

# QUO VADIS, U.N.O. ?

a review of some of the issues raised by the Club of Rome study of « world dynamics »<sup>2</sup>

*The Club of Rome is a semi-secret, international, nongovernmental, nonpolitical organization consisting of a network of some 75 scientists, humanists, economists and business leaders who have joined together to find ways to understand better the changes now occurring in the world. They are not in governmental decision-making positions, nor has the Club itself any ideological, political or national commitments. Their orientation is activist — that is, they wish to do more than study and understand. They wish to clarify the course of human events in a way that can be transmitted to governments and peoples to influence the trends of rising population, increasing pollution, greater crowding, and growing social strife. «The Club views their role as that of a catalyst. It realizes that its program can succeed only if its achievements are sufficiently new and important that they attract a lasting group of adherents from different cultures and various branches of scientific and political activity. To do that the Club seeks to identify a new class of social problems and to provide the language, the methodologies and the criteria of success appropriate for their solution.» Inspired by Aurelio Peccei (\*), the Club was created some three years ago by a handful of eminent industrialists and academicians such as Eduard Pestel, Alexander King, Hasan Ozbekhan, and Hugo Thiemann, and has now been incorporated in Geneva (\*\*) as a non-profit association under the Swiss Civil Code. Members see themselves as shadowy background figures whose mission is to save the world by infiltrating their ideas into the corridors and dining tables of power — a much-needed transnational, but self elected, «Conseil des Sages».*

\* Peccei, Aurelio. *The Chasm Ahead*. The Macmillan Company, London, 1969.

Peccei, Aurelio. «Where Are We? Where Are We Going?» *Successo*, Vol. XII, no. 1 New Series, pp. 119-126 (February 1970) publ. by Aldo Palazzi, Editore, Via Zuretti 34, Milan, Italy.

Peccei, Aurelio. «The Predicament of Mankind», *Successo*, Vol. XII, no. 6 New Series, pp. 149-155 (June 1970), publ. by Aldo Palazzi, Editore, Via Zuretti 34, Milan, Italy.

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## Introduction.

In June, 1970, the Club of Rome met in Bern to discuss its projects on «The Predicament of Mankind». It was at this meeting that Jay W. Forrester, Professor of Management at the Massachusetts Institute of Technology, suggested that the Club should make use of the system dynamics computer modelling technology developed by his team. These techniques had already been successfully applied over a 15-year period to studying the problems of the dynamic social system constituted by large corporations and cities'. The Club then met for ten days in July at M.I.T., to examine Forrester's approach. As a result, a decision was made to establish a one-year research program under the leadership of Professor Dennis L. Meadows and funded by the Volkswagen Foundation in the Fédéra Republic of Germany.

A book by Jay Forrester entitled «World Dynamics»<sup>2</sup> has just been published and widely acclaimed. The book describes the dynamic model of world interaction which was discussed at the July conference and which is the foundation for the research program currently underway. As of July, 1971, Dennis Meadows was able to state that «during the past year extensive empirical research by a 10-man team at MIT has not altered the basic conclusions» detailed in the book and which are discussed below.

It is reported that a total of 10,000 copies of the «sensational» conclusions of the computer-based study have already been sent to high-level decision-makers around the world to warn them where their present policies might be leading them. The conclusions are certain to be heavily attacked once they become widely-known, especially by politicians committed to the short-term policies that the computer predicts will cause long-term crises. The book is of the utmost importance to those concerned with the nature and relationship of international development, freedom from hunger, investment, birth control, and environmental programs. It is in fact the first of a continuing series of scientific and political papers reporting on the Club's project at M.I.T.<sup>3</sup>

<sup>1</sup> Forrester, Jay W. *Industrial Dynamics*. The M.I.T. Press, Cambridge, Massachusetts, 1961.

Forrester, Jay W. *Principles of Systems*. (Preliminary Edition, ten chapters.) Wright-Allen Press, Room 516, 238 Main Street, Cambridge, Massachusetts 02142, 1968.

Forrester, Jay W. *Urban Dynamics*. The M.I.T. Press, Cambridge, Mass., 1969.

<sup>2</sup> Forrester, Jay W. *World Dynamics*. Wright-Allen Press, Inc. 238 Main Street, Cambridge, Massachusetts. 02142, USA. \$9.75.

