MC 0439

BOX 126 FOLDER 1

[Club of Rome]

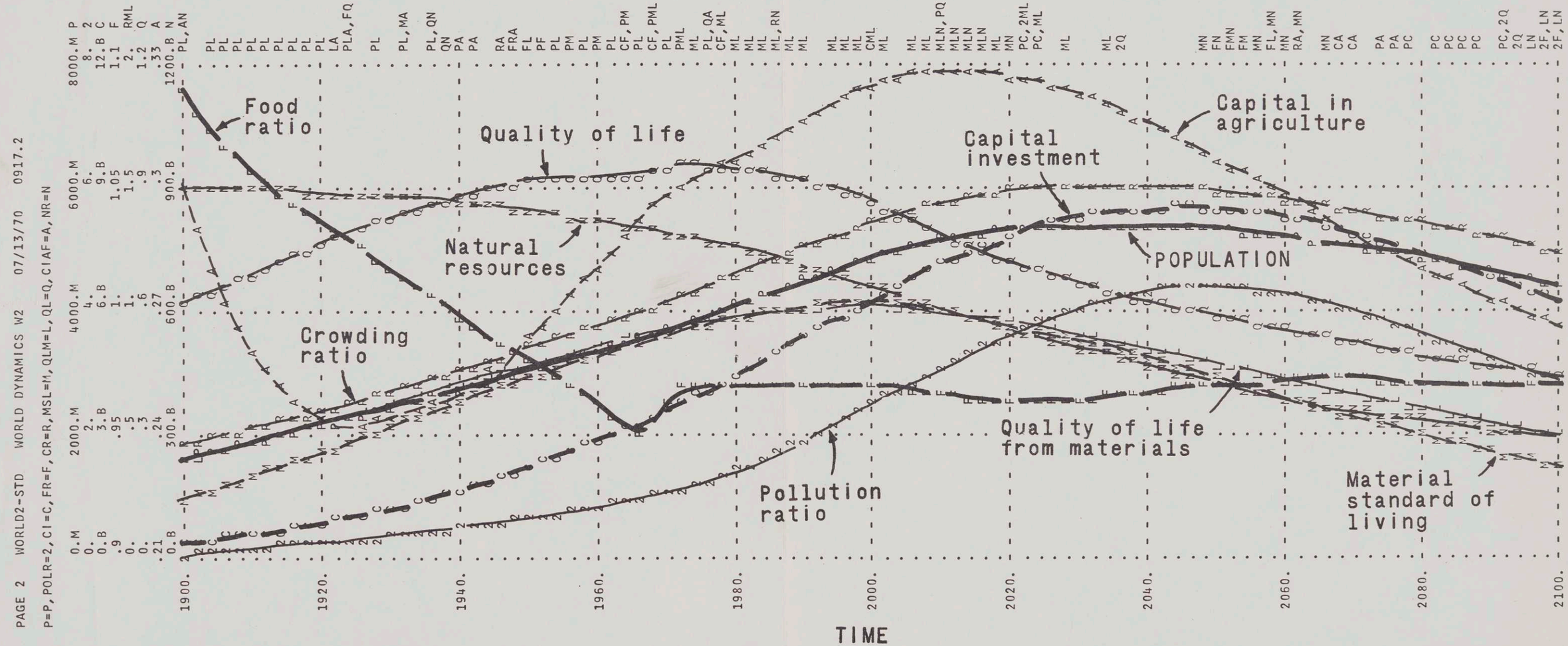
1970

OK

J.W.F. Howe

CI	C	Capital investment (capital units)
CIAF	A	Capital-investment-in-agriculture fraction (dimensionless)
CR	R	Crowding ratio (dimensionless)
FR	F	Food ratio (dimensionless)
MSL	M	Material standard of living (dimensionless)
NR	N	Natural resources (natural resource units)
P	P	Population (people)
POLR	2	Pollution ratio (dimensionless)
QL	Q	Quality of life (satisfaction units)
QLM	L	Quality of life from material (dimensionless)

WORLD2-STD



PAGE 2 WORLD2-STD WORLD DYNAMICS W2 07/13/70 0917.2

P=P, POLR=2, CI=C, FR=F, CR=R, MSL=M, QLM=L, QL=Q, CIAF=A, NR=N

CI	C	Capital investment (capital units)
CIAF	A	Capital-investment-in-agriculture fraction (dimensionless)
CR	R	Crowding ratio (dimensionless)
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MSL	M	Material standard of living (dimensionless)
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P	P	Population (people)
POLR	2	Pollution ratio (dimensionless)
QL	Q	Quality of life (satisfaction units)
QLM	L	Quality of life from material (dimensionless)

WORLD2-STD S

Pollution Scale 0-8

Capital investment

Natural resources

Crowding ratio

Population

Quality of life

Food ratio

Capital in agriculture

Material standard of living

Quality of life from materials

Pollution ratio

1900. 1920. 1940. 1960. 1980. 2000. 2020. 2040. 2060. 2080. 2100.

PAGE 2 WORLD2-STD. S WORLD DYNAMICS W2 08/04/70 1607.8

P=P,POLR=2,CI=C,FR=F,CR=R,MSL=M,QLM=L,QL=Q,CIAF=A,NR=N

	CIGC1
PRESENT	1.2
ORIGINAL	1.

CI	C	Capital investment (capital units)
CIAF	A	Capital-investment-in-agriculture fraction (dimensionless)
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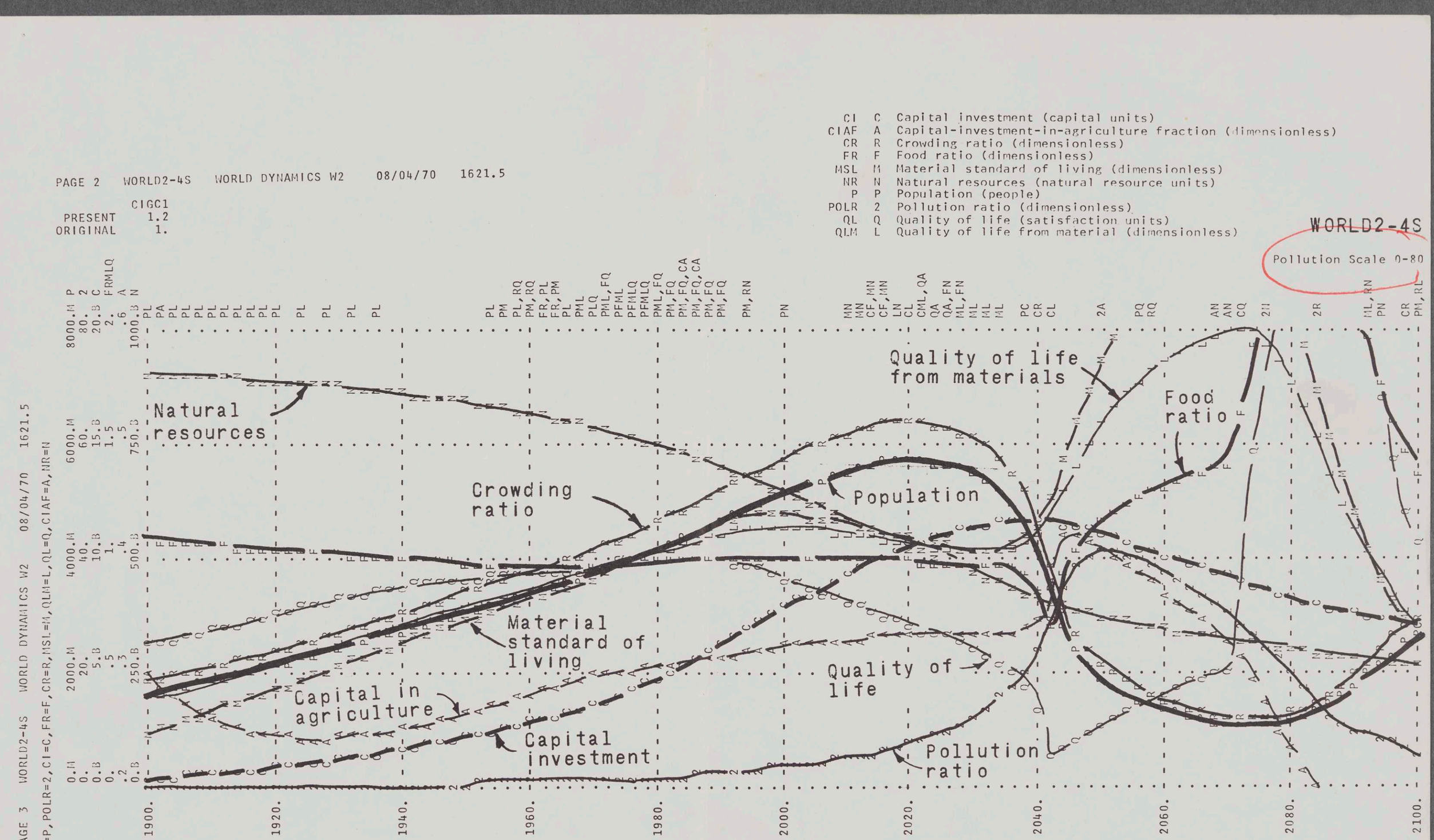
MSL	M	Material standard of living (dimensionless)
NR	N	Natural resources (natural resource units)
P	P	Population (people)
POLR	2	Pollution ratio (dimensionless)
QL	Q	Quality of life (satisfaction units)
QLM	L	Quality of life from material (dimensionless)

