	( )	P61
	medium	(7.5%, 10%, WEUR)	( )	P62
	*none		(x)	P63
7. Relationship Between Oil Prices and Investment Good Cost	full	(1.0)	( )	P71
	partial	(.5)	( )	P72
	*none		(x)	P73
8. Desired Economic Growth	fast	(5%, 6%, LDC)	( )	P81
	*medium	(3%, 4%, LDC)	(x)	P82
	slow	(1%, 2%, LDC)	( )	P83
9. Population Policy	stringent	(20 Yr.)	( )	P91
	*medium	(35 Yr.)	(x)	P92
	none		( )	P93
10. Monetary Recycling	efficient		( )	P101
	*fair		(x)	P102
	poor		( )	P103

*Standard Values.

Figure 3.

simply involves typing in the word "RUN" at the typewriter console. The computer will respond by providing the results of the computer run in terms of sets of indicators as specified. The format of display, e.g., hardcopy printed version, TV tube display, or a combination thereof, can also be specified. As an illustration, some results of the computer run for the scenario sheet shown in Figure 3, using two of the sets of indicators shown under Step 3, are given in Figure 4 in graphical form, and in Figure 5 in numerical form. (The information shown in Figure 5 is normally shown on a year-by-year basis; for simplicity here, however, the information is shown on an every-five-years basis.)

In addition to these purely formal steps, which specify the "physical" use of APT, there are the steps of policy formulation and evaluation of the computer printouts or displays. These steps, however, require an intimate understanding of the specific issues at hand and, for the sake of brevity, will not be elaborated upon here.