<sup>3</sup> Some of these have since appeared as offset documents which readers may try to obtain from Dennis Meadows, System Dynamics Group, Alfred P. Sloan School of Management. MIT, Cambridge, Mass. 02139, USA.

## Conclusions of the Study.

Forrester is careful to point out with regard to the project, that «It must be considered a preliminary effort.» The preliminary conclusions are cited in full on pages 478-481<sup>4</sup>.

## Criticism of the Study.

1. For those who are able to get hold of a copy, a major criticism of the study is evident in the contrast between it and the intentions of an earlier Club of Rome report under the direction of Hasan Ozbekhan<sup>5</sup>. This report sketched out the strategy of the Club with respect to governments and other parts of the world system, but included a brilliant statement of the «problématique» or problem of the steps to be taken to orientate research and action on multi-disciplinary problems. The statement raised more questions than it answered, but they were important and subtle questions which are seldom considered. The current study appears to answer many questions without offering any assurance that the right ones have been asked.

One may suspect that there was a power struggle within the Club between the factions in favour of re-examination of methodology and those in favour of quick, if preliminary conclusions<sup>6</sup>.

But as a matter of tactics it may indeed be better to make known the dramatic conclusions in order to obtain resources for subtler approaches.

2. Forrester's method is to postulate a set of quantities, usually 15 to 30, which describes the state of the system which he is examining at any time. He does not seek to determine the present or past values of these variables, or to derive empirical relations between them. Instead, he writes down relations, according to his own judgement, based on a varying amount of discussion with experts. He then simulates, on a computer, how the system governed by these relations will behave, under alternative policies, and invites experts to consider whether this behaviour is plausible.

One member of the Club of Rome says of the above approach that «The failure to study empirical evidence or to make a serious statistical analysis of the predictive qualities of his relations, makes Professor Forrester's method an exotic device for confirming the prejudices of the investigator.»

Forrester has an excellent argument against this point:

<sup>4</sup> Points 1 to 8 were grouped as such in the book on pages 11-13 and no modification has been made to the text. The indented paragraphs under each point are citations on the point taken from the relevant sections of the book with minor alteration to the wording for grammatical purposes. The action conclusions of point 9 were elaborated in a different part of the book. The wording of that point, the choice of title for the conclusions, and the French translation were made by the U.A.I.

<sup>5</sup> Ozbekhan, H. «The Predicament of Mankind. A Proposal.» The Club of Rome, Geneva, March 1970.

<sup>6</sup> Ozbekhan is no longer Executive Director of the Club's program. He is now with the Wharton School of Finance, University of Pennsylvania.

## AN ECHO from OECD

Extract from an international report reassessing science policy.

«Many aspects of developed societies are approaching a condition that may be described as the precursor of saturation, in the sense that things cannot go on growing much longer in some lines without reaching fairly fundamental limits. Indications of saturation are present in total population, pollution of the environment, in the size of [cities], in traffic...even in higher education and perhaps, in the view of some people, the production of new knowledge... in a society now accustomed to growth in almost all its aspects during the last 300 years, this is something quite new.»

*«There is nothing new in the use of models to represent social systems. Everyone uses models all the time. Every person in his private life and in his community life uses models for decision making. The mental image of the world around one, carried in each individual's head, is a model. One does not have a family, a business, a city, a government, or a country in his head. He has only selected concepts and relationships which he uses to represent the real system. A mental image is a model. All of our decisions are taken on the basis of models. All of our laws are passed on the basis of models. All executive actions are taken on the basis of models. The question is not whether to use or ignore models. The question is only a choice between alternative models.»*

*The mental model is fuzzy. It is incomplete. It is imprecisely stated. Furthermore, even within one individual, the mental model changes with time and with the flow of conversation. The human mind assembles a few relationships to fit the context of a discussion. As the subject shifts, so does the model. Even as a single topic is being discussed, each participant in a conversation is using a different mental model through which to interpret the subject. Fundamental assumptions differ but are never brought into the open. Goals are different and are left unstated it is little wonder that compromise takes so long. And it is not surprising that consensus leads to actions which produce unintended results...*

*Until recently there has been no way to estimate the behaviour of social systems except by contemplation, discussions, argument, and guesswork.*

*The approach used here to examine the world system combines the strength of the human mind with the strength of today's computers. The human mind is best able to perceive the pressures, fears, goals, habits, prejudice delays, resistance to change, dedication, good will, greed and other human characteristics that control the individual facets of our social systems. Only the human mind seems at present able to formulate a structure into which separate scraps of information can be fitted. But when the pieces of the system have been assembled the mind is nearly useless for anticipating the dynamic behaviour that the system implies. Here the computer is ideal. It will trace interactions of any specified set of relation-*

ships without doubt or error... (World Dynamics, pp. ix and 14-15.)

