

# The Limits to Growth and the Latin American World Model

*In stark contrast with the Meadows model*

Alejandro Teitelbaum - editor

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## Introduction

**I**n January 2023, Jus Semper published "Note on The Limits to Growth" by the editors of Monthly Review, a commentary on the report prepared in 1972 at the Massachusetts Institute of Technology (MIT) by Dennis Meadows and others.<sup>1</sup> In 1974, the Latin American World Model (LAWM), a report by a group of Latin American sociologists and economists, was published with a critical and different approach from The Limits to Growth.

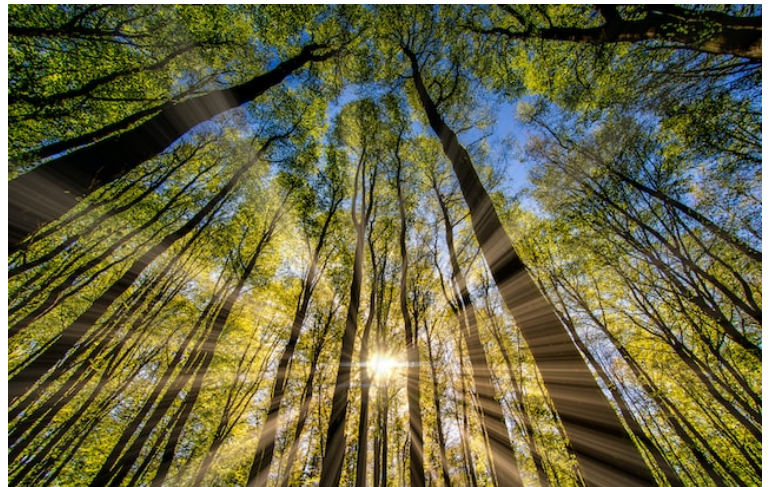


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Referring to The Limits to Growth, the Latin American report stated that the ecological catastrophe predicted in other models for the more or less distant future was now a reality for a large part of humanity.

There are also other differences in the interpretation of the Latin American World Model with the Meadows report. For example, the relationship between inequality and demography: whereas The Limits to Growth had explicitly stated that demographic pressures led to inequality in the distribution of resources among people (Meadows et al. 1972), the LAWM had labelled Meadows' approach as Malthusian and adopted the opposite explanation, i.e. that poverty and inequality are the main drivers of population growth.

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<sup>1</sup> The Editors of Monthly Review: [Note on the Limits To Growth](#) — The Jus Semper Global Alliance, January 2023.

The philosophical/epistemological critique focused mainly on the claims of objectivity of the Meadows report, which resulted in the explicit affirmation of the LAWM as a normative model. "Any long-term prognosis of human development is based on a worldview founded on a particular value system and ideology. The assumption that the current structure of the world and the value system underpinning it can be projected unchanged into the future is not an 'objective' view of reality but also implies an ideological position. This is why the often-made distinction between projective and normative long-term models is misleading. The model presented here is explicitly normative: it does not predict what will happen if current human trends continue but points to a way to achieve the ultimate goal of a world free of backwardness and poverty.

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A second edition of the LAWM was published in 2004: *¿Castrofe o Nueva Sociedad? Modelo Mundial Latinoamericano. 30 años después*,<sup>2</sup> in which Hugo D. Scolnick, Gabriela Chichilnisky, Gilberto C. Gallopin, Jorge E. Hardoy, Diana Mosovich, Enrique Oteiza, Gilda L. de Romero Brest, Carlos E. Suárez and Luis Talavera participated and included the Prologue by Amílcar Herrera (who died in 1995) to the first edition. Some parts of the 2004 text are reproduced below. Editorial-----

## Editorial

*Ana Hardoy-Executive Director, International Institute for Environment and Development, Latin America.*

In today's world, there are a number of signs that lead us to be pessimistic about its future. They show a world threatened by poverty, exclusion, hunger and disease. The Latin American World Model, carried out by the Bariloche Foundation between 1972 and 1975, more than 30 years ago, showed a possible path towards a better, more equitable, fully participatory and non-consumerist world.

It emerged as a response from a group of thinkers to the message contained in the model proposed at MIT, "Limits to Growth" (1972), which argued that the limits to growth were physical and that the way out of a catastrophic future was through reducing population growth and restricting the growth of the world economy.

This new edition, an initiative of the IIED-AL (International Institute for Environment and Development, Latin America) supported by the IDRC (International Development Research Centre), consists of an introductory part in which three of the authors analyse the model from a historical perspective and a second part that reproduces the original Spanish edition.

In the first part, Enrique Oteiza emphasises the ethical-political stance of its authors and the construction from the periphery of an alternative world model to the hegemonic one meant in Argentina in the 1970s. Gallopin reflects on the role and importance of worldviews and ideologies, and Scolnik points out how mathematical techniques can and should be used as tools for policy design.

<sup>2</sup> Previous editions of the book: Herrera, A.- Scolnik, H.- Chichilnisky, G.- Gallopin, G.- Hardoy, J.- Mosovich, D.- Oteiza, E.- Romero Brest, G.- Suárez, C.- Talavera, L.; "¿Catástrofe o Nueva Sociedad?- El Modelo Mundial Latinoamericano", English version 1976 and Spanish version 1977, International Development Research Centre, Ottawa; Japanese edition of 1976, Tokio; French edition, Presses Universitaire de France de 1976; Edición alemana "Grenzen des ElendsDas Bariloche- Modell", Ed. S. Ficher, Frankfurt, 1977. <https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html>

The second part, the original edition, develops a conceptual proposal of an ideal society where desirable goals to be achieved in a minimum amount of time are established and verified through modelling. One of its most significant contributions is incorporating the concept of basic needs as an indicator and using a production function with a substitution between capital and labour.