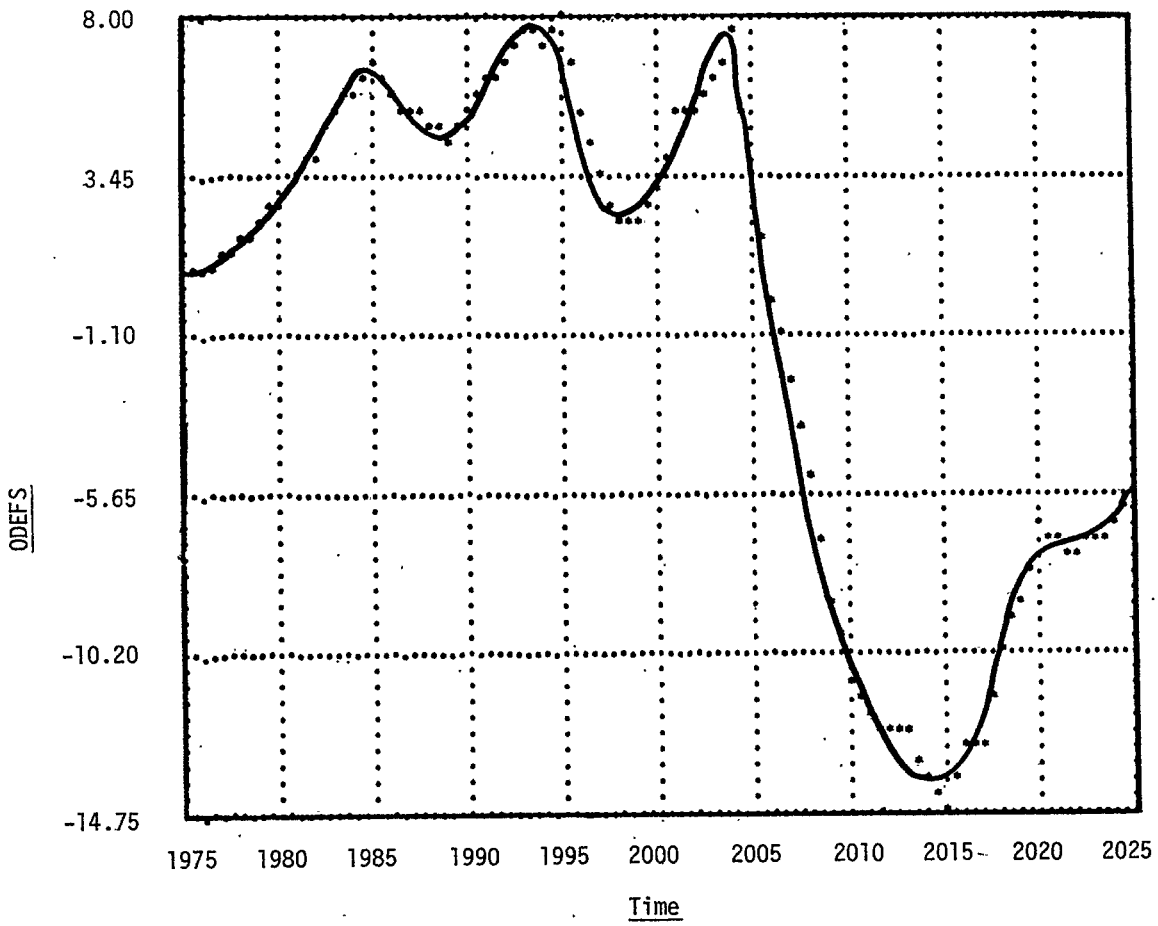

Figure 4.

	Y NAM	Y WEUR	Y JAP	Y RDEV	Y EEUR	Y LAM	Y ME	Y AFR	Y SEA	Y CHINA	Y WORLD
1975	1038.74	1071.51	350.41	61.597	585.49	166.09	125.44	47.30	152.54	106.37	3705.5
1980	1214.14	1219.69	424.75	83.305	742.53	224.41	178.57	82.47	205.83	138.62	4512.3
1985	1419.18	1400.85	508.95	121.284	944.22	297.48	213.95	134.10	277.58	198.81	5514.2
1990	1637.41	1572.10	598.43	156.494	1206.47	393.68	308.68	195.39	378.81	312.23	6757.7
1995	1896.69	1734.11	704.90	190.908	1546.82	521.47	453.95	277.47	503.40	509.10	8336.7
2000	2185.60	1959.70	846.13	230.370	1896.14	700.84	732.10	385.64	641.91	667.12	10265.8
2005	2586.02	2271.57	1050.70	270.091	2267.71	932.96	1051.84	498.77	803.12	863.09	12573.9
2010	3089.41	2721.89	1368.57	321.404	2759.59	1205.98	1260.51	627.93	1019.15	1098.35	15470.8
2015	3897.95	3249.33	1789.21	382.197	3368.57	1530.77	1560.46	795.62	1296.72	1393.32	19064.1
2020	4397.35	3845.19	2519.12	452.571	4099.34	1951.00	2011.97	1006.02	1647.63	1780.31	23510.5
2025	5214.78	4554.94	3018.86	533.542	4979.72	2478.45	2632.39	1272.89	2094.09	2260.71	29038.4

Figure 5.

USE OF APT FOR ANALYSIS OF FOOD ISSUES

The use of APT and the global model will be described in this section by means of another specific example. This presentation is completely parallel to that given in the last section on the use of APT for analysis of oil issues.

Again, scenario analysis using APT proceeds in the following steps.

Step 1: Selection of a scenario sheet, and its completion. A simple form of a scenario sheet for food issues is shown in Figure 6. Scenario sheets which facilitate more detailed analysis of options and policies are too long to show here. The scenario sheet of the type given in Figure 6 is completed simply by marking off the selected options with "x"'s. Completion of more detailed scenario sheets requires indication of numerical values, and may even involve indicating a consistent sequence of values. For the sake of illustration, the scenario sheet in Figure 6 is filled in in a manner reflecting somewhat optimistic assumptions about the food situation.

Step 2: After the scenario sheet has been completed, it has to be "inputted" into the computer to provide the model with the assumptions made in policy selection and scenario preparation. Again, one can turn this step over to a technical person, but simple scenarios of the type given in Figure 6 can be introduced to the computer by any user after about ten minutes of training.