*It is hoped that those who believe they already have some different model that is more valid will present it in the same explicit detail, so that its assumptions and consequences can be examined and compared... It seems traditional for explicit models of social systems to be greeted by vague criticisms about their lack of perfection. Instead, we need equally explicit alternatives with a demonstration that the alternative leads to a different and more plausible set of conclusions.»*

3. Only broad aspects of the world system are considered and then only at a very high level of aggregation so that distinctions between developed and undeveloped countries do not appear explicitly. In other words, differences around the world are largely ignored and only the world situation as a whole is considered. This means that geographical pockets could escape the disasters predicted but on the other hand the model cannot predict social disasters due to the presence of a heightened gap between the «haves» and the «have nots.»

4. The study may also be criticized for producing conclusions for action which are so politically unacceptable as to make all the conclusions appear incredible. Because it is based upon a very abstract concept of the world system, «people» have no place in it. For this reason, its conclusions are liable to be considered as irrelevant and far-fetched by the man-in-the-street who does not see how he can act to counteract the trends predicted. The politician will therefore be on fairly strong ground in ignoring the study — unless a way is found to «translate» the abstractions concerning world systems into "an analysis of the systems in which the individual is involved on a day to day basis, and preferably into psychodynamic terms(\*). In this way, perhaps the individual could see how each of his actions contributes to systems which Forrester analyzes.

5. A basic criticism made of the study is its emphasis on a physical picture of the world as defined by relationships between pollution, land, natural resources, agricultural production, population and capital. The study is therefore based on the unrealistic assumption of unchanging social and political circumstances, and does not incorporate possible changes in human aspirations and values that might come from widespread recognition of the predicament facing mankind.

Insertion of «relevant» socio-political variables into the existing model is considered by the Club to be an important future goal. For the moment, however, in the absence of adequate resources, the probable influences of such factors on the existing model are being examined. Factors considered relevant include: rationalization of approach to social organization, social mobilization, political : participation, nation building, modernization, planning and control, and increasing governmental activity<sup>7</sup>.

It is here that we see the dangers of the Forrester

<sup>7</sup> Harbordt, Stephen C. *Linking Socio-Political Factors to the World Model*, Cambridge, M.I.T. System Dynamics Group, 1971, 42 p., mimeo.

\* For one attempt see: Judge, A.J. *World dynamics and Psychodynamics*. Brussels, UAI, 1971, 20 pages, mimeo, (ORG/2).

approach as opposed to what might have been the Ozbekhan approach. The choice of these variables is based on the «literature on social change, modernization of underdeveloped countries and related subjects.» But did the authors consulted ask the right questions in arriving at a consensus on the importance of these variables? The assumption is made that these are adequate and sufficient to a description of the socio-political aspects of the system. Other authors might offer other variables — how is «relevant» to be defined?

The stress is heavily on governmental activity, government institutionalization, control, mobilization, etc., all of which are rightly subject to much questioning in the current youth and university context. Where do the «non-governmental» and the «human beings» fit in?

One is reminded of the current debate on social indicators adequate to the definition of «quality of life». Most of the attempts result in farcial descriptions which emphasize all those «social» features which are needed to ensure that the individual functions satisfactorily as an *economic* unit. The approach is rather similar to that of the mass-production factory farmer who develops measures to ensure that his pigs, chickens, or calves receive the optimum amount of light, ventilation, space and nutrients. «Optimum» is defined in terms of production criteria.