WORLD2-4S

Pollution Scale 0-80



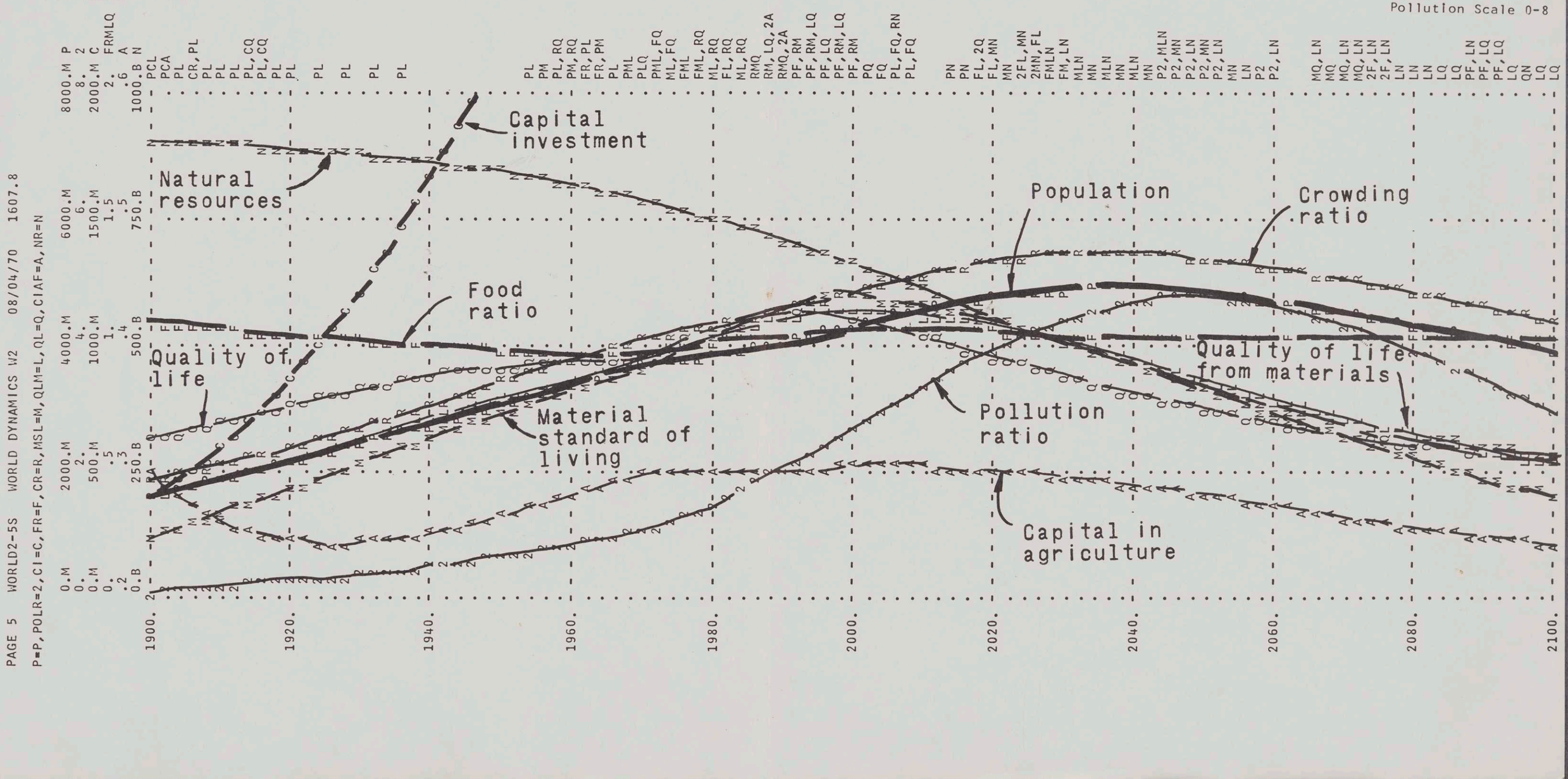
P=P,POLR=2,CI=C,FR=F,CR=R,MSL=M,QLM=L,QL=Q,CIAF=A,NR=N

CI	C	Capital investment (capital units)
CIAF	A	Capital-investment-in-agriculture fraction (dimensionless)
CR	R	Crowding ratio (dimensionless)
FR	F	Food ratio (dimensionless)
MSL	M	Material standard of living (dimensionless)
NR	N	Natural resources (natural resource units)
P	P	Population (people)
POLR	2	Pollution ratio (dimensionless)
QL	Q	Quality of life (satisfaction units)
QLM	L	Quality of life from material (dimensionless)

WORLD2-5S

BRN1
PRESENT 35.A
ORIGINAL 45.A

Pollution Scale 0-8



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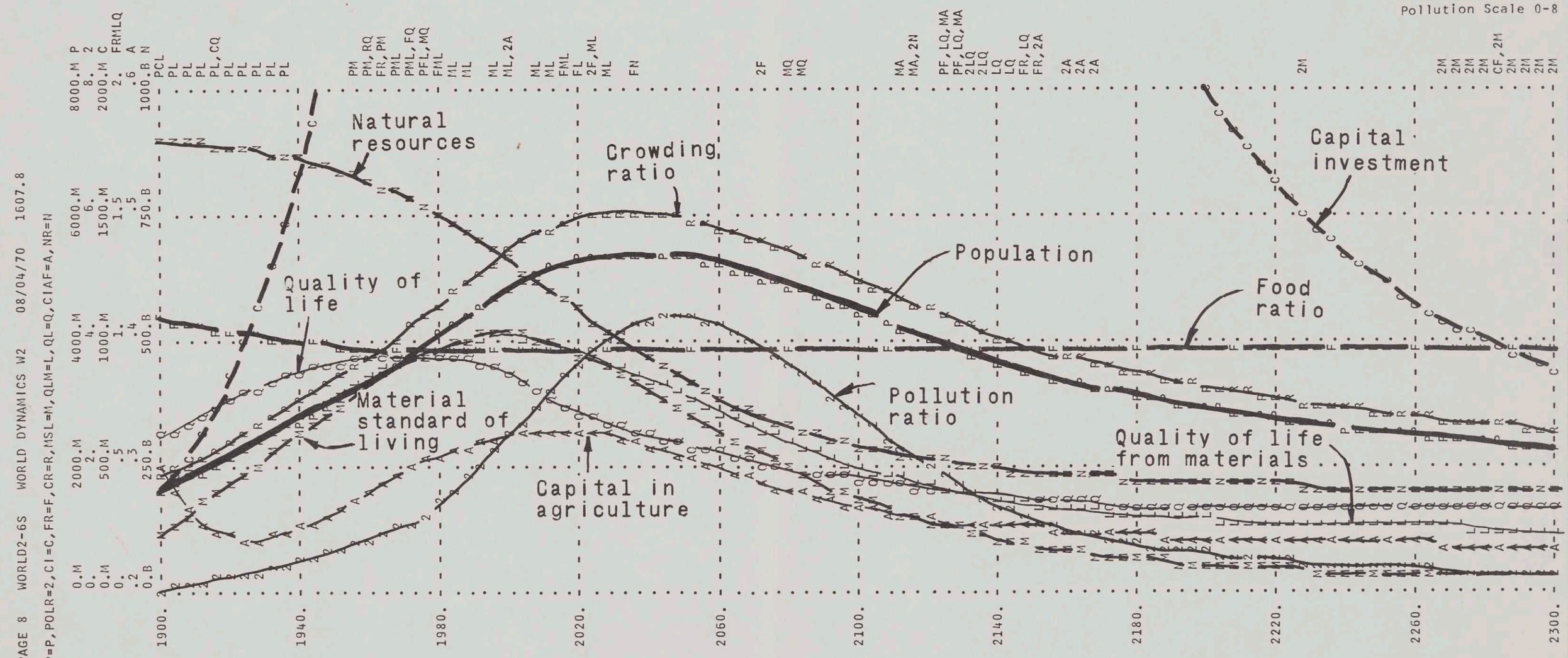
PRESENT	2300.	4.
ORIGINAL	2100.	2.