In analysing the obstacles, the authors argue that these are essentially socio-political and related to the distribution of power internationally and within each country. The crisis being encountered is universal. In this sense, applying the model would provide the prerequisites for generating a truly supportive world order, whose emergent would be *"integration into a cosmopolitan society that constitutes the expression of the unified consciousness of humanity"*.

The call for global solidarity for an equitable and participatory society remains unanswered. *In light of the time that has passed and with the benefit of today's knowledge, the core message of the model is still valid.*

This book should be read by all young people beginning their university education and particularly by politicians, academics and technicians responsible for national, regional and global strategic planning.

## Presentation

*Federico S. Burone - Regional Director for Latin America and the Caribbean / International Development Research Centre.*

The idea of favouring the reincorporation of this material as a reference for public debate, approximately a quarter of a century after the publication of its original version, is fully justified from our perspective. On the one hand, it is a sufficient condition to benefit from the revision contributed by some of the members of the original work team. Their reflections matured during the time that has passed and are still sufficiently challenging to stimulate reading a book whose contents, approach and objectives are still entirely valid. The soundness of the initial reflection exercise remains firm in the face of the possible outdatedness brought about by the passing of time. The systemic perspective and the projection of a desirable model of society used in the analyses defend its contents against the temptation to forget them in the face of the arrival of new airs of catastrophe at the global level or to waste them in the face of the emergence of new spaces and needs for critical reflection. But it is precisely in the face of this change in the provision of new open spaces for this reflection—without the risks that many of the researchers who participated in the elaboration of these studies had to assume, in times of obscurantism and repression—that it is undoubtedly a necessary condition to favour the recovery of this part of the memory in the construction of a set of signs and warnings as an aid to decision making at the current crossroads between "Catastrophe or New Society".

Many of the tensions identified today in increasing global interactions and dependencies seem to have changed since the book's original edition. The moment seems to be marked by actions and discussions that attempt to consolidate a new geopolitics of regional spaces and, with it, a multipolar level of influence in relations between countries and between blocs of countries. Regional spaces have made steady progress in this period, consolidating economic, political and military power blocs through efforts to actively build a system of shared values among the countries and social collectives that comprise them. These values, in turn, are increasingly used as justification in the design and implementation of new standard public policies aimed at facilitating and managing the proper integration of these blocs on a global scale.

Despite the acceleration of these changes within the regional processes of opening up in the search for alternatives for social and economic development and a framework of greater international interdependence, a significant set of

difficulties conditions the transformations of the institutional framework, and its role in favouring better social integration in adapting to the opening towards greater global relations and interdependence also appears to have remained in full force.

Improving the capacity of societies organised in nation-states to manage the necessary transformations inclusively is a critical condition for preserving the meaning of democracy on this territorial scale. The ability of societies to think in the long term, reviewing existing evidence to understand the opportunities and difficulties offered by the domestic and global contexts in the construction of desired scenarios and in the design of measures to approximate these models, represent the basis for ensuring the necessary conditions of internal stability in a process of change towards a new society.

In this way, at a time when the international community seeks to consolidate a framework of integrated actions at a global level in order to advance with the commitment of the Nation-States in the Millennium Development Goals and to reach 2015 with a reduction by half of the current figures of poverty considered as extreme, the contribution of this book aimed at understanding the causes and difficulties for the necessary transformations towards a new society is still valid.

This is the challenge that IDRC and IIED are taking on by facilitating the reintegration of this book in the spaces of open and public debate, in the necessary construction of ideas and fertilisation of new public policies with the contribution of the existing evidence in the set of indicators identified by the authors of this book as signals for moving towards a new society.

## The Latin American World Model: scriptum- post scriptum

*Enrique Oteiza*<sup>3</sup>

Re-reading the book "Catastrophe or New Society?", one of the results of the Latin American World Model carried out in the early 1970s in the framework of the Bariloche Foundation, raised several questions for me. These arise partly as a product of the project's history over more than three decades and my evolution as someone who participated in the project and lived through what has happened since then. It is only possible to read the same exact text in the same way over 35 years if one is embalmed.

Before I continue, it is worth mentioning that, having read the excellent contributions by Hugo D. Scolnik and Gilberto Gallopin, I will not dwell in this introduction on issues they have dealt with very competently.

Having made this clarification, I will begin by trying to answer some of the questions raised by this work, which is finally being published in the Spanish-speaking world, with such a long delay (1). The first is precise: why did the Spanish edition take so long when Editorial Paidós already had the rights to publish this book? We know in this case that the long delay was due to the academic repression exercised by the authoritarian regimes and especially the last dictatorship, including censorship in the field of cultural production,<sup>4</sup> the disappearance, imprisonment or exile of creators in the most varied fields of knowledge, and the effect of self-censorship on the part of many publishers in a period when state terrorism reigned.

<sup>3</sup> Enrique Oteiza. He was a Professor and Researcher at the Gino Germani Institute, Faculty of Social Sciences, University of Buenos Aires; President of the National Institute against Discrimination, Xenophobia and Racism (INADI); Organised and was the first director of the UNESCO Regional Centre for Higher Education in Latin America and the Caribbean (CRESALC); directed the United Nations Research Institute for Social Development (UNRISD). He passed away in September 2017.