Is it not possible to produce psycho-social indicators to measure the opportunity for fulfilling personal development and satisfaction in a society? it would appear to be the lack of such opportunities that contributes to alienation and violence — all of which are «relevant». Is it not worth investigating such indicators as: home and office space per capita, number of groups of which an individual may become a member in a given area, number of distinctive formal roles available per capita (i.e., jobs with titles which distinguish a man from his fellows), accessibility of information on the decision-making process, or even the number of nongovernmental organizations per capita, or the number of new concepts to which the average individual is exposed per year.

The reason that nothing is done is that those responsible for the «literature on social change» have not yet defined the required methodology and it is doubtful whether they believe there is any need for it. «Relevant», is that which is currently studied.

## Implications for International Programs.

The Club of Rome study could very well be renamed by the U.N. as «McNamara's Nightmare.» It is a computer study, which the President of the World Bank is known to consider highly significant from his U.S. Department of Defense days. And yet it strikes at the very foundations of the World Bank's commitment to growth, growth, and more economic growth as the key to the solution of world problems. It also menaces the assumptions on which the U.N.'s whole development program is based.

In general, the study raises again many of the questions posed in the carefully pigeon-holed Jackson Report on the Capacity of the U.N. Development System<sup>8</sup>. Specifically, if each Specialized Agency can gaily formulate

<sup>8</sup> See «Planning for the 1960's in the 1970's.» *International Associations*, .vol. 23, 1970, March, April.

its own programs in a framework of only token inter-agency coordination, then which Agency is going to monitor the interaction between Agency programs? The whole point of the Forrester study is that the implications of different programs must be juxtaposed within a common framework to determine what the *dynamic interactive effects* will do to the world system as a whole. The study shows that the current policies, particularly if successful, will lead to even greater problems than those the individual programs are currently trying to combat.

The only common framework in the UN context is a frail unintegrated administrative structure (there were 33 coordinating bodies at a recent count), riddled with political problems, inhibitions, and private empires. It is incapable of examining systematically interactions of a technical nature unless these are within a narrow domain such as economics. Many of these difficulties will become apparent in the UN's treatment of the environment issue, which is viewed by many developing countries as undermining the thrust of the Second Development Decade. It has still not become clear that more growth and development constitutes a direct menace to the environment. The Club of Rome study makes this very clear in a chapter entitled «Obvious Responses Will Not Suffice» in which are examined the *unfortunate* consequences of such current programs as:

- increased capital-investment generation
- reduced birth rate
- less pollution
- higher agricultural productivity.

## Final Comments.

Detailed examination of the Club of Rome study may show that the method is weak and data improperly used. Nevertheless, current policies are in many cases based on even weaker and less integrated methods and data, whose interpretation is often a matter of opinion and fashion. The important point is that there *may* be some truth in the study's conclusions which would be better shown up by improved multidisciplinary social system models. Why have not such possibilities become apparent sooner? Why is the U.N. totally unable to examine the plausibility of the study's conclusions with the aid of a more powerful and more plausible model? It would seem that the United Nations is not organized to respond to a broad multidisciplinary problem except through a number of badly coordinated agencies with uni-disciplinary biases. It is ironic that it should be an international *nongovernmental* body, «unrecognized» by the U.N., that should have produced such a study — at a time when Member States find it difficult to conceive of any non-public-relations function for NGOs. It will be interesting to follow the UN's attempts to «contain» the study's implicit criticism of its current organized approach to world problems.

The study raises an interesting ethical problem which may or may not be academic. The problem may be illustrated by the following event which occurred in London during the Second World War<sup>9</sup>:

*The commander of a fire brigade was faced with the following choice. A building containing 500 people was burning down. There was a possibility that the 500 could*

*be got out by using all his men to make an exit tunnel through the fire. The water needed was not readily available, but could be obtained by flooding a nearby air-raid shelter to provide a reservoir for the fire-pumps. The air-raid shelter, however, contained 12 people who could not get out because of bomb damage which it would take 2 hours to clear — by which time the 500 would certainly be dead. The choice he faced was therefore between (a) a possibility of saving 500 by flooding the shelter and a certainty of drowning 12, or (b) a certainty of saving 12 by concentrating his resources on the shelter and a certainty that the 500 would burn to death<sup>10</sup>.*

The Club of Rome study poses the same problem displaced over time. Do we save a relatively limited number of people now, (which we can *certainly* do with our current resources), with the prospect that the improved conditions will encourage them to increase in numbers so that, when the resources are once more limited in the future, it is *certain* that many more will die as a result of our humanitarian action? Or do we passively withdraw our assistance to the few in the present, in the knowledge that they will *certainly* die, thus avoiding the *possible* deaths of many in the future?

