1. **Motivation and Objectives**

The world problematique formulated by the CLUB OF ROME is not only global in nature, involving factors traditionally considered as unrelated, but also points to the crisis situations which are developing in spite of the noblest of intentions and, indeed, as their corollary.

To point out the problematique and the spectrum of critical and traumatic situations it entails is not enough; the acceptance of the reality of the problematique MUST BE FOLLOWED BY CHANGES IF THE CONCERN IS NOT TO REMAIN PURELY ACADEMIC.

It is necessary, therefore, to present the issues within the problematique in specific and relevant terms which requires regions interpretation of the global issues. Furthermore, a basis should be provided for the resolution of conflicts (inevitably accompanying the problematique-type situations) through cooperation rather than confrontation.

These factors have provided the motivation for initiation of the Strategy for Survival project which calls for the construction of a regionalized and adaptive model of the total world system with the following specific objectives:

i. **TO ENABLE THE IMPLEMENTATION OF SCENARIOS FOR THE FUTURE DEVELOPMENT OF THE WORLD SYSTEM** which represent visions of the world future stemming from different cultures and value systems and reflecting hopes and fears in different regions of the world.

ii. **To develop a planning and options-assessment tool for long-range issues, and thereby TO PROVIDE A BASIS FOR CONFLICT RESOLUTION** by cooperation rather than confrontation.

2. **Basic Structure of the Model**

The basic characteristics of the model are:

i. **THE WORLD SYSTEM IS REPRESENTED** in terms of interacting regions with provisions made to investigate any individual country or subregion in the context of regional and global development.

Presently the world system is represented BY TEN REGIONS:
II. In order to be able to deal with the complex of factors involved in problematique in a way which is sound, credible and systematic, a hierarchical structure has been adopted for the model in which each level in the hierarchy represents the evolution of the world system within a context defined by a given set of laws and principles.

Specifically, the levels involved are:

- GEO-PHYSICAL
- ECOLOGICAL
- TECHNOLOGICAL (MAN-MADE ENERGY AND MASS TRANSFERS)
- ECONOMIC
- INSTITUTIONAL
- SOCIOPOLITICAL
- VALUE-CULTURAL
- HUMAN-BIOLOGICAL

Such an approach enables an optimal use of confirmed scientific knowledge and available data.

III. An adequate view of the conditions in which the problematique is emerging and under which the solutions must be found requires the recognition of the purposive aspects of the human community and adaptiveness of human beings.

The model of the world system will have, therefore, two parts:

i. the so-called causal part, representing dynamical processes which follow historical patterns of development

ii. the so-called goal-seeking part which represents purposive changes under new conditions. The goal-seeking part in turn includes two levels:
   - the decision-making or actions level
   - the norms level

The former represents the purposive response of the system while the latter represents the values and norms which constrain and condition such a response.

3. Progress in the Model Construction

The construction of the model as described in Sec. 2 and with the objectives as specified in Sec. 1 is certainly a rather complex task and the research is organized to proceed in parallel in several directions.

The overall assessment of the model status is the following:

The model has been developed up to the stage where it can be used for policy analysis related to a number of critical issues, such as:

- energy resources utilization and technology assessment
- food demand and production
- population growth and the affect of timing of birth control programs
- reduction of inequities in regional economic developments
- depletion dynamics of certain resources, particularly oil reserves
- phosphorus use as fertilizer
- regional unemployment
- constraints on growth due to labor, energy or export limitation, etc.
Specific developments which enable use of the model as described above include the following:

1. **A COMPUTER MODEL OF THE WORLD ECONOMIC SYSTEM HAS BEEN DEVELOPED AND VALIDATED BY AN EXTENSIVE SET OF DATA.** The model has two levels - macro and micro.

   On the MACRO LEVEL the model of each region INCLUDES THE GROSS REGIONAL PRODUCT, TOTAL IMPORTS AND EXPORTS, CAPITAL AND LABOR PRODUCTIVITY AND VARIOUS COMPONENTS OF FINAL DEMAND SUCH AS PUBLIC CONSUMPTION, GOVERNMENT EXPENDITURE, AND TOTAL INVESTMENT.

   ON THE MICRO LEVEL EIGHT PRODUCTION SECTORS ARE RECOGNIZED:
   - AGRICULTURE MANUFACTURING
   - FOOD PROCESSING
   - ENERGY
   - MINING
   - SERVICES
   - BANKING AND TRADE
   - RESIDENTIAL CONSTRUCTION

   The input-output framework is used for the intermediate demands. A FULL SCALE MICRO TRADE MATRIX ALSO HAS BEEN DEVELOPED.

2. **A WORLD POPULATION MODEL HAS BEEN CONSTRUCTED IN TERMS OF THE SAME REGIONS AS THE ECONOMIC MODEL.** The model has been validated by the data available. In each region the population structure is represented in terms of four age groups with appropriate delays which make possible assessment of population momentum and assessment of the effectiveness of implementation of various population control measures.