CI	C	Capital investment (capital units)
CIAF	A	Capital-investment-in-agriculture fraction (dimensionless)
CR	R	Crowding ratio (dimensionless)
FR	F	Food ratio (dimensionless)
MSL	M	Material standard of living (dimensionless)
NR	N	Natural resources (natural resource units)
P	P	Population (people)
POLR	2	Pollution ratio (dimensionless)
QL	Q	Quality of life (satisfaction units)
QLM	L	Quality of life from material (dimensionless)

WORLD2-6S

Pollution Scale 0-8



P=P,POLR=2,CI=C,FR=F,CR=R,MSL=M,QLM=L,QL=Q,CIAF=A,NR=N

NRUN1
PRESENT .25
ORIGINAL 1.

CI	C	Capital investment (capital units)
CIAF	A	Capital-investment-in-agriculture fraction (dimensionless)
CR	R	Crowding ratio (dimensionless)
FR	F	Food ratio (dimensionless)
MSL	M	Material standard of living (dimensionless)
NR	N	Natural resources (natural resource units)
P	P	Population (people)
POLR	2	Pollution ratio (dimensionless)
QL	Q	Quality of life (satisfaction units)
QLM	L	Quality of life from material (dimensionless)

WORLD2-12S

Pollution Scale 0-80

PAGE 6 WORLD2-12S WORLD DYNAMICS W2 08/04/70 1621.5

P=P,POLR=2,CI=C,FR=F,CR=R,MSL=M,QLM=L,QL=Q,CIAF=A,NR=N

Natural resources

Food ratio

Crowding ratio

Material standard of living

Capital investment

Population

Quality of life from materials

Quality of life

Pollution ratio

Capital in agriculture

1900. 1920. 1940. 1960. 1980. 2000. 2020. 2040. 2060. 2080. 2100.

	CIGC1	BRN1
PRESENT	1.2	25.A
ORIGINAL	1.	45.A

CI	C	Capital investment (capital units)
CIAF	A	Capital-investment-in-agriculture fraction (dimensionless)
CR	R	Crowding ratio (dimensionless)
FR	F	Food ratio (dimensionless)
MSL	M	Material standard of living (dimensionless)
NR	N	Natural resources (natural resource units)
P	P	Population (people)
POLR	2	Pollution ratio (dimensionless)
QL	Q	Quality of life (satisfaction units)
QLM	L	Quality of life from material (dimensionless)

WORLD2-21S

Pollution Scale 0-80

P=P,POLR=2,CI=C,FR=F,CR=R,MSL=M,QLM=L,QL=Q,CIAF=A,NR=N

Natural resources

Quality of life from materials

Food ratio

Material standard of living

Capital in agriculture

Capital investment

Quality of life

Crowding ratio

Pollution ratio

Population

Massachusetts Institute of Technology
Alfred P. Sloan School of Management
50 Memorial Drive
Cambridge, Massachusetts, 02139

Memorandum

To: Industrial Dynamics Staff

From: Dennis Meadows

Subject: Visit to the United Nations with Aurelio Peccei

Date: August 27th

On August 27th I went to the United Nation's Economic and Social Council (ECOSOC) to be introduced as the director of the Club of Rome project and to explore with Peccei and U.N. personnel the possibilities for cooperation between the M.I.T. project and the ECOSOC personnel. This memo briefly summarizes the main points of information and conclusions deriving from that conference. The comments can logically be divided into three sections: information obtained from Aurelio; information obtained from de Seynes; and information obtained from the ECOSOC staff.

Aurelio Peccei: Aurelio had one disturbing report to make. The Japanese have been quite disappointed with the direction that the project took at M.I.T. Apparently their primary goal for participation in the project was to learn new techniques of social analysis. Now that Phase I has essentially been restricted to one technique, Industrial Dynamics, they see little reason for participation. However, a Japanese representative will be in Europe during the September meeting at Battelle and it may, perhaps, be possible to work towards an accommodation. The Japanese situation is exacerbated by Dr. Kaya's displeasure as well. He had prepared his family to live in Geneva and now finds that no trip is in the offing. Peccei continues to feel that Japanese participation is of the utmost importance, so this situation is of concern to him. The situation was underlined by our recent telegram from Okita stating it would be impossible to select an appropriate representative at the moment.

On other fronts the response has been neutral to positive. Pestel reports little objections to the new proposal and, in fact, has undertaken to translate the rough-draft into German. A full day spent with the VW committee talking over our rough draft suggested that they are highly pleased with the current direction of the program. Peccei had many further remarks for the project concerning adaptation of model and contacts which should be made for purposes of information and political advantage in implementing the proposal. A brief summary of his suggestions, those sketched out on his plane trip to the New York meeting, are included here as an appendix. They include discussion of a supplementary variable, social tension, which should be included as a function of the gap in material standard of living and the crowding ratio and the food ratio and in the pollution ratio. Social tension would stand merely as an index of the system's susceptibility to social difficulty but would not, itself, be part of the feedback loop. He made extensive suggestions of organization and individuals that should be contacted. Those are adequately listed in the appendix.

Philippe de Seynes: We are extremely fortunate in having, through Peccei, a contact at the highest levels of the United Nations. De Seynes is Under Secretary General of the United Nations in charge of ECOSOC. He is/an extremely competent Frenchman with over 15 years of experience at the United Nations. A firm friend of Peccei and a man with the vision to be extremely enthusiastic about the topic and the approach of our project. He had read Urban Dynamics, appreciated the book and learned a great deal from it, so that he was easily able, during our luncheon, to comprehend our general approach. Although current problems prevent his staff from undertaking the type of project in which we are engaged, he recognizes the necessity for long-term perspectives and has essentially ordered his staff and personnel to cooperate in any way possible with our project. From de Seynes we learned additional information about the Prague and the Stockholm meetings. The information only confirmed my impressions that those two meetings are extremely important targets for our study results. The Prague meeting is to be held next May and is currently under the

operating administration of a Mr. Bishop, an American in the Council for Economic Development which sits in Geneva. We will attempt to meet with Bishop and his superior during the Geneva visit. The Stockholm meeting is receiving support at the highest level.. In January a Mr. Strong, a young wealthy Canadian who has recently distinguished himself in design, organization and support of an institute to study the determinants of economic development in Canada, has been appointed assistant undersecretary general of the United Nations in charge of the Stockholm meeting. I would expect that Strong would be extremely receptive to our suggestion that System Dynamics techniques could provide, for him, the basis for integrating the Stockholm material. During Peccei's visit to M.I.T. on Friday, September 4th, we will draft a letter inviting Strong to visit M.I.T. at his convenience during September. In my opinion these two meetings provide a real opportunity for our work to impact on the international community concerned with the types of problems we are addressing. I propose that the thrust of our effort this year be divided into three components: supplying inputs to the environmental summit meeting; preparing an adequate program and staff for the Geneva conference; and generating material for the book. After lunch deSeynes, Peccei and I met with four of de Seynes' personnel members.

ECOSOC Staff: The four members present at the meeting were Macura, Desai, Wang and Bamera They were respectively Director of Population Study, Assistant Director of Science and Technology, Director of the Division for Development and Programming and Director of the section on Natural Resources. The four individuals varied greatly in their receptivity to our approach; they ranged from out-right hostility to the interest by Macura and Wang in further meetings which would permit an in-depth study of the approach as it related to their particular field. Time constraints prevented more than a brief introduction of our own project and a short discussion of its relation to the United Nations. On the basis of that it was decided to hold a second meeting on Wednesday, September 2nd, at the United Nations with Wang and Macura for purposes of exploring the model and determining to what extent information sources available at the United Nations might provide useful inputs. Macura is a widely known

and respected population expert and should be extremely useful in our project. Since the Thursday meeting we have investigated the population sector of our model intensively and formulated rough-draft of world 3 relationships including the detailed flow diagram and preliminary equations. Those will be discussed at the Wednesday meeting.