In fact the study's conclusions seem to suggest that rather than undertake the current short-term, compromise, «humanitarian - for - political - appeal» programs, which in many cases do not even «buy time» and in most cases increase the severity of the eventual crisis, it *may, ironically enough, even be better to do nothing to avoid the impending world crisis*. Namely, aid, development, education, investment and similar programs of all kinds should be cut back and maintained at an absolute minimum consistent with giving the appearance that «something is being done» (in the interests of short-term political considerations.) This would allow each part of the world system to concentrate even more closely on the pursuit of its own interests, thus precipitating the crisis sooner, whatever its form, and therefore with less total damage in the long run. (This is not an argument against the interests of the developing countries, for the point is specifically made that it is they who will suffer *least* in any crisis, precisely because they are less dependant upon the complex organizational and technological arrangements which will suffer most in any crisis.)

In this light, again ironically, the publication of the Club of Rome study may itself be counter-productive for its insights may lead to «almost adequate» programs and organization mechanisms which postpone the crisis — thus increasing its eventual severity. On the other hand, perhaps understanding the conclusions will lead to a change in values and therefore introduce new compensatory factors into the evolution of the world system.

A. J.

<sup>9</sup> I am indebted to Peter Harper and Jan Fjellander for drawing my attention to this illustration of the ethical problem posed by the Club of Rome conclusions.

<sup>10</sup> The fire chief chose to drown the 12 and did save the 500. He was decorated as a hero. After the war the relatives of the 12 attacked him by legal processes for manslaughter, his wife divorced him, his neighbours, turned against him, and he committed suicide.

**SHOCK EVALUATION  
OF INTERNATIONAL  
PROGRAMS**

**PROGRAMMES  
INTERNATIONAUX :  
PREVISIONS "CHOC"**

**Preliminary conclusions of the probable effects of interaction of international programs in terms of current population, pollution, and economic growth trends.**

**Conclusions préliminaires sur les effets probables de l'interaction des programmes internationaux en ce qui concerne la population actuelle, la pollution et les tendances de la croissance économique.**

world dynamics», of which these are the conclusions, is reviewed in this issue on  
see particularly footnote 4 on page 471.

**1. Increasing industrialization may be a more fundamental disturbing force in world ecology than is the world population increase. In fact, the population explosion is perhaps best viewed as being a result of technology and industrialization. (Medicine and public health are included here as a part of industrialization.)**

**1. Plus que l'augmentation de la population, l'accroissement de l'industrialisation peut être, pour l'écologie du monde, un facteur fondamental de perturbation. En fait, l'explosion démographique devrait être considérée comme étant le résultat de la technologie et de l'industrialisation (La médecine et la santé publique font ici partie de l'industrialisation).**

- over the last two centuries it appears that improved technology and better medical treatment have been major contributors to the « population explosion ». A humanitarian medical program may in the long run subject a much-expanded world population to the ultimate pressures of over-population. In historical perspective, we may see that many more people suffer in the future so that a few can benefit in the present.
- the high density of population is possible only because of industrialization. Without industrialization the population could not be sustained.
- a point may be reached where continuing the industrialization process means a population collapse from pollution, while stopping the industrial process means a population collapse from failure of the technical support systems of the society.

**2. Within the next century, man may face choices from a four-pronged dilemma:**

**2. Au cours du siècle à venir l'homme se trouverait devant quatre angoissantes perspectives :**

**1. Suppression of modern industrial society by a natural-resource shortage.**

**1. Disparition de la société industrielle moderne à cause d'une pénurie de ressources naturelles.**

- well before natural resources disappear, their shortage depresses the world system because of the difficulties of extraction from depleted and more diffuse stocks or resources. Rising demand and failing supplies appear to create the effects of shortage, not 250 years in the future, but only 30 to 50 years hence.
- many industrialized nations are now growing rapidly and placing ever-greater demands on world resources. Many of those resources come from the presently underdeveloped countries. What will happen when the resource-supplying countries begin to withhold natural resources because they foresee the day when their own demand will require the available supplies ?