<sup>4</sup> See Ferreira, Fernando; "Una historia de la censura- Violencia y proscripción en la Argentina del Siglo XX", Ed. Norma, Buenos Aires, 2000. Gociol, Judith; "Un golpe a los libros- Represión a la cultura durante la última dictadura militar", Ed. Eudeba, Buenos Aires, 2003.

The publication of this book is not a trivial event. It is part of recovering what was lost in the long night that our country went through. It is a valuable contribution to the search for a so-called "alternative strategy" to the hegemonic forms of globalisation, mainly responsible for the socio-political systems that keep more than two-thirds of the world's population in marginalisation and poverty, often extreme poverty. This quest was indeed the fundamental motivation of those of us who, in the early 1970s, embarked on what then seemed an adventure, the construction of an 'alternative world model' that could really enter the debate at the international level without being dismissed on theoretical and methodological grounds, given the 'state of the art' at the time.

Another question that now arises for me is why most of us Latin Americans invited to the meeting in Rio de Janeiro in 1970, convened to present and discuss the "World Model III",<sup>5</sup> reacted in the same way when we came from different disciplines and had had no previous exchange among ourselves? Reflecting on this question, it now appears more clearly than before that the perspectives on the so-called development issues, as they were formulated in the most prestigious places in the central countries, differed more and more from the new critical thinking produced in the Latin American periphery. This complex and polemical thinking was a construction process in which we participated. This is the only way to explain why, at the end of the Rio meeting, we got together there, began to discuss and compare our criticisms of the MIT model, and decided to take the initiative to build a global Latin American model. It was evident that such a task would require the joint work of a variety of high-level specialists who shared the basic orientation of this new model, which had yet to be formulated. It was immediately agreed that the Bariloche Foundation was in a position to provide a suitable institutional framework and that there was also the possibility of forming a significant team. The

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Foundation also had a group of leading mathematicians, systems and computer specialists at its disposal. It was not difficult to agree on Dr Amilcar Herrera, a geologist by training whose breadth of knowledge and capacity for articulation and synthesis made him the ideal person to lead the project. Interestingly, all the members of the initial project committee had been trained in Argentina and had carried out postgraduate studies and research abroad in academic institutions in the core countries.

Therefore, we were familiar with the thinking and ways of working in those countries and involved in the peripheral Latin American perspective previously mentioned.

The fundamental criticism of the Meadows Model was that its basic theoretical structure was neo-Malthusian in character, where on one side of the equation were included the variables of renewable and non-renewable natural resources required for both the production and consumption of the existing population in the centre and in the periphery, as well as those expressing the impact on the environment, and on the other the dynamics of population growth. The inclusion in the model of a set of variables characterised by their exponential growth over time made it evident that the extension of economic growth, as manifested in the central countries, would quickly lead to the unsustainability of any relatively egalitarian proposal at the global level. Moreover, the proportion of the world's available natural resources consumed by the core countries constituted an exceptionally high proportion of total availability compared to such consumption in the periphery. The main constraint to overcoming poverty at the global level appeared in the model to be the depletion of non-renewable natural resources and the deterioration of the

<sup>5</sup> Model from the group led by Meadows at the Massachusetts Institute of Technology (MIT) —which at that time had not yet been published.

environment (both effects resulting primarily from the exaggerated level of consumption in the 'more developed' countries). As these limits were seen as ineluctable in the model, the solution had to be found not through an equitable global system, which would have implied a revolutionary transformation for the privileged groups in the centre and the periphery, which was unthinkable in a projective formulation of the hegemonic system. Consequently, the supposedly overcoming proposal presented by Meadows consisted of zero economic growth in the core countries and population control and reduction in the periphery. The neo-Malthusian logic of the model was thus able to avoid catastrophe.

The alternative path followed by the Bariloche Foundation group consisted in questioning the thesis of natural resource depletion as inevitable in the framework of a global social dynamic aimed at development, not simply understood as economic growth in a consumerist context, but in a variant oriented towards the eradication of poverty from the face of the earth.

Was this normative goal feasible in terms of the resources available to humanity in the world of 1970? In order to answer this question, it was necessary to construct a different model, one that fundamentally explored the feasibility of achieving a minimum goal of the general global welfare and to verify whether this was not impossible due to limits

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imposed by the depletion of indispensable resources. The theoretical perspective required to address this problem made it necessary to specify which conception of foresight was the most appropriate. The alternative approach, clearly differentiated from a methodology based on trend projections that did not contemplate transformations of the existing power structure in the 1970s, led - by aiming at universal

equity goals - to opt for an alternative perspective of a normative nature. In his book "Science and Politics in Latin America", Amílcar Herrera (chap. IV)<sup>6</sup> had already clearly established these variants of foresight, as well as the distinction between explicit and implicit policies and strategies (and the importance of making the latter explicit). Consequently, the "Fundación Bariloche" group considered it essential to make explicit its theoretical and methodological choices, including basic assumptions. This constituted another difference in conception concerning the Meadows Model.

In this way, two models, or two dimensions of the model, were constructed. The first of a conceptual, substantive and logical nature allowed the main characteristics of the theoretical perspective and normative aspects to be established, including the target society of a large initial stage. The second consisting of constructing a formal model, where the productive dimension would grow according to a utility function with capital and labour substitution leading to the set goal of universal welfare for the world's population, defined in terms of satisfaction of basic needs.