APPENDIX I: PECCEI'S THOUGHTS ON CONDUCT OF THE PROJECT

-Reflections on Data Input

I. Interface

(between work team and problem experts and agencies)

paramount importance

II. Problem areas main contacts

A. Population ------ECOSOC (Macura)

B. Food Production ------FAO

C. Capital Investment -----OECD, IBRD (?)

D. Natural Resources ------OECD (?)

E. Pollution ---- M.I.T. (Wilson), WHO, US , OECD

F. Standard of Living -----ECOSOC, OECD, IBRD

G. Quality of Life -----UNESCO (?educ.)

H. Tensions -----ECOSOC

III. Informative Contacts

A. 'World Game' (Southern Illinois U., Gvbondale)

B. Commission on Year 2000 (Bell)

C. Hudson Institute (Kahn)

D. U.S. Government Agencies

E. Fondation Europeene de la Culture (Europe 2000)

F. Moscow (Committee Science and Technology, Academy of Science)

G. Tokyo

H. UNCTAD

I. Nobel Institute (?)

J. Futuribles International

K. Max-Planck-Gesellshaft (v. Weizsaiker, Schneider)

L. Salk Institute, LaJolla (Slater, Salk)

IV. Individuals : Consultants and/or Simple Contact

A. Hasan Ozbekhan

B. Erich Jantsch

C. Other COR Members

D. Daniel Bell, Sociology, New York

IV. Con't.

E. Kenneth Boulding, Economics, Univ. of Colorado

F. Jan Tinbergen, Economics, The Hague

G. Barbara Ward, London

H. Lord Jackson, Geneva

I. Dennis Gabor, Anzio

J. Nigel Calder, Science Writer, Crowley

K. Karl Steinhuck, Cybernetics, Un Karlsruhe

L. Georg Piecht, Writer , Germany

M. Murray Gell-Maan, Physics, Cal. Tech, Berkley

N. Yehezel Dror, Rand Corp., Santa Monica

O. Harvey Cox, Divinity, Harvard

P. John Archibald Wheeler, Physics, Princeton

Q. Graham Greene, Writer, Antibes

R. Lewis Mumford, Writer

S. Erich v. Kahler, Writer (?), Cornell

T. Ralph Nader, Ombudsman, USA

U. Jonas Salk, La Jolla, MD (?)

V. Some US Senators

W. Norman Cousins, Publisher (Saturday Review), New York

X. Asa Briggs, Brighton, Sussex (history?)

Y. West Churchman, Systems (?), San Francisco, Space Sciences Lab and Univ. of Cal., Berkeley

Z. John Gardner, Urban Coalition, Washington

a'. Eduard Wenk, Systems, Univ. of Washington, Seattle

b'. Margaret Mead, Anthropologist., New York

c'. H.B.G. Casimir, Director of Research, Eindhoven

d'. Michael Crozier, Sociology, Univ. of Nanterre

e'. De Finetti, Statistics, Univ. of Milan

f'. Ceccato, Philosophy, Math, Univ. of Milan

g'. Denis de Rougemont, writer, Switzerland

V. Modality for Data Input Contacts

A. Preparation of Basic Document (also for other purposes)

B. Time schedule for contacts
- -fact determination
- -fact revision and coordination (interspersed with World 3 Model Experimentation)

V. Con't.

C. Overall check-up and rationalization (April 71 check point, then with U.N.(?)).

VI. Proposal to COR (1, 5)

including: -Scope of Study Project (2)

-Outline of Work

-Work Team

-Consultants (data input)(3)

-Time schedule and intermediate check Points (4)

-Progress and Final Reports

-Economic Terms and Budget

-COR Supervision (DLM/JAS)

1. COR will base on it its Proposal to VW

2. Elegant presentation very important

3. This input very important. Also interface between work team and ECOSOC - OECD - FAO - Others

4. Check points preliminarily established:

-Aug. 27, 1970: de Seynes - needs working follow-up
-Dec. 18 - 19, 1970: Boston
-Beginning April 1971: tentatively Ottawa
-June 1971: (Final report discussion) Tentative Reiffenberg Castle

plus: September 11 or 12, 1970 Paris or Geneva (5)

5. Can Proposal be ready for September 11?

SOCIAL TENSIONS -only for period 1970 - 2000

-represents:

Potential for - discontinuity or disruption

of World System due to - inner disequilibria or malfunctioning

-is rough anticipation of further studies (coordinated models of subsystems)

STS = Social Tensions Standard : 1970 = 1

ST.K is function of:

a. QL

b. GAP in MSL

c. GAP in CR

d. GAP in FR

e. GAP in POLR

f. HA (Human adaptability)

namely:

a. = linear inverse

b. to e. = Taking significant groups of DC's and LDC's and existing projections (U.N. or other) or extrapolation of 1960 to 1969 trends

f. = HA is function of : education [CIR(education)/BR]

speed of change [CIR(R & D)/CIR]

can we introduce it?

[ST.K = f(distribution function).K]

Gordon Brown to return OK

HASAN OZBEKHAN

1 August

My dear Jay,

This is just a short note to thank you again for the wonderful hospitality you showed us while we were in Cambridge.

I only regret that the hectic circumstances of the last days of our stay did not allow me to spend a little more time with you. I hope we'll have an occasion soon to rectify that.

Please remember me to Mrs. Forrester who received us so graciously and to Dean Gordon Brown to whom I was not able to say thanks and goodby.

All my best Hasan

DER REKTOR
DER TECHNISCHEN UNIVERSITÄT HANNOVER

3000 HANNOVER 1
Welfengarten 1
Fernruf (Durchwahl):
Bearbeiter: (0511) 762- 2201
Vermittlung: (0511) 762-1
Fernschreiber: 923868

JW7

DATUM 25. August 1970

Mr. Dennis L. Meadows

Massachusetts Institute of Technology
Alfred P. Sloan School of Management

50 Memorial Drive

CAMBRIDGE, Massachusetts, 02139

USA

Dear Dennis:

Thank you very much for your letters of August 10 and 14 and for the proposal. I like it quite and do not believe that major changes are necessary.

To-day I had a long talk with the VW-foundation staff that is responsible for our project. I left the proposal with them in order to have their unofficial criticism on Friday. Sofar I detected only enthusiasm with our new approach. I hope that the referrees think the same way.

I shall return the proposal next Friday. But contrary to your letter of August 14 I shall rightaway produce the German version since the Foundation urges me to act swiftly.

Hoping that you all are doing fine, I remain

cordially Yours

Ed

(Prof. Dr.-Ing. D. Eng. h.c. E. Pestel)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY CAMBRIDGE, MASSACHUSETTS 02139

August 20, 1970

Mr. Aurelio Peccei
Administratore Delegato
Italconsult
Societa Generale per Progettazioni,
Consulenze e Partecipazioni S.p. A.
Rome, Italy

Dear Aurelio:

I hope the intensive fortnight at M.I.T. by a distinguished group from the Club of Rome will lay a foundation for a Study Project.

I was sorry to miss the Swiss meeting and the M.I.T. session, but my excuse is a good one. I was concentrating on Critical Global Environmental Problems. Enclosed is a statement of our Findings and Recommendations and the New York Times, and Washington Post reports on SCEP. The full Report--a 250-page paperback book--will be issued by the M.I.T. Press October 15th, and I believe you may want to send copies to Club of Rome members.

I've read with great interest your article from SUCCESSO of June 1970. We focussed part of our attention on Ecological Demand which is beautifully illustrated in Figure 2 of your article. I would greatly appreciate 10-15 copies to send to some of my SCEP colleagues--especially those who considered environmental impact on the Biosphere.

I hope I shall see you soon.

Sincerely,

CLW/abd

Carroll L. Wilson
(written in France--signed at M.I.T.)

CC: J. Forrester

CLW/d

I supplied them to Wilson's secy; she's written Peccei.

HAS

8/31/70

DER REKTOR
DER TECHNISCHEN UNIVERSITÄT HANNOVER

3000 HANNOVER 1
Welfengarten 1
Fernruf (Durchwahl):
Bearbeiter: (0511) 762- 2201
Vermittlung: (0511) 762-1
Fernschreiber: 923868

DATUM 25. August 1970

Prof. Dr. Jay W. Forrester

Massachusetts Institute of Technology
Alred P. Sloan School of Management

50 Memorial Drive

CAMBRIDGE, Massachusetts, 02139

USA

Dear Jay :

Just a few lines to thank you once more for the fine symposium.