2. Decline of world population from change wrought by pollution from power generation, raw-material conversion, chemical plants, waste disposal and intensive agriculture.

— it is most likely that the disruption of social systems and agriculture would occur in such a way that the industrialized societies would suffer the greatest population declines ;

— it is the failure of the rate of pollution absorption to rise as total pollution rises which triggers the pollution crisis. It means that cleanup processes are disrupted by the pollution itself. When pushed far enough, the regenerating processes break down.

3. Population limitation by food shortage.

— if all other influences on growth are removed, the population will rise by as much as is necessary to generate the degree of food shortage that is needed to suppress growth.

4. Population collapse from war, disease, and social stress caused by physical and psychological overcrowding.

3. We may now be living in a «golden age» when, in spite of a widely acknowledged feeling of malaise, the quality of life is, on the average, higher than ever before in history and higher now than the future offers.

4. Exhortations and programs directed at population control may be inherently self-defeating. If population control begins to result, as hoped, in higher per capita food supply and material standard of living, these very improvements may relax the pressures and generate forces to trigger a resurgence of population growth.

— serious doubts are raised about the effectiveness of birth control as a means controlling population. But even if populations were controlled, such control would not forestall difficulties from resource shortage and pollution.

— a birth-control program which would be effective, all other things being equal, may fail because other things will not remain equal. The very incipient success of a program can set in motion forces to defeat the program.

2. Diminution de la population mondiale résultant des changements dus à la pollution provenant de la production d'énergie électrique, de la conversion de la matière brute, du fonctionnement des usines chimiques, de l'accumulation des détritiques et de l'expansion de l'agriculture intensive.

3. Décroissance de la population par l'insuffisance de nourriture.

4. Decimation des populations par la guerre, les épidémies, la tension sociale provoquée par l'étouffement physique et psychologique.

3. Nous vivrions actuellement un «âge d'or» puisque, malgré un sentiment de malaise de plus en plus répandu, la qualité de la vie est, en moyenne, plus élevée qu'elle ne l'a jamais été dans le passé et qu'elle ne pourra l'être à l'avenir.

4. Les exhortations et les programmes visant au contrôle de la population peuvent d'eux-mêmes aboutir à un cercle vicieux. Si le contrôle des naissances commence à donner comme résultat, selon les prévisions, une quantité plus grande de nourriture par tête d'habitant et une amélioration du standard de vie, ces progrès mêmes peuvent amener une détente des pressions initiales et donner lieu à une recrudescence de l'accroissement de la population.

5. The high standard of living of modern industrial societies seems to result from a production of food and material goods that has been able to outrun the rising population. But, as agriculture reaches a space limit, as industrialization reaches a natural-resource limit, population tends to catch up. Population then grows until the «quality of life» falls far enough to stabilize population.

5. Le haut standard de vie de la société industrielle moderne paraît résulter d'une production de denrées alimentaires et de biens matériels dont le taux d'accroissement dépasse celui de la progression démographique.

Mais, lorsque l'agriculture aura atteint les limites imposées par l'espace existant et que l'industrialisation aura atteint les limites imposées par les ressources naturelles disponibles, la population commencera à rattraper la production et continuera à s'accroître. Le moment arrivera où la "qualité de la vie" tombera suffisamment bas pour amener une stabilisation.

— any proposed program for the future must deal with both the quality of life and the factors affecting population. « Revising the quality of life » means releasing stress, reducing crowding, reducing pollution, alleviating hunger, and treating ill health. But these pressures are exactly the sources of concern and actions that will control total population to keep it within the bounds of the fixed world within which we live. If the pressures are released, so is the concern about how we impinge on the environment. Population will then rise further until the pressures reappear with an intensity that can no longer be relieved. Everything we do to reduce those pressures causes the population to rise farther and faster and hastens the day when expedients will no longer suffice.

6. There may be no hope of the present under-developed countries reaching the standard of living demonstrated by the present industrial nations. In fact, the present disparity between the developed and under-developed nations may be equalized as much by a decline in the developed countries as by an improvement in the underdeveloped countries

6. Il n'y a pas d'espoir pour les pays actuellement sous-développés d'atteindre le standard de vie des nations industrialisées d'aujourd'hui. En fait, l'écart existant entre les nations développées et les pays en voie de développement peut se rétrécir aussi bien par un déclin des premières que par un progrès des seconds.