Step 3: Selection of the assessment indicators. The benefit from any given policy has to be assessed in terms of indicators which reflect the response of the system. For the sake of simplicity, some "standard" sets of indicators have been prepared for this purpose. The list of the simplest and most commonly used sets is given at the top of the next column. A participant with some experience using APT can select the indicators of his or her own choosing from the very large set available.

Step 4: Activation of the computer run. This step is accomplished simply by typing in "RUN" at the console. The computer then responds by providing the results of the computer run in terms of sets of indicators and their values. As an illustration, some results of the computer run for the scenario sheet shown in Figure 6, using two of the sets of indicators shown at the top of the next column, are given in Figure 7 (shown 3 pages hence) in graphical form, and in Figure 8 (also shown three pages hence) in numerical form. (As before, the information shown in Figure 8 is normally printed out on a year-by-year basis; for simplicity here, however, the information is shown on an every-five-years basis.)

In addition to these purely formal implementation steps, there are the much weightier steps of policy formulation on the one hand, and evaluation of the model-produced results on the other. Of course, these steps require understanding of specific issues; for brevity, they will not be explored here.

BASSCN	TABLE OF BASIC DATA FROM SEVERAL SELECTED DOMAINS
BASPLT	PLOT OF BASIC DATA
POPSCN	TABLE OF POPULATION DATA
POPPLT	PLOT OF POPULATION DATA
NUTSCN	TABLE OF NUTRITION
NUTPLT	PLOT OF NUTRITION DATA
ECOSCN	TABLE OF ECONOMIC DATA
ECOPLT	PLOT OF ECONOMIC DATA
AGESCN	TABLE OF AGRO-ECONOMIC DATA
AGEPLT	PLOT OF AGRO-ECONOMIC DATA
CROPSCN	TABLE OF CROP PRODUCTION DATA
CROPPLT	PLOT OF CROP DATA
LANDSCN	TABLE OF LAND-USE DATA
LANDPLT	PLOT OF LAND-USE DATA
POLSCN	TABLE OF SELECTED POLICY-RELEVANT DATA
BASPRT	TABULAR DATA, BASIC
CROPRT	TABULAR DATA, ECONOMIC
POPRT	TABULAR DATA, POPULATION
LANDPRT	TABULAR DATA, LAND

CONCLUDING REMARKS

The purpose of this article is to enable an interested person to use APT, or actively participate in a demonstration of its use. Needless to say, an application of APT aiming at actual implementation of the results requires a considerable investment in time and effort. The objective of the simple kind of use described here is merely to indicate the tool's potential and to trigger the imagination as to what really can be done when the instrument is used more fully. As an aid to the imagination, the following is a potpourri of thoughts on the subject.

(a) A sequence of increasingly intricate scenario sheets has been designed. The scenario sheets presented earlier are termed "qualitative," because the participants need not develop numerical values but simply indicate general preferences or expectations. A type of "quantitative" scenario sheet requiring specification of numerical values has been developed, as have still more detailed scenario sheets on which one indicates the entire pattern of assumed or selected policy changes over a period of time. Finally, there is the "design your own scenario" option which was mentioned earlier. In more aggregated scenarios, any variable or option which is not explicitly indicated takes on a "standard" value determined from the data and past trends.

(b) The period of time over which the implementation of a policy is to be analyzed can be selected by the user. Of course, with longer time spans, the associated uncertainties increase, and this has to be taken into account when analyzing results.