After a period of intensive exploratory work and internal debate, it was decided to construct such a model using the most advanced methods then available from systems theory, establishing a dynamic function-oriented by the satisfaction of a set of fundamental basic needs on which there was already by 1970 a significant consensus among those working on problems of this nature. In the paper "Social Indicators for Human Development", author Ian Miles<sup>7</sup> states: "The basic needs approach received its initial impetus from the work of the Bariloche group; in their task of constructing an alternative global model they set out to explore the conditions under which a set of basic needs could be met for the

<sup>6</sup> Herrera, Amílcar; "Ciencia y política en América Latina", Siglo XXI Editores, Buenos Aires, 1971.

<sup>7</sup> Miles, Ian; "Social Indicators for Human Development", Frances Pinter (Publishers), London, 1985.

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entire world's population. Unlike other computerised global models, the Bariloche model was not aimed at predicting the consequences of current trends, but at demonstrating the material feasibility of a desirable future.... The demonstration of the possibility of meeting basic needs within a framework of environmental constraints was an important critique of the end-of-the-world prediction of the 'limits to growth' model. It also showed the usefulness of the notion of 'basic needs' as a way of assessing long-term development strategies”.

Since then, indicators related to measuring the satisfaction of basic needs—selected and defined in different ways—have become widespread, not only in the construction of global models. Their use became very useful for the definition of so-called poverty lines and for the formulation of socio-economic or more restrictive social policies. In this respect, it is important to note that the Latin American World Model incorporated the notion of the satisfaction of basic needs into the formal part of a model that thus integrated fundamental economic and social dimensions. This is undoubtedly a much

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more advanced conception than that used in the hegemonic policies of recent decades, consisting of neoliberal economic models such as those promoted by the IMF and the World Bank. Indeed, in this orientation, the indicators of basic needs do not integrate economic with social dimensions but are used to define the order of magnitude of different degrees of poverty and exclusion, thus locating the social groups to which a kind of state philanthropy should be directed, ensuring the political sustainability of the hegemonic project. This 'state aid' does not place the large social groups harmed by the economic model above the poverty line, as a comprehensive welfare policy would, but rather constitutes a palliative for extreme poverty a posteriori when the damage has already been done. This substantive difference also illustrates how social indicators and statistics can be used in the framework of very different political and economic strategies.

It is worth noting that, since the work of the Bariloche Foundation, various theoretical and methodological approaches have taken up the notion of basic needs developed in the Latin American World Model. In the mid-1970s, the World Employment Programme launched by the ILO used the notion of basic needs in its theoretical perspective and even resorted to the advice of Dr Hugo Scolnik, Deputy Director of the Bariloche Foundation's Model Group, to carry out the Programme. UNESCO also adopted the versions published in Canada (Spanish and English) and France (French) of the Latin American World Model in its training programme for planners from different countries (Dr Hugo Scolnik also installed this model there in an interactive version, suitable for teaching).

Another highly innovative feature of the Bariloche Foundation's project was to use life expectancy at birth as the variable to be optimised in the dynamic processing of the model's production and distribution function. After examining an important set of variables used in human and social development indicators, it was confirmed that this variable was the most sensitive to inequality among those commonly used. In purely economic models, where social issues are not explicitly considered, the optimised variable is almost always GDP. It is well known that this variable masks the most diverse patterns of wealth distribution in different societies. Here, too, the innovation was received with interest.

Finally, the Latin American World Model made another important innovation by constructing the population sub-model to correctly reflect the impact that, according to the study of multiple historical experiences, the increase in population

welfare has on the decrease in population growth rates. This is true in general, even though the improvement in the satisfaction of basic needs, with its impact on the population's well-being, contributes to decreasing infant mortality and prolonging life expectancy at birth.

Catastrophe or new society? In contrast to Meadows, who postulated from a neo-Malthusian perspective that if the recommendations of his Model were not taken into account, a global catastrophe would occur, the Latin American World Model considered that the catastrophe was already in place in 1970, given that two-thirds of humanity was then immersed in exclusion and poverty. In Meadows' approach, the salvation strategy only required a small sacrifice from the core countries, which had already reached a high level of wealth and where the real problem was and is one of distribution; for the rest of the world, his recipe offered no hope of overcoming poverty and closing the gap (which proved to be growing in the years that have passed), since his only proposal consisted of reducing the rate of population growth.

The title of the book *Catastrophe or New Society?* aptly reflects that, according to the results obtained through the Latin American World Model, the only possible way out of the tendencies of the current hegemonic project consisted of an alternative strategy. This conclusion is even more valid at present, given the socio-economic and environmental conditions existing in the different regions of the planet.

## The Latin American World Model ("Bariloche Model"): Three decades back (Fragments)

*Gilberto C. Gallopín, ECLAC-Chile*<sup>8</sup>

*"The optimist proclaims that we live in the best of all possible worlds; and the pessimist fears that this is true."*

*James Branch Cabell (1879-1958)*

### Introduction

Almost thirty years ago, "Catastrofe o Nueva Sociedad. El modelo mundial latinoamericano" (Catastrophe or New Society. The Latin American World Model) was published. It represented a response to the diagnosis and proposal embodied in World III, the first world model sponsored by the Club of Rome (Meadows et al. 1972), and a new proposal for the global system. To date, it is the only global model elaborated in the Global South.

This article is a personal reflection by one of the authors of the Latin American World Model (LAWM) on what it meant (and what it can still mean) in the context of the debate about the limits and the broader issue of the future(s) of the global system.