— the pollution and natural-resource load placed on the world environmental system by each person in an advanced country is probably 20 to 50 times greater than the load now generated by a person in an underdeveloped country. With four times as many people in underdeveloped countries, their rising to the economic level that has been set as a standard by the industrialized nations could mean an increase of 10 times in the natural-resource and pollution load on the world environment. Noting the destruction that has already occurred on land, in the air, and especially in the oceans, capability appears not to exist for handling such a rise in standard of living.

7. A society with a high level of industrialization may be nonsustainable. It may be self-extinguishing if it exhausts the natural resources on which it depends. Or, if unending substitution for declining natural resources were possible, a new international strife over pollution and environmental rights might pull the average world-wide standard of living back to the level of a century ago.

7. Une société parvenue à un haut niveau d'industrialisation peut devenir incapable de satisfaire à ses besoins et provoquer sa propre destruction si les ressources naturelles dont elle dépend s'épuisent. Même si une substitution interminable des ressources naturelles était possible, un nouveau conflit international dans la lutte contre la pollution et la préservation de l'environnement pourrait ramener la moyenne du niveau de vie dans le monde à celle d'il y a un siècle.

8. From the long view of a hundred years hence, the present efforts of underdeveloped countries to industrialize may be unwise. They may now be closer to an ultimate equilibrium with the environment than are the industrialized nations. The present underdeveloped countries may be in a better condition for surviving forthcoming world-wide environmental and economic pressures than are the advanced countries. If one of the several forces, strong enough to cause a collapse in world population does arise, the underdeveloped countries might suffer far less than their share of the decline because economies with less organization, integration, and specialization are probably less vulnerable to disruption.

9. With a view to action towards a global equilibrium solution, the study concludes that we are at the point where higher pressures on growth in the present are necessary if insurmountable pressures are to be avoided in the future. In order to maintain the quality of life (defined here as a combination of material standard of living, degree of crowding, available food, and level of pollution) at the current level, the following changes must be made immediately:

natural resource usage rate:	reduced	75%
pollution generation:	»	50%
capital investment generation:	»	40%
food production:	»	20%
birth rate:	»	30%

which have the effect of maintaining the population at the 1970 level.

8. Dans une certaine d'années, l'effort déployé à présent par les pays sous-développés pour s'industrialiser pourrait paraître imprudent. Us seraient maintenant plus près d'un ultime équilibre avec l'environnement que les nations industrialisées. Ils auraient de meilleures conditions de survie sous la pression montante de l'environnement aussi bien que de la vie économique. Au cas où l'un des nombreux facteurs suffisants pour causer la décadence de la population mondiale ferait sentir pleinement ses effets, les pays sous-développés souffriraient relativement peu parce que les économies moins organisées, moins intégrées et moins spécialisées sont probablement moins vulnérables à une dislocation.

9. En vue d'une action tendant à une solution d'équilibre global, l'étude conclut que nous sommes arrivés au point où un contrôle plus rigoureux de la croissance s'impose si l'on veut éviter les pressions insurmontables dans le futur.

Pour le maintien de la qualité de la vie (définie ici même comme étant la synthèse du standard de vie matérielle, du degré de surpeuplement, de la nourriture disponible et du niveau de pollution), les changements suivants doivent être effectués sans délai :

Taux d'utilisation des ressources naturelles :	réduction de 75 %
Production de la pollution :	réduction de 50 %
Production de capitaux d'investissement :	réduction de 40 %
Production alimentaire :	réduction de 20 %
Taux de natalité :	réduction de 30%
lesquels auraient pour effet de maintenir le niveau de la population à celui de 1970.	

— the world is running away from its long-term threats by trying to relieve social pressures as they arise. But, if we persist in treating only the symptoms and not the causes, the result will be to increase the magnitude of the ultimate threat and reduce our capability to respond when we no longer have more space and resources to invade.

— instead of automatically attempting to cope with population growth, the national and international efforts to relieve the pressures of excess growth must be reexamined. Many such humanitarian impulses seem to be making matters worse in the long run. Rising pressures are necessary to hasten the day when population is stabilized. Pressures can be increased by reducing food production, reducing health services, and reducing industrialization.