A few days ago I had the preliminary draft of the proposal which I liked quite well and sumitted to the VW-Foundation for a quick review to-day. The response was quite favorable and I hope that the referrees' reaction will be similar.

As to further developments I shall keep you posted.

Cordially Yours,

(Prof. Dr.-Ing.D.Eng.h.c. E. Pestel)

AIR MAIL

Jw7 8/11/70

Battelle

INSTITUT BATTELLE

CENTRE DE RECHERCHE DE GENÈVE

Professor Jay W. Forrester
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Alfred P. Sloan School of Management
50 Memorial Drive
CAMBRIDGE, Massachusetts, 02139
U.S.A.

votre réf:

notre réf: TH.isch

Genève, le August 6, 1970

Dear Jay:

I would like to express my gratitude for the effort that you made for our short study programme in your Institute. I was very much impressed by the excellent work you presented and the observations you made when looking into different complex systems. I would also like to thank your colleagues John F. Collins and Gordon S. Brown for their valuable contributions in coming to a conclusion concerning the first phase of work for the COR.

I hope that the collaboration with Dennis Meadows will be an interesting one and that we may be able to find the right people for the Geneva team.

Hoping to meet you again in the very near future,

Yours very truly,

H. Thiemann

cc: Mr. Peccei

7, route de Drize - 1227 Carouge/Genève
téléphone 022/42 32 50, télégrammes: Battelle-Genève, télex 23-472 CH

JWF 8/10/70

Jeremy Bray

11 Luttrell Avenue Putney London SW15

Tel: 01-788 4269

5 August 1970

Dear Jay,

I was so sorry I was not able to get to the Club of Rome meeting at MIT and much look forward to hearing the results of the meeting and the follow-up of the work of the Club of Rome.

With kind regards,

Yours sincerely,

Jeremy Bray

Professor Jay W. Forrester,
Room E52-454,
Massachusetts Institute of Technology,
50 Memorial Drive,
CAMBRIDGE,
Massachusetts, 02139,
U.S.A.

AIR MAIL

JWF 8/7/70

(Provisional letter paper)

THE CLUB OF ROME

Rome, July 31, 1970
DAP/amp

Professor Jay W FORRESTER
Alfred P Sloan School of Management
Massachusetts Institute of Technology
Building E 52-454
Cambridge, Mass. 02139

Dear Jay,

This letter is addressed to you and to all other Club members to inform you succinctly about the general meeting held in Bern on June 29 and the Conference with Swiss political, scientific, industrial and banking personalities the following day. As you know, the Bern convocation was made on the invitation of the Swiss Federal Council, which is the highest political authority of Switzerland, which wanted thereby to show its acknowledgement of and interest in The Club of Rome and its aims. I will report herein also on some relevant activities developed since the Bern meeting.

1. General Meeting of Members (June 29, 1970).

The list of members who were able to attend is shown in Annex 1. Most of the other members sent letters or cables expressing interest, and regret at not being able to attend.

It is not possible to make a resumé of the lively discussion which characterized the two sessions (morning and afternoon) of the meeting. In the opinion of most of those present, it was carried out at a very high intellectual level, and it afforded a keen and penetrating insight into the present, troubled situation of human society, and a first-class debate on how its further degradation can be halted and its future developments put under control--notwithstanding the recognized, extreme difficulty of overcoming the inertia and confusion now prevailing in the general conduct of human affairs. The particularly high quality of the meeting was only to be expected as it was the first time our members had gathered in conspicuous numbers to go over the topics which constitute their common concern.

The trait of informality having been followed throughout, the agenda of the meeting (Annex 2) was only indicative. I will

Secretariat:
• Rome: Via Pastrengo 16, 00185 Rome - phone: 480041 - telex: Tecnital 61497 - cables: Romclub

Offices:
• Geneva: c/o Institut Battelle, 7 rue de Drize, 1227 Carouge, Geneva - phone: 423250 - telex: Batel 23472 - cables: Battelle
• Tokyo: c/o Japan Techno-Economics Society, Masuda Building, 4-5 Iidabashi, 2-Chome, Chiyoda-ku, Tokyo - phone: 2635501

limit myself here to sending a few notes (Annex 3) made by Dr. Giarini--who, with M. Lorthioir, successfully organized the convocation--though they refer to some aspects of the discussion only, and do not bring out the essence of many of the valuable contributions offered by the participants. And I will add information on some specific points, which complete the report I made during the Conference with Swiss personalities (see Annex 9).

Membership of the Club on June 24 was as it appears in Annex 4. The Bern meeting provided an opportunity to examine how to expand this in order to include some other disciplines and to blend into our group the contribution of other cultures presently not adequately represented in it. For instance, with T.A. Lambo the participation that can and should be sought from Africa was examined. But very much has still to be done actively to involve eminent scientific and intellectual leaders from other parts of the world in The Club of Rome thinking and postures. Dr. Jermen M. Gvishiani, Vice Chairman of the State Committee of the USSR Council of Ministers for Science and Technology was invited to attend the Bern convocation as our guest, as he did the meeting we had with the Austrian Government last December, but this time previous engagements prevented him from coming. Particularly with him we are continuing to explore Soviet participation in the Club or in its activity. On these points I will report further according to developments.

The incorporation of The Club of Rome as a private association under the Swiss civil code has been filed in the Canton of Geneva. A copy of the Statutes is attached herewith (Annex 5). As you will see, the Executive Committee, initially composed of six members, can be modified, and brought up to 12 members by co-optation. There was consensus that any such expansion should aim at strengthening it particularly with men of vision and sound judgment who can contribute, also by their personal activity, toward a transnational, multicultural and more creative understanding of world problems. Also on this matter I will report again as circumstances advise.

The Predicament of Mankind Project, designed to outline the study activity envisaged for the near future, was attentively examined. The initial draft of the Predicament of Mankind Project, in the same way it had been submitted to members for their comments and criticism, had also been sent to the Stiftung Volkswagenwerke (Volkswagen Foundation=VW) in Hannover with a request for funds. However there had not been time to discuss with VW experts some aspects of the methodology (white pages of the prospectus) nor to submit the Outline of Work Program document which in the meantime you and the other Club members have received. Therefore, as reported in Bern by Eduard Pestel--who is also one of the trustees of that Foundation who met a few days before our meeting--VW did examine our request but postponed a decision on it in order that we may clarify and modify some points of our submission and relative documents. These points concern chiefly methodology, and also personnel, budget and contingency costs. To enable The Club of Rome to prepare and work out the Project in this sense, VW granted a sum of DM200,000 ($55,000 approx.).

The question of the methodology or methodologies to be followed seemed central for the attainment of our objectives both for the short term (to engage important decision centers to reappraise realistically and without delay the grave situation of the world considered as a whole, not fragmentarily) and the long term (to contribute to the adoption of normative guidelines capable of safeguarding the future of human society). Therefore this point was particularly discussed, and Jay Forrester suggested that he believed that a suitable methodology to be applied to our Project had been developed at the Massachusetts Institute of Technology (MIT) in connection with the work which had been done to study the dynamics of large and complex systems where also human and social factors interact. These techniques are generally known as 'industrial dynamics' from their early application to corporate problems. Forrester's invitation was accepted to carry out a seminar and work sessions at MIT in Boston in order to ascertain further the adaptability of these techniques to our purpose and, in the affirmative, to prepare the Project or part of it accordingly, and thereby renew our request for VW sponsorship.

Finally, I am glad to inform you that the Canadian participants suggested that the next general assembly of The Club of Rome members should be held in Canada. The beginning of April 1971 was tentatively indicated as a suitable period. I will return on this as soon as possible.

2. Conference with Swiss Personalities (June 30, 1970).

This was likewise held in Bern, the Swiss Federal Council being represented by one of its seven members, M. Nello Celio (Conseiller Fédéral, Département des Finances et des Douanes de la Confédération Suisse). The other Swiss participants are those indicated in the list herewith (Annex 6). M. Celio clearly expressed the wish of Switzerland to give recognition to The Club of Rome objectives, and moral support to its action. After his speech the morning session was dedicated to the presentation of The Club of Rome rationale by some of our members. You may wish to have some of their speeches, and therefore I am enclosing a copy of the papers made available by Jacques Freymond (on the critical world situation--Annex 7), Alexander King (on what little is being done to meet this situation--Annex 8) and Aurelio Peccei (on The Club of Rome posture and proposed activity--Annex 9). Hasan Ozbekhan illustrated The Predicament of Mankind Project, and Hugo Thiemann the framework for the work to be carried out in Geneva (Annex 10). The afternoon session was dedicated to discussion.