SELECT THE REGION(S) FOR WHICH THE INDICATORS ARE TO BE PRESENTED

North America	( )	Rest of Developed	( )	Latin America	( )
Western Europe	( )	Eastern Europe	( )	Africa	( )
Japan	( )	Middle East	( )	Southeast Asia	( )
				China	( )

I. FOOD POLICIES AND PARAMETERS

				Code for Computer Implementation
1.	Cultivable But Uncultivated Land	*high	(x)	F11
		medium	( )	F12
		none	( )	F13
2.	Price Increase for Fertilizer and Technical Inputs	high	( )	F21
		medium	( )	F22
		*none	(x)	F23
3.	Technology Advances Increasing Agricultural Productivity	high	( )	F31
		medium	( )	F32
		*none	(x)	F33
4.	*Receipts of Food Aid*	massive	( )	F41
		moderate	( )	F42
		*none	(x)	F43

II. ECONOMICS

1.	Desired Economic Growth Rate	fast	( )	E11
		*medium	(x)	E12
		slow	( )	E13
2.	*Shift of Investment from Non-Agriculture to Agriculture*	high	( )	E21
		medium	( )	E22
		*none	(x)	E23
3.	*Shift of Non-Agricultural Investment to Food Imports*	total	( )	E31
		medium	( )	E32
		*none	(x)	E33
4.	*Magnitude of Monetary Foreign Assistance (Recipient Region)*	massive	( )	E41
		moderate	( )	E42
		*none	(x)	E43
5.	*Usage of Foreign Assistance Funds (Recipient Region)*	agriculture	( )	E51
		*balanced	(x)	E52
		industry	( )	E53
6.	*Magnitude of Monetary Foreign Assistance (Donor Regions)*	massive	( )	E61
		moderate	( )	E62
		*none	(x)	E63
7.	*Source of Funds for Foreign Assistance (Donor Regions)*	investment	( )	E71
		*balanced	(x)	E72
		consumption	( )	E73

III. POPULATION

1.	*Improved Health Care and Medical Technology*	high	( )	P11
		medium	( )	P12
		*none	(x)	P13
2.	*Population Policy*	stringent	( )	P21
		moderate	( )	P22
		*none	(x)	P23

*standard values

Note: Parameters in roman letters refer to questions of uncertainty about the future; parameters in italicized letters refer to policy options

Figure 6.

(c) A more demanding type of analyst-computer interaction is possible in which the analyst becomes de facto a part of the system's evolution, rather than a passive observer as (s)he is in the case of the scenario analysis presented here. In such a process - termed interactive or symbolic analysis - the policy choices are implemented only over a short initial period of time (whose length is free to be selected), and the response of the system is observed. The analyst then can either continue the application of the originally selected policy, or make modifications and changes in light of the way the system responded initially. In such a way, the analyst becomes a part of the overall system as it evolves in time, in the sense that his or her own judgments and values determine the ultimate evolution of the system. The policy which evolves from such a process is often composed of a combination of the policies originally conceived.

(d) APT can be used for numerous other issues and not only for energy and food; other possibilities using the global model in APT include the analysis of effects of the indexing of raw materials prices, reducing the world gap in economic development, and alternative proposals for a new world economic order.

(e) APT can and has been refined to be used on a national level, i.e., for the analysis of long term national development policies in the global context, both with the global model and with more detailed national models.

(f) APT can be of use not only to governmental decision-makers or policy analysts in international organizations, but also to other government branches, such as the legislature, and even to other elements of society, such as business and the public at large. This could, in principle, add a new dimension to "democratization and decentralization" of decision-making in modern, highly complex, post-industrial societies, and to public education. The well known information and expertise gap between bureaucracy and the people and their representatives could conceivably be somewhat reduced. For example, decision-makers could be asked to explicate proposed policy in a manner which would permit its evaluation by using APT and global or national models.

(g) Many contemporary international and global problems create conflicts, not only because of the diverging interests and goals, but also because of factual ignorance and reliance on "wishful thinking." The realities of the world situation are complex to comprehend, and in an atmosphere contaminated with suspicion, the facts, even when presented, are doubted. APT can provide a vehicle for arriving at a common denominator of facts regarding present and future, and in that way hopefully eliminate at least those conflicts which are demonstrably unnecessary.