### The global debate

The 1960s and 1970s witnessed the debate on the newly discovered environmental problem and the need for a new international world order (see Dag Hammarskjöld Foundation 1975; Nerfin 1977; United Nations 1972). This rich period generated bold, creative, challenging and comprehensive studies on the planet's future. Despite their differences, these studies shared long-term global perspectives. They were also based on the hope and expectation that models and other studies could contribute to solving humanity's problems. These studies raised the two most burning global issues of the 1970s: first, the perceived need for a new international economic order to change North-South relations, to reduce the

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<sup>8</sup> [This article](#) is dedicated to Amílcar O. Herrera, the "father" of the LAWM, a friend and inspiration, and also one of the few truly planetary minds I have had the privilege of knowing. Translated, with some modifications, from my paper "The Latin American World Model (a.k.a. The Bariloche Model): Three Decades Ago", in *Futures* 33 (2001): 77-88.



gap between rich and poor countries, and second, what had come to be known as "the global predicament", by which was meant the problem encompassing the depletion of non-renewable resources, environmental degradation, overpopulation and pollution that threatened human survival (Steenbergen 1994).

In this context, the construction and launching of the World III model, detailed in "The Limits to Growth" (Meadows et al. 1972) in the public debate, was a bold and pioneering initiative. Perhaps the single most important and positive impact of that model was applying the systemic approach to address the global problem, with an explicit effort to take into account multiple linkages and non-linearities. The fact that the model was somewhat crude and supported by a questionable interpretation and empirical basis, and the fact that, to some extent, it had a self-fulfilling prophecy structure based on the exponential growth of key variables, does not detract from its importance in this respect.

However, like any global model, World III embodied a certain worldview. By "worldview", in this context, I mean the set of beliefs and theoretical premises that determine the perception of reality, the explanations given and the kind of actions proposed. A worldview embodies value judgements regarding the desirability of alternative images of the future (goals and desires) and causal inferences of how different futures manifest themselves and preferred management styles or strategies (controlling, laissez-faire, etc.).

It is important, in the generation of global models, to make as explicit as possible the underlying worldview (and also, in

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some cases, to use alternative worldviews) because the role of worldviews and ideologies becomes critical due to: (a) the very incomplete knowledge regarding functional relationships and future surprises; (b) the lack of generally agreed theoretical frameworks to explain the functioning of the world system; and (c) the fact that different social actors have different goals for the global system. Inevitably, the worldview is reflected in the explanatory assumptions

made, the selection of critical variables to be included in the model, the perceived solutions and the recommendations offered.

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statement. The same can be said for the LAWAM; the latter, however, had this intention explicitly and deliberately, whereas World III was often presented as an objective, value-free model based on "our best and most up-to-date knowledge". This central theme

characterised the LAWAM as a response to World III and the neo-Malthusian position that prevailed in some quarters at the time.

### The Latin American World Model as a response

The LAWAM was a response from the South (I would like, though perhaps it would be presumptuous, to say "from the South") to the widely held position - supported mostly by the North - that attributed underdevelopment, international problems and poverty to overpopulation in developing countries. Our critique of World III as the first of the global models should be read in that context. Our critique had a technical, philosophical and ethical dimension.

Since the model was presented as a scientific demonstration that the basic limits to growth in the foreseeable future (first decades of the 21st century) were physical (and therefore supposedly quite inflexible) and that the only way out of this catastrophic future was through reducing population growth and stabilising industrial output per capita,<sup>9</sup> the LAWM team undertook a critical analysis of the assumptions and structure of World III.

The technical criticisms made by the LAWM team mainly concerned the assumptions about the signals of natural resource scarcity, the absence of regenerative processes (e.g. ecosystem and soil restoration), the intensely exponential behaviour of critical variables (leading inexorably to explosive overshoot), and the sensitivity of World III to small simultaneous parameter variations that could drastically alter projected trajectories even within the standard or "business-as-usual" run.

It is essential to clarify that we never denied the possibility of physical limits. This differentiated our position from that of other critics of World III, some of whom relied on unrestrained technological optimism and the concept of infinite

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substitutability between factors of production. We argued that, *in the time horizon considered and at global or regional scales*, the operational limits to humanity were socio-political and not physical. Our model included a deceleration of economic growth once basic needs were met and incorporated conservation and environmental

protection as additional production costs, conducive to a society intrinsically compatible with its environment and natural resources. We do not postulate indefinite material economic growth.

Other differences of interpretation that can be grouped with the technical issues were the causal relationships (implicit or explicit) considered. A clear example was the relationship between inequality and demography. While Limits to Growth had explicitly stated that demographic pressures led to inequality in the distribution of resources to people (Meadows et al. 1972), the LAWM adopted the opposite explanation, that poverty and inequality are major drivers of population growth.

We also decided to distinguish South and North, thus subdividing the world into three regions, three of them in the South.

The *philosophical/epistemological* critique concentrated mainly on the objectivity claims of World III. This was reflected in the explicit declaration of the LAWM as a normative model.