After the Conference, reports reached us that it was considered very interesting and important by the Swiss participants, both in enlarging their horizons and in convincing them that our effort must be supported.

3. Seminar and Workshops in Boston (July 20 to 30).

Members have received from Jay Forrester two memoranda dated July 3 and 8 outlining a plan of activities for this meeting. The intensive program therein indicated has been accomplished, and--after a thorough discussion of the avenues which the proposed 'industrial dynamics (ID) methodology may open up for a reshaping and the execution of our Project--some

preliminary conclusions were reached by those Executive Committee members who were present. Let me try to report to you in as orderly a way as I can the results of the Boston meeting.

First of all, what was necessary was to peruse in some detail, discuss and evaluate the ID method and techniques with a view to assessing whether and under what conditions they can apply to study, reproduce by models, and understand the dynamic behavior of complex, high-order, multi-loop, non-linear feedback systems--which is the problem we propose to tackle in dealing with the situations which are developing in the world. Professor Forrester and his associates made an admirable effort, after Bern, to organize this 'ad hoc' seminar on highly effective bases. A model called 'World 1' of certain interacting factors which may be considered relevant or exemplificatory was prepared, a large series of computer runs were then made to explore the model's behavior according to the logic and hypothesis adopted, and finally the model was somewhat modified to reach a higher, though still very preliminary, level of representativity of world reality ('World 2'). The purpose of modelling is of course that of substituting for the verbal and conceptual description of a system that of a formal simulation model, which is as good as its capacity to put together the relevant critical dynamic elements of the real world. But the kind of thinking this operation generates--as occurs in our case--is an invaluable asset by itself in fostering a keener understanding of the complexities and workings of large systems.

The flow diagram of 'World 2' and an example of a computer plot are attached 'Annexes 11 and 12). For those who might be interested, I enclose also: a list of participants in the seminar (Annex 13), program executed (Annex 14) and index of the reference and working documents used in the seminar (Annexes 15 and 16), noting that those more directly related to the 'World 2' exercise are those listed in Book 2 under the letter G. If you are interested in receiving any of them, you may write Mr. John A. Seeger, Administrative Officer, Dynamics Group, MIT, Sloan School of Management, 50 Memorial Drive, Cambridge, Massachusetts, 02139, USA.

Besides acquiring an effective grasp on Professor Forrester's

proposed social dynamics method and judging its applicability, to which question an affirmative answer was given (for conducting a first, significative phase of our Project), the work at Boston was aimed at organizing our activity with respect to the Project in the immediate future. The Executive Committee members present had long sessions in this respect with Jay Forrester, consulted with the other colleagues present, and reached a majority decision on principle.

'World 3' which we used in Boston is still a rather simple dynamic model which interrelates five main, 'level' variables--population, capital investment, food production, natural resources and pollution--among themselves and with six 'rate' variables and other auxiliary factors, leading to the establishment of some 40 non-linear equations permitting very interesting and, to the best of our judgment, meaningful computer simulations on the base of already tested software. The degree of aggregation adopted is the world as a whole.

The decision mentioned above is to consider two phases in the development of our modified Project: the first phase to be executed mainly in Boston using ID methodology, and technical support, personnel and experience available at MIT; and the second phase to be carried out in Geneva by a larger and more diversified team which may and probably will use also such other methodologies as it may deem necessary.

Phase One will start immediately and it is expected to be concluded by June 1971. It will be based on a 'World 3' model (a more advanced development of 'World 2') whose configuration will be defined after consulting international Organizations during the next few months. The level of aggregation will still be the world, not only because of the difficulty of devising, at this stage, meaningfully and by rational procedures, a hierarchy of subsystems and then correlating them mutually and with the world system, but also because we have reached a point in our planet when many of the critical data of the smaller problems or systems do essentially depend on how the larger system behaves. The project leader for this phase will be Professor Dennis L. Meadows of MIT, while Professor Jay W. Forrester will provide general guidance, being assisted for this purpose by Professors Gordon S. Brown and John F. Collins, all of MIT. A compre-

hensive Report will be made at the end of Phase One, with a whole set of computerized projections which represent simulations of alternative future situations obtained by using a variety of assumptions, and which we are confident will realistically--and probably dramatically--illustrate what the predicament mankind has worked itself into actually is.

VW will be asked to extend its initial grant in order to cover the total cost of Phase One, and the decision--hopefully positive--is expected to take place in November. Between now and then activities can be carried on using the balance of the initial grant, and advances from other funds on hand if necessary.

Phase Two should be organized while Phase One is being carried out, and should start as soon as possible thereafter. It will have a broader scope, draw from more diversified talents, use a wider range of methodologies, and require larger financial means. It will greatly benefit from the experience gathered during Phase One, which we hope will give us, as well as our sponsors and the entities which will morally and technically support The Club of Rome, a clearer vision of how the wide-based effort to guide ourselves in the modern world we advocate can be organized. What may now be envisaged is that during Phase Two, besides modeling something such as 'World 4', different levels of data aggregation may be considered, and an attempt made at including long-range normative goals. If we are successful in presenting our case, funding of Phase Two may become multinational. There will however be ample time to discuss Phase Two during the next few months, and certainly at the next general assembly foreseen for April 1971.

I hope I have given you a fairly complete picture of developments so far. If you need any other data, please let me know, while your comments and suggestions will be highly appreciated.

Best personal regards,

Yours sincerely,

Aurelio

Aurelio Peccei

This is the standard letter, not necessary in your case - You may keep it in your files, if you want - The Seminar was very interesting, and I hope fruitful -
Best regards to Mrs Forester
A

P.S.:

Due to their bulk, the annexes will be sent under separate cover.

They are:

Annex 1: List of members who attended Bern meetings

Annex 2: Agenda of Bern meetings

Annex 3: Dr. Giarini's notes

Annex 4: Membership as of June 24, 1970

Annex 5: Statutes

Annex 6: Swiss participants in Bern Conference

Annex 7: Prof. Freymond's speech

Annex 8: Dr. King's speech

Annex 9: Dr. Peccei's speech

Annex 10: Dr. Thiemann's speech

Annex 11: Flow diagram of 'World 2'

Annex 12: Example of computer plot

Annex 13: Participants in Boston Seminar

Annex 14: Program of Boston Seminar

Annex 15: Index of reference and background documents, Boston Seminar

Annex 16: Index of working documents, Boston Seminar.

AIR MAIL

JWF 8/3/70

ALTIERO SPINELLI
MEMBRO DELLA COMMISSIONE
DELLE COMUNITÀ EUROPEE

Brussels, 24th July, 1970

Dear Professor Forrester,

Although with much delay, for which I apologize, I thank your for kind invitation to take part in the meeting of the Club of Rome, at MIT, at the end of July. I have not been able to come because, having been appointed Member of the Commission of the European Communities, at the beginning of July, I have been overcharged by my new work during the last weeks.

I take this opportunity to inform you that the Managing Commitee of the Istituto Affari Internazionali in Rome has appointed deputy director Prof. Cesare Merlini, who comes from the Turin University. He will therefore be responsible for the Institute in the future.

With my best wishes, I am,

very sincerely yours,

Altiero Spinelli

Prof. Jay W. FORRESTER
Romm E52-454
Massachusetts Institute of Technology
50 Memorial Drive
CAMBRIDGE, Massachusetts 02139
U.S.A.

OFFICE OF THE PRESIDENT

July 20, 1970

Professor Jay W. Forrester
Room E52-454C
M.I.T.

Dear Jay:

I am looking forward to having the members of the Club of Rome and those others who are participating in the conference come to our home at 111 Memorial Drive at 5:30 p.m. on Monday, July 27. In your note to me you mentioned that Mr. Leavitt will work with my office on arrangements and invitations. There are no further arrangements required. We shall simply look forward to having the group join us at 5:30 p.m. As to invitations, given the shortness of time, I wonder whether you would relay to the members of the conference my personal invitation. Finally, you might have Mr. Leavitt let me know the approximate number who will come at the beginning of next week.

In the meantime, I hope that there will be a chance for me to join the group at luncheon, and I shall try to do so on Wednesday of this week.