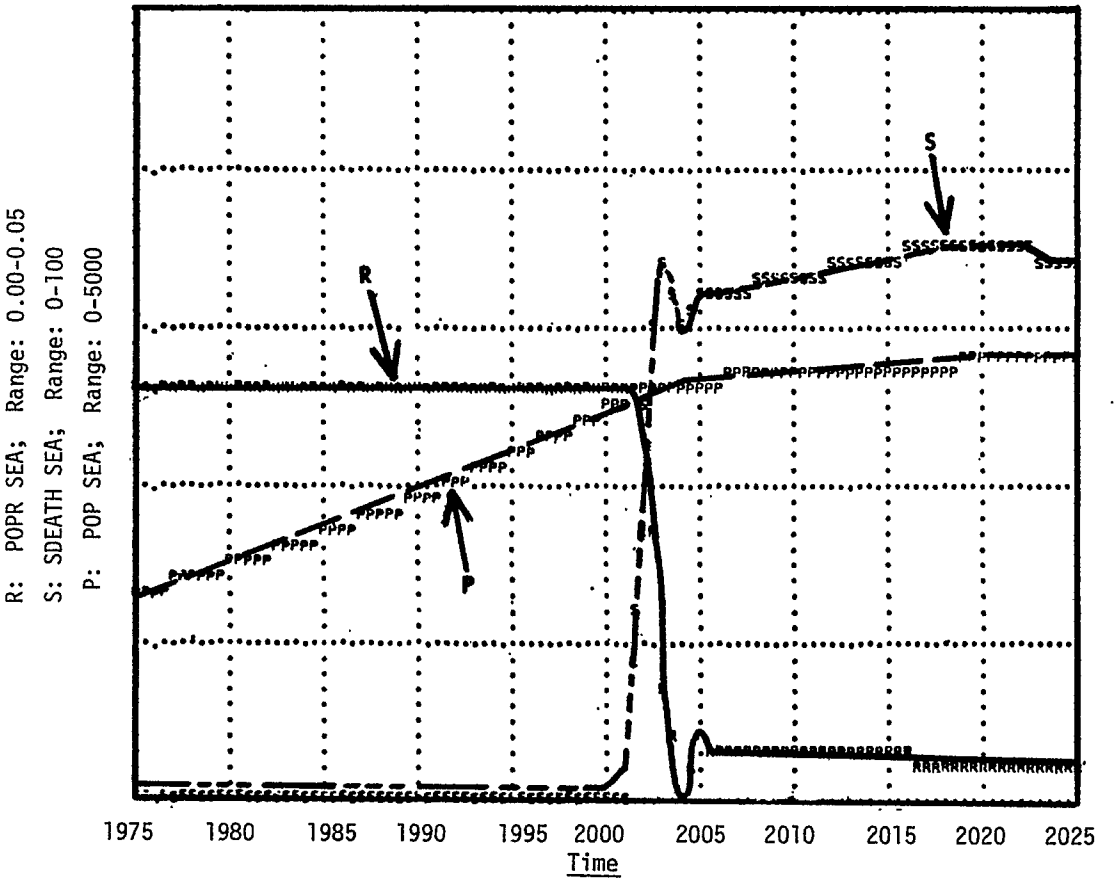

Figure 7.

	Y SEA	YA SEA	YNA SEA	I SEA	II SEA	INA SEA	KNA SEA
1975	145.430	53.9083	91.522	23.1234	3.3529	19.7705	210.50
1980	169.901	55.1984	116.654	27.0142	3.9171	23.6971	268.30
1985	200.427	59.5483	144.882	31.8679	4.6208	27.2471	333.23
1990	232.949	64.2913	176.474	37.0389	5.3706	31.6683	405.89
2000	305.481	73.5645	240.575	48.5683	7.0424	41.5259	574.02
2005	341.769	75.7185	291.131	54.8183	7.9487	46.6698	669.60
2010	398.397	76.1470	336.531	62.0731	9.2224	54.3804	774.02
2015	440.279	76.2515	386.569	70.0044	10.1506	59.8538	888.88
2020	495.100	76.1842	441.340	78.7210	11.4145	67.3084	1015.08
2025	555.457	76.8369	501.655	88.3176	12.8061	75.5116	1153.81

Figure 8.