It is now clear to me that we used the term "normative" in two different senses. The first one referred to the assumptions and the explicit cosmivision (e.g. the LAWM) or implicit (all other models) cosmivision in modelling exercises. The second sense is related to what is sometimes called "backcasting", i.e. defining a desired future state of the world and then looking for feasible trajectories to reach it. This approach contrasts with allegedly "extrapolative" or "projective" approaches (describing the trajectory/as the system will follow "by its own means").<sup>10</sup> In this sense, the LAWM was the

<sup>9</sup> Clearly, the political problem with this diagnosis and recommendations for the South was that they could be used to justify proposals to halt population growth in the South (and some even advocated using force if necessary) and maintain income disparities between the South and North. [https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref\\_ch04-2](https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref_ch04-2)

<sup>10</sup> Of course, the reality of the global system "by its own means" is open to question, notably when many of the most critical social variables and mechanisms are excluded from the equations, given the lack of knowledge of causal relationships. [https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref\\_ch04-2](https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref_ch04-2)

only normative model (although it was also run in a projective mode for the period from 1960 to 1980 - the year in which the normative mode began when the optimisation process operated) .....

Finally, the ethical critique focused on the fact that, while other global models concentrated on the crisis looming in the future, at that time, most of humanity was already living in a state of poverty and misery. For them, the crisis had already arrived; ignoring that fact was tantamount to accepting the status quo and the core values of existing society and

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subordinating the need for change to avoiding a future catastrophe that would bring the crisis to the North. In this context, global equilibrium state-oriented policies, as advocated in "Limits to Growth", would tend to ensure that the current injustices of the global system would be maintained in global systems.

### The Latin American World Model as a proposition

On the basis of our analysis, we did not accept the position (particularly prevalent in the North) that accepts without question the core values of today's society, and (in some cases for that very reason) argues that the most fundamental problems facing humanity today are physical limits. Our position was radically different: we argued that the biggest problems facing (global) society are not physical but socio-political (see page 159 of this issue).

Our proposal could not be entirely contained in the mathematical model because some of its features could not be

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formalised in an appropriate way. We therefore distinguished between the proposed society (the desirable future society defined by a set of basic attributes) and the mathematical simulation model, which was essentially used as a tool to explore the material

feasibility of that society (and of the trajectory leading to it), a kind of material/economic feasibility analysis.

Our conceptual model of the "ideal" society was based on the premise that humanity can free itself from underdevelopment and oppression only through radical changes in the social and international world organisation.

According to our vision, the following elements were the basics for any desirable society:

- a) Equity at all scales. A fundamental principle recognised that, by simply existing, every human being has inalienable rights to the satisfaction of basic needs - nutrition, housing, health, education - that are essential for full and active incorporation into his or her culture.<sup>11</sup>
- b) Non-consumerism, understood as meaning that consumption is not an end in itself; production is determined by social needs rather than profit, and the structure and growth of the economy is structured to constitute a society that is intrinsically compatible with the environment.
- c) Recognition that social needs - beyond the most basic - may be defined differently at different times by different cultures and forms of societal organisation. We assign the highest priority to the participation of society's members in decisions, both as an end in itself and as a primary mechanism for establishing the legitimacy of needs in the new society.

<sup>11</sup> Those necessities were designated as basic because, unless they are satisfied, it is impossible to participate actively and with dignity in the human world. These needs are invariant in that they are common to all species members, regardless of culture, origin, race, sex, etc. [https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref\\_ch04-2](https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref_ch04-2)

More universal concepts of *use and management* of the means of production replaced the concept of private ownership of the means of production. How to manage them would be decided and organised through the same processes of discussion that would regulate all other social activities. Within this conceptual framework, many forms of property management and administration are possible, depending on traditions, cultural characteristics and social organisation.

In this sense, the proposal was socialist rather than capitalist, although the central emphasis on democratic participation in the ideal society clearly distinguished our proposal from the then-existing socialist states. Had it been formulated in the present historical period, the same proposal would undoubtedly have been described as post-capitalist and would have emphasised self-organisation and decentralisation as basic elements. ....

### Progress and setbacks

Several authors have pointed out that, after a "golden decade" of long-term global studies in the 1970s, there was a clear retreat during the 1980s, including the dissolution of many of the research groups that had produced them. Some attribute this to a general disillusionment about planning and the poor predictive performance shown by those studies (Central Planning Bureau 1994, p.34). Steenbergen (1994), while considering this possibility, also suggests the alternative explanation of a change in the general "mood of the moment" associated with the '80s defined by him as the decade of the "conservative revolution". Burrows et al. (1991, p.297) also proposed the latter explanation.

In the '90s, there seemed to be a renewed interest in long-term global studies. Steenbergen (1994) wrote an interesting analysis of the main similarities and differences between studies belonging to the two waves.<sup>12</sup>

I tried to summarise their analysis in Table 1 of the LAGM, where significant shifts are indicated in terms of cosmovisions, values, ideologies, burning issues and, finally, the issue of global equity. Interestingly, despite the enormous advances in information technologies, modelling methodology does not appear as a determining difference.

From the point of view of the South, and indeed of solidarity in general, the new wave represents a clear step backwards.

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As Steenbergen (1994, p.50) puts it: "This lack of Western interest in the less developed world has to do with a general change in the Western cultural climate, which can be described as a declining interest in and solidarity with the less privileged, both internally (declining support for the welfare state) and externally (poor nations). The West seems to be primarily interested in the successful, in those who "made it" (countries, people, etc.) and is no longer interested in what Attali has called "the losers of the next millennium". Steenbergen defines global models as including mathematical simulation models and qualitative studies of long-term futures.

### Looking to the future (again)

The current situation with regard to future prospects is - as in the 1970s - somewhat surreal, if not schizophrenic. The same path officially designated as unsustainable in 1992 by some 100 leaders at the Earth Summit in Rio de Janeiro is proclaimed a triumphant ascent by the World Bank and other international financial organisations.