Sincerely yours,

Howard W. Johnson

HWJ:mj

cc: Mr. Peter D. Leavitt

July 26, 1970

ROUGH DRAFT - DENNIS MEADOWS

Thoughts On A Possible Club Of Rome Research Program

Let us base our efforts on our greatest asset in affecting any change in values or policy. We have two irrefutable arguments:

- the world must ultimately pass from this period of exponential growth into the phase of overall equilibrium.
- the characteristics (timing and nature of limiting factor) of the transition will determine the options open for the equilibrium period.

To catalyze productive world change the Club of Rome could attempt through its program to institutionalize the concept of planning for an orderly transition to equilibrium. It could provide the language and methodologies, identify the critical problem areas and suggest criteria by which alternative solutions should be judged.

Such a program might involve four stages.

Aug. 1 - Oct. 15 Validation and analysis of the world model. Discovery exploration and illustration of its various behaviour modes. Identification of the important research areas. Output-Draft of the technical book. Schedule for the actual research program.

Oct. 16 - Dec. 31 Consideration by VW Foundation. Preparation of the facilities and software. Identification of the core staff (ex: 3 Industrial Dynamicists, Demographer, Agriculturist, engineer, political scientist).

Jan. 1 - May 31 Training and preliminary work of the core staff at M.I.T. Identification of ten first year staff members: eg. arms, economic development, exploitation of the sea, etc.

June 1,'71 - June 1, '73 Formal inauguration of The Institute for an Orderly Transition to World Equilibrium. Two one-year research periods in which 10 experts study through I.D. and their traditional methodologies the policy implications of an explicit goal of equilibrium in their fields. Output - 20 profession-oriented monographs explicating the concepts and implications of equilibrium. One non-technical book designed to attract popular support eg. Silent Spring, one technical book which employs the model to explain the critical policy issues and the explicit steps which should be taken at the national level.

June 1973, on Systematic coordination by an enlarged Club of Rome (200 industrialists, educators, and communication media professionals) to implement the technical book's proposals.

23 July 1970

1. Is MIT ready to work with CoR in principle?
2. Definition of the work statement?
3. First phase gross model—how do we define inputs? levels
4. Approximate guess of level of effort
5. Relationship of Cambridge and Geneva work
6. What specific output expected?
7. Time
8. Money
9. Organization of relationship
    a) for preparing the effort
    b) for carrying out the effort
10. General considerations regarding sponsorship strategies

Include in 2-wk CoR Program.

1. Fey - Conflict model 2 sessions { ___ ___

~~[illegible]~~ • 2. Ⓢ JF - introduction Mon 7/20 IMI

3. Barney -- Simple Malthus model Tues 7/21

4. Barney -- more complete pop-land model

5 Randers solid waste

6 JF - Urban

7 JF Urban

8 JF Urban

9 JF Urban. Rent control, } Thur 7/23

10. Urban model lab session *

11. Urban model lab. session *

12. Foster - Insulin model Wed 7/22

13. JF corporate growth

14. JF corporate growth) mon 7/27

15. Behrens - Welfare model

16. Meadows - Commodity model - Emphasize Data input.

17. " " ") Tues 7/28

18. Commodity model lab session

19 " " " ") Tues 7/28 * *

20 Roberts R+D management { ___ ___

21 Swanson ?

22 Henize ?

23 Patni - ~~corporate~~ market growth + cap invest { ___ ___

24 Ⓢ JF. Skills + training required in soc. dyn. Tues 7/28

Include in 2-wk C.R Program.

25. (S) Schroeder on sequel to U.D.

26 (S) JF, History at MIT in computers, sensor, I.D., dynamics, present educational program. Mon 7/20

27 (?) Wilcox ec. model

28 JF New Corporate Design

29 ~~Biologists on~~ Foster on biologists

30 Possible project

31 PUGH- DRUG PROBEM Phil Levin Fri 7/24

Randers

Barney

Foster

meadows.

32 Regional analysis -- Hamilton +

33 (S) Summary of Regional Analysis, emphasis on impact on gvt attitude on studies.

34 JF Positive feedback. ~~Procedure~~

35 Collins on cities.

Do. ①

1. Send to each member:
   a. Ind. Dyn.
   b. U. D.
   c. Princ of Sys.
   d. Memo on reactions

2. Memo on levels of aspiration
   build on Mc Gregor.
   a. Send memo to C. R
   b. Send copy of Mc Gregor.

3. What to do To build on and use Hagen book.
   Find model of Hagen book.

4. Write & send a memo on the "unity" theme & how one can combine all aspects of knowledge. (T) to #43

5. Memo showing how similarities of structures are more ~~different~~ important than differences.
   Seek the common structures in which the coefficients describe the different behaviors
   Example -- pendulum vs employment & inventory.
   model technique

6. Memo on how attitudes distort the "true" value base
   How human values are probably more alike than different.

7. Write memo on how data is not the problem
   adapt
   ↳ ~~Include~~ goals and traditions loop from (F) to 43
   corp growth paper.

8. Memo on importance of generality in a model. Show how we arrived at the present condition.

9. Try to develop a model of pop - technology - resources - std of liv.
material std of living vs psychological std of living.
Show exhaustion of space & resources.
Show how population increase depends on std of living.

10. Write a memo on basic sci.
vs. appl in the context
of our plans to go beyond U. D.

11. Memo to go with P. of S. to discuss
educational sys. — future development
of book., revision of sec. 2.5
ability to teach complex dynamics
in secondary school.

12. Send "Urban Consensus" to Co R.

13. Write separate memos expanding
on each of the characteristics
of complex systems.

14. With U. D. send an outline of
our plans beyond U. D,

15. Propose to Co R. that we have the
approach that can be used.

16. Det Peccei, Pestel & Exec. com to come to MIT for 10 days of discussion.

17. Consider how the CoR can be related to the Independence Foundation.
   * Should we invite the CoR
   * to our Ind. F. symposium?

18. A memo on CoR time schedule. need to develop a ~~better~~ proposal. Will take a year. Too much urgency, not yet enough substance.

19. Consider a presentation of dynamics of conflict at CoR ~~re~~ seminar

20. CoR seminar: Discussion of new Corp Design and tie into ~~corp~~. social trends in the community and student unrest. Importance of subdividing back down from globe & country.

21. CoR. Make a model of ~~medical~~ gene damage due to medical sci. as described in Daedelus.

22. Be sure Ritchie knows the schedule for the seminar.

THE CLUB OF ROME

Do. (4)

23. Should we invite some guests to the CoR seminar?

24. Do over the CoR proposal + 1st report and dictate comments for the seminar.

25. Write a draft proposal for CoR.

26. Computer runs or wall chart of an exponential curve.

27. Put Kuhn book in seminar reading.

28. Semina: Stress decomposition of problems into separate models, depending on level of interest. Systems within systems.

But not same as present compartments in sci.

29. Numerous verbal-to-formal model exercises. Direct quote from Malthus. etc.

30. Nathan's paper.

31. Stress continuity of past to future. Can't act except in future.

32. Stress that model must show how the past leads to the present problems.

Do. (5)

THE CLUB OF ROME

(7) x item ~~65~~ 64

~~33. Stress the unity of foundation underall?~~

34. Outline MIT tradition of bridging from theory to practice.

35. Invite Bob Maes

36. Memo on history of feedback & ~~computers~~ & sys at MIT,

37. Books for members.
Ford — McGregor — Regional analysis – Hamilton.
Packer — Kuhn Sci. change 5 7/5
Roberts
Jarmain — Hogen

38. Paper on B(?) how complex systems differ, Harvard, on learning from simple systems, judgement and intuition developed in simple systems. complex systems react in ways that cause people to degrade system. Frustration from levers that are insensitive, wasted resources from system relaxation, Degradation from worse before better and then redoubling efforts.
Sketch how we do not perceive loop even in filling a glass, A → B sketch.

Ozbekhan
British "muddling thru" vs development of new theory

39. Paper on stress in transition in growth to equilibrium.
reproduce U.D. diagrams
pamphlet paper diagram
nature of a growth loop and how it can be made equilib seeking. to rabbit population example. Show with environmental pressure as a variable.

"obvious" control points do not work.

40. Paper on self-compensating changes in a system -- corp. growth examples and of student frustration, examples from U. D. Computer sim, inkt paper model, increase sales allow after equilibrium.

But refer to separate paper on points #65

41 Paper on how a system relaxes and distorts to defeat activist intervention.
a. By throwing load on intervener
b. By raising pressures against the action.