3. **AN ENERGY MODEL HAS BEEN CONSTRUCTED** which gives for each region the consumption and production of energy and interregional exchange of energy resources as a function of economic factors.

   Energy is treated both in composite terms and in reference to individual energy sources, namely solid fuel, liquid fuel, nuclear, gas and hydro.

4. **A FOOD PRODUCTION AND ARABLE LAND USE MODEL HAS BEEN CONSTRUCTED** which allows the assessment of a number of food related issues including:
   - the need and availability of phosphorus required for intensive agriculture
   - THE CONSEQUENCES OF TIMING AND MAGNITUDES OF NATURAL DISASTERS SUCH AS DROUGHT, CROP FAILURE DUE TO DISEASE, ETC.

5. **A MAJOR CONCERN IN THE APPLICATION OF THE COMPUTER MODEL** is its proper utilization so as to avoid dependence on the deterministic aspects of model operation. In order to avoid this an interactive method of computer simulation analysis has been developed.

   THE METHOD REPRESENTS A SYMBIOSIS OF MAN AND COMPUTER IN WHICH THE COMPUTER PROVIDES THE LOGICAL AND NUMERICAL CAPABILITY WHILE MAN PROVIDES THE VALUES, INTUITION AND EXPERIENCE.
The method utilizes an option specification and selection program which enables the policy analyst or decision-maker to evaluate alternative options on various levels of the decision process, i.e., with respect to goals, strategies, tactical and implementational factors.

SPECIAL ATTENTION IS PAID TO THE NORM CHANGING PROCESSES.

6. Progress in Application. THE MODEL HAS BEEN USED both for the assessment of alternative scenarios for future regional and global developments (under different regional conditions) as well as in the interactive mode selection of policy options (specifically for the energy crises issues in developed regions).

OUR EFFORTS IN THE IMMEDIATE FUTURE WILL BE CONCENTRATED ON FURTHER USE OF THE ALREADY DEVELOPED MODEL.

THE PLANS INCLUDE EMPHASIS IN THE FOLLOWING THREE DIRECTIONS:

i. Assessment in the changes over time of the span of options available to solve some major crisis problems.
ii. IMPLEMENTATION of the regional models in different parts of the world and their connection via a satellite communication network for the purpose of joint assessment of the long term global future by teams from the various regions.
iii. Implementation of the vision for the future outlined by leaders from an underdeveloped region in order TO ASSESS with the model EXISTING OBSTACLES AND THE MEANS WHEREBY THE VISION MIGHT BECOME REALITY.
'KINGDOMS': CLUB OF ROME'S TEN GLOBAL GROUPS

GROUP 1: North America
Canada United States of America

GROUP 2: Western Europe
Andorra Luxembourg
Austria Malta
Belgium Monaco
Denmark Netherlands
Federal Republic of Germany Norway
Finland Portugal
France San Marino
Great Britain Spain
Greece Sweden
Iceland Switzerland
Ireland Turkey
Italy Yugoslavia
Liechtenstein

GROUP 3: Japan

GROUP 4: Rest of the Developed Market Economies
Australia Oceania
Israel South Africa
New Zealand Tasmania

GROUP 5: Eastern Europe
Albania Hungary
Bulgaria Poland
Czechoslovakia Rumania
German Democratic Republic Soviet Union
GROUP 6: Latin America

Argentina
Barbados
Bolivia
Brazil
British Honduras
Chile
Colombia
Costa Rica
Cuba
Dominican Republic
Ecuador
El Salvador
French Guiana
Guatemala

Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Surinam
Trinidad and Tobago
Uruguay
Venezuela

GROUP 7: North Africa and the Middle East

Adu Dhabi
Aden
Algeria
Bahrain
Cyprus
Dubai
Egypt
Iran
Iraq
Jordan
Kuwait

Lebanon
Libya
Masqat-Oman
Morocco
Qatar
Saudi-Arabia
Syria
Trucial Oman
Tunisia
Yemen

GROUP 8: Main Africa

Angola
Burundi
Cabinda
Cameroon
Central African Republic
Chad
Dahomey
Ethiopia
French Somali Coast
Gabon
Gambia

Ghana
Guinea
Ivory Coast
Kenya
Liberia
Malagasy Republic
Malawi
Mali
Mauritania
Mauritius
Mozambique
Niger  
Nigeria  
Portuguese Guinea  
Republic of Congo  
Reunion  
Rhodesia  
Rwanda  
Senegal  
Sierra Leone  
Somalia  
South Africa

GROUP 9: South and Southeast Asia  
Afghanistan  
Bangladesh  
Burma  
Cambodia  
Ceylon  
India  
Indonesia  
LAOS

GROUP 10: Centrally Planned Asia  
Mongolia  
North Korea

South West Africa  
Spanish Guinea  
Spanish Sahara  
Sudan  
Tanzania  
Togo  
Uganda  
Upper Volta  
Zaire  
Zambia

Malaysia  
Nepal  
Pakistan  
Philippines  
South Korea  
South Vietnam  
Taiwan  
Thailand

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