<sup>12</sup> Steenbergen defines global models as including not only mathematical simulation models but also qualitative studies of long-term futures. [https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref\\_ch04-2](https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref_ch04-2)

On the one hand, there seems to be a general 'official' belief in a single global future with marginal variations revolving around a central theme, and most discussions of the long-term future focus on issues of economic competitiveness and financial gain. People's needs and their development seem to have become non-issues.

On the other hand, indicators of the possibility of breaks in the historical trajectory are increasingly being documented, as shown, for example, by the negative environmental trends analysed by the United Nations Programme.

## A personal historical perspective of the Bariloche Model (Fragments)

Hugo D. Scolnik - Faculty of Exact and Natural Sciences, UBA<sup>13</sup>

Developing a Latin American World Model arose as a reaction to the message in the paper "Limits to Growth",<sup>14</sup> which argued that restrictions should be placed on global economic development due to the unending depletion of non-renewable natural resources. How those resources were consumed or squandered, or facts such as inequality in income distribution, the arms race, etc., were not discussed. Hayward Alker<sup>15</sup> wrote that the Forrester-Meadows model reflects the ideology of the upper-middle class living in the wealthy suburbs of US cities.

From a political point of view, the Meadows model is unacceptable for the sanctimoniously named developing

*The whole socio-economic and political approach not [of the Meadows Model] needed to be questioned from the point of view of "developing" countries.*

countries. The only solution proposed to avoid catastrophe as a consequence of the depletion of non-renewable resources, increasing pollution, excessive population growth, etc., was to freeze economic growth.

The implications and the message implicit in this model were clear:

1. The poor were to remain poor given the unfeasibility of further economic growth and the failure to consider redistribution policies.
2. As the unequal distribution of income and power was not discussed, halting economic growth meant that the majority of the population had to remain in the same conditions of misery.
3. Responsibility for resource depletion was shared but did not take into account that per capita consumption differs widely between industrialised countries and Third World nations.

The whole socio-economic and political approach needed to be questioned from the point of view of "developing" countries. Although the points mentioned above were more than enough to disqualify the model, it was important to highlight its ideological and technical weaknesses.

The reasons for discussing these points should be clear: to develop a reliable global model, all sectors (demographics, energy, environment, etc.) must be seriously studied and formalised. Global models are dynamic in that they try to explain the temporal evolution of a set of variables. The interaction of sub-models leads to very complicated technical problems. For example, the model itself can be compared to a chain whose weakness is given by the weakest of its links. This means that each of the relationships connecting the variables to each other must be scientifically justified and that the need to "close gaps" by intuition or by decisions based on unreliable speculation must be carefully avoided.

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<sup>14</sup> World Model III, built by the group led by Meadows at the Sloan School of the Massachusetts Institute of Technology - MIT, 1969. [https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref\\_ch04-2](https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref_ch04-2)

<sup>15</sup> A political scientist at MIT. [https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref\\_ch04-2](https://www.idrc.ca/sites/default/files/openebooks/144-2/index.html#ref_ch04-2)

Another essential aspect to consider is the naivety of the general public when reading headlines such as "computer predicts catastrophe". To question a model, it is necessary to construct an alternative one, as it is possible that a majority of the public will consider that the refutation of something that appears as a serious scientific work must necessarily be done with equal levels of scientific formality.

These were some of the considerations that led to the development of the Bariloche Model. Fortunately, the results were very encouraging, as a model applicable in very diverse countries from all points of view was achieved.

In general, the modelling process is more important than the model itself because it forces the different specialists to work in an interdisciplinary way, investigating the interrelationships between the different sectors.

*Before proceeding further, it seems appropriate to clarify some concepts from an epistemological point of view.<sup>16</sup> A global model is a structured discourse composed of two main parts: the theoretical and formal models. The theoretical model is organised from the theoretical framework on which the global model rests through an ad hoc effort of theorisation. Further on, the existence of a homology between the theoretical model and reality is assumed. It is, therefore, a discourse on reality and, as such, necessarily reflects, implicitly or explicitly, the authors' ideology.*

The World III model suffered from a number of critical errors, both conceptual and technical. For example, its authors confuse the known data on existing oil reserves with their actual physical existence. A cost-benefit equation governs the exploitation and search for oil. This means that if a government or company knows that there are reserves in a certain region to cover the needs of the next 10 to 20 years, it does not proceed with further exploration as long as they are not

*The World III model also excluded political dynamics and ignored the enormous inequalities between countries or regions in its treatment of the economy as a single-world system.*

needed. Therefore, knowledge of the existence of non-renewable resource reserves on the planet should not be confused with the entire physical existence of reserves. In fact, the known quantity of oil reserves has increased in recent years despite rising consumption. Therefore, predicting a

"catastrophe" based on an erroneous conceptualisation of the problem of non-renewable natural resources was enough to invalidate the published conclusions.

The World III model also excluded political dynamics and ignored the enormous inequalities between countries or regions in its treatment of the economy as a single-world system. These huge inequalities become clear when looking at international trade flows. In particular, the figures published in the original edition of the Bariloche Model book were obtained from UN databases. They show how financial resources flow continuously to the industrialised countries, seriously affecting the poorest countries as their negative balances represent a high percentage of GNP.

## The beginning of the Bariloche Model

From the beginning, an interdisciplinary group designed the model to analyse the feasibility of developing a different world. The first step was to define "basic necessities" in terms of life expectancy at birth, protein and calorie consumption, housing, education, etc. The international bureaucracy soon incorporated these concepts as if they were of its own making.

<sup>16</sup> See Loiseau I., Ruiz C. and Scolnik H.D., et al, Answering the 6th IIASA Global Modeling Conference questionnaire en el libro "Groping in the dark" edited by G. Bruckmann, D. Meadows and J. Richardson, J. Wiley, 1982. [https://www.idrc.ca/sites/default/files/openbooks/144-2/index.html#ref\\_ch04-2](https://www.idrc.ca/sites/default/files/openbooks/144-2/index.html#ref_ch04-2)

At this point, it is necessary to clarify whether there is a difference between projective and normative projects. The former project the future as an extrapolation of the existing structure and data, evaluating alternative values of control variables (those that can be manipulated within certain limits by political or economic decisions, e.g. interest rates, exchange rates, allocation of national investments in different sectors, etc.). Ideologically speaking, what is defined as the "best" is the crucial factor.

On the other hand, a normative model defines a desirable future and looks for alternatives that can lead to achieving those goals. However, it is clear that extrapolating present structures is in itself an ideological position, and therefore any projective model is normative because it postulates that the world will continue as it is.

The Bariloche Model was normative - to use the current categorisation - and used the data at the time of its development, not to project the future but to study the feasibility of achieving goals perceived as essential to humanity in different world regions.

*Some main ideas were revolutionary, such as abandoning the classic economists' approach of maximising GNP and replacing it with life expectancy at birth. If the goal is to increase GNP, it is obvious that making weapons is much more effective than providing education or health services. Unfortunately, most economists are educated in universities that do not seem to promote independent critical thinking, let alone consider the social implications of their neoliberal paradigms. The results can be seen around the world today.*

There are many examples of countries whose socio-economic indicators vary dramatically even though their GNPs are similar. It is obvious that an indicator such as GNP per capita hides the real distribution of income, and thus the possibility of knowing what percentage of the population actually meets their basic necessities.

Only those countries with basic necessities met have a high life expectancy. On the other hand, life expectancy is a good proxy indicator of income distribution. A person can accumulate fortunes, but cannot take in an unlimited amount of calories, let alone accumulate them. In many regions, and particularly in the Third World, the ruling classes achieve standards of living comparable to those in rich countries, while a high percentage of the population lives below the poverty line, suffering from malnutrition, health problems, etc.

The mathematical formulation of the model led to a non-classical approach to economics because the goal was, as we said before, not to maximise GNP but to maximise life expectancy. In other words, it was a model oriented towards achieving desired goals in minimum time, considering a number of constraints related to "technical" possibilities and socio-political ones. For example, it was argued that a given development plan is socially viable if the population perceives an improvement in its basic indicators from one year to the next. This is an essential point because one alternative to achieve high economic growth rates is to dramatically increase investments at the cost of decreasing consumption. The practical consequence of this policy is that present generations must sacrifice their living standards for the benefit of future generations. We considered that there were other options more likely to be accepted, and in fact, the computational implementation of the model allowed us to study and define different policy alternatives and verify their effects.

The Bariloche Model was cautious in verifying and justifying each data and each equation. For example, the relationship between birth and life expectancy with education, the distribution of labour in different sectors, the demographic structure and other indicators was finally formulated as a set of non-linear equations, whose parameters were obtained

using data from almost all countries in different decades. This effort took five years, using databases, non-linear techniques, etc.

An interesting by-product was to relate education levels to demographics. In many models, education is a value-added that is included because it must be, without knowing clear relationships with other variables. If this is the case, then there is no reason to develop education because there are no relationships with other variables. Some researchers have tried to relate different education levels to technological progress.

The results given by the demographic model were particularly interesting. Generally, the age pyramid is known in each country divided into cohorts or age groups by sex. Given this information, if the birth rate (number of live children born per 1000 inhabitants) and life expectancy are given, then the population dynamics is a simple arithmetic process.

One of the most critical features of the Bariloche Model has been its ability to predict birth rates and life expectancy as functions of indicators such as levels of education, calorie and protein consumption, urbanisation, percentage of women employed in the secondary sector of the economy, etc. The demographic sub-model gave almost perfect results for all countries in the world, and it was fascinating to see the population dynamics in different regions. As expected, the

*The lesson was clear: if living conditions improve, the population tends to zero growth without additional measures.*

developed countries balanced quickly because when life expectancy increased, the proportion of older adults and mortality, measured as a percentage of the total population, also increased. After a while, the increase in mortality leads to an increase in the proportion of young people, and thus the birth rate rises. The result is that a kind of cyclical behaviour emerges that leads to oscillations close to zero growth.

The lesson was clear: if living conditions improve, the population tends to zero growth without additional measures. For example, if the proposed measures were implemented in Latin America, the model predicted a population growth of only 0.89% by 2020.

## Conclusions

The Bariloche Model contributed to changing the way of thinking about socio-economic development. The introduction of basic necessities spread as a concept, and international agencies and governments are now using such indicators. In particular, India included this concept in its Constitution.

From a conceptual and technical point of view, developing a dynamic model is a fascinating undertaking from every point of view. These models teach a lot about the dynamics of socio-economic systems and are an irreplaceable tool for training decision-makers (UNESCO used an interactive version of the Bariloche model to teach planning courses in Paris).

Perhaps the most important lesson was that mathematical techniques could and should be used as support tools for the design of desirable policies to, for example, verify their feasibility and whether the proposed desirable goals can be achieved, taking into account the constraints and barriers existing in a given society. Serious models do not replace human judgement, but they can offer indisputable support for developing and implementing development policies.



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