42. Paper on the zero-sum game argument.

43. Paper on eras of human pioneering.
Future of soc. dyn.

Example of Foster for mobility

Sci. has compartmentalized knowledge, must now reunite and restructure to give everyone key to fostering intellectual mobility.

Impact on education, Harvard "Structure" as explained by Common foundation under all knowledge.
Unity of knowledge.
~~Stress importance of similarity rather than difference.~~
~~Pendulum & empl inc. structural identity.~~
Can handle any statment that can be made in words.

43 Memo on sources of models.
Data not the problem.
Perception of "policy" points by people,
Best combination of man and computer
Oshima -- wise man vs science, combine both.

Stress proper wrong assumption about data need.

Data and data banks will not give theory.
~~model is a theory. We need theories of structural relationships.~~
need to piece together theories of behavior from readily available info.
Refer to 5 great books in Ec. -- But principles of structure and dynamics will make easier.

no 16 rules for Nobel Prize
Physci also uses judgment and intuition on frontier
soc. sci expects them to come out of models
to process.

Do (7)

44. See that all new memos carry copyright notice. S 7/5

45. Select Theses for group to read.

46. Collect ec. development memos from 1963 (?) for exhibit.

47. Check on Wilcox m.sc thesis on economy.

48. Memo on aggregation and how all models tend toward same complexity. How, when a system is understood, individual modes of behavior can be shown in 1st to 5th order models Example: Mkt paper as a sub-~~mode~~ system out of corporate growth work.

49. Paper on short vs long run effects on system. Figures from W. D. Verbal examples: Long run vs short run ethics and morality.

50 Paper on how social system reaction is usually in a different dimension from intended result. Repeat example from item 40? on use of mkt paper

51. Paper on time perspective, won't have effect in this decade, slow change in soc sys., education of a new generation after info available, build well rather than hastily, don't focus on short run with again a long-term disaster. Too many crash programs have already wasted valuable time

[See also item 64] If there is a continuum of ~~ton~~ short-long conflicts, how ~~to~~ for can humans look ahead. Refer to Banfield class definitions.

Do (8)

52. Paper on the need for objectives, need to ~~go~~ describe a future world. What like. Can it satisfy a majority. Difficulty in focusing on goals action rather than accomplishment The road rather than the destination

53. Economic growth in McGregor setting
The corporation as a source of ~~co~~ community breakdown. Transfer of employees. no roots, mid-mgt frustration. Present students the children of a ~~apathetic~~ frustrated generation, Reaction against the mgt. jungle and "gray flannel suit" conformity, no tradition of how to succeed at higher goals.

corp o.k. as long as necessary to meet material goals. student "rejection" of business. Concern in business press.

54. Converging threads toward a new society, communal living, return to crafts and work with hands, rejection of "business socialism", need to conserve resources, 10-year-or-tax products, repair rather than replace, return to "old world craftsmanship", college graduates becoming taxi drivers, rapid rise in costs & wages in service sector, too many physics PhD's, ~~zero growth~~ zero population growth

Do (9)

55. Paper on ideology, capitalism vs socialism, corporation or a socialist bureaucracy, reference to new Corp Design paper.

56. Paper on aggregation of people in cities. Paths of least resistance. Expansion allows inner parts to decay. U.S. vs Copenhagen. Protection of green space. London green belt. Proposal for 20-mi band around Denver.

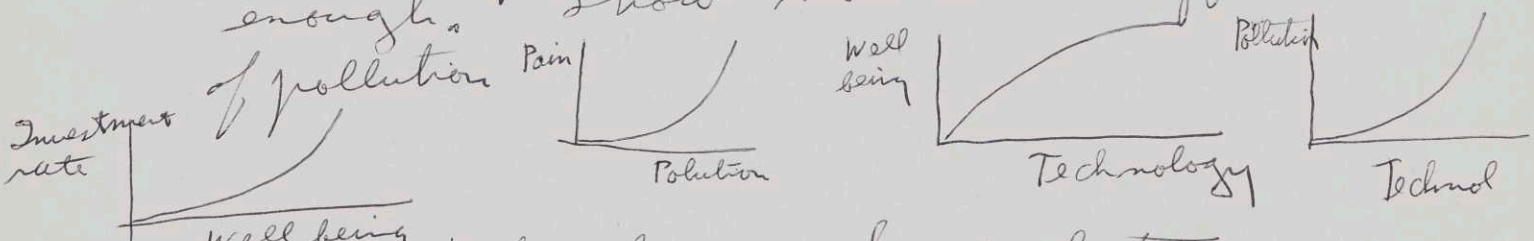
57. ~~Fads~~ Paper on urban transportation How it may degrade the city. New Y. as an example. Consider transportation for commercial purposes, express trains between small urban nuclei.

58 Paper on the diseconomies of gvt subsidizing services, loss of individual choice, must use if to benefit from tax payment, increase bureaucracy of gvt to operate, choice of individual is use or not use so tries to maximize consumption, gvt must then ration in some way by generating restraining pressures (resulting gvt employees are a drag on std of living and a source of social conflict). Focuses rebellion on the gvt as the opposition

DO (10)

59. Paper on shortening of time horizons
Farm family → industrial soc.
anti nepotism
away from founder-manager to professional mgr.
Social security, retirement plans,
Financial retirement rather than support
by land and children
Short tenure in political office mattered less
~~than~~ when people came into office from
a background of future orientation
Traditional "extended" family structure
gave a preview of old age.
Large corp defines jobs of little personal responsibility,
inherit situation from predecessor,
leave mistakes to successor. The
"system" makes daily decisions but
does not plan for future.

60. Paper on technology. Relate to compensating
dynamics in urban attractiveness
consider in non-linear influence on
well-being. Can we make a dynamic
model that shows how technology helps
at first but can then become the
sorcerer's apprentice. Benefit from
more std of living falls when std of l high
enough. Show non-linear effect
of pollution



Tie in technology and population
and growth in each. Include
capital investment as cause of pollution
and std of l. Cap. invest. depends on
rate of change of std of living and excess
well being.

Put in
G.N.P.

Do (11)

61. Discuss the gut control points for technology. Can we do that in context of item 60 model.

62. Draft proposed CoR project plan.
Examples of how to model systems
Dramatic nature of probable results.
Plan for educational materials for schools at all levels.
Channels of influence: not thru gut, instead reach opinion leaders.

63. Paper on what will we choose as the pressures to stop population growth. Now only talk. Limit business & residence to ~~pa~~ land presently used? Create crowding pressure thereby before food disappears and open spaces are filled and contaminated,

64. ~~Stucty~~
Paper on dynamics of change.
CoR. can not avoid "politics"
" should model the dynamics of social change. How long to develop ideas.
[combine with item 51]

~~If~~ Does "politics" cover Banfield's class distinctions and the ~~tim~~ long-short conflict more than it does comparable time values. Refer to zero-sum-game paper.

Do (12)

65. Paper on influence points.
contrary to paper on self compensation
slum demolition in U. D.
Resource alloc in ~~a~~ cap growth
(refer to item 40 paper)

Price and expansion, not sales in
~~mkt~~ mkt. growth & cap invest paper

66. ~~Pap~~ Introduction & perspective on
~~mkt~~ mkt growth paper.

67. Paper on failures of activist intervention
waste of money & time
Examples.
Should have attitude that troubles have causes,
Remove causes. Ref to zero-sum-game memo.
attitude that govt must handle problem,
when, in fact, govt set the social
structure that is creating the problem.

D-1354

J.W.F. bc.

WORLD2 DOCUMENTOR

a part of

A World Dynamics Model:

Introductory Exercise

by

Jay W. Forrester

Professor of Management

Sloan School of Management

Massachusetts Institute of

Technology

Cambridge, Mass.

July 15, 1970

```
r dc world2 world
W 1422.6

P.K=P.J+(DT)(BR.JK-DR.JK)                                          1,L

P=PI                                                               1.1,N

PI=1.65E9                                                          1.2,C

     P      - POPULATION (PEOPLE)
     BR     - BIRTH RATE (PEOPLE/YEAR)
     DR     - DEATH RATE (PEOPLE/YEAR)
     PI     - POPULATION, INITIAL (PEOPLE)

BR.KL=(P.K)(CLIP(BRN,BRN1,SWT1,TIME.K))(BRFM.K)(BRMM.K             2,R
  )(BRCM.K)(BRPM.K)

BRN=.045                                                           2.1,C

BRN1=.045                                                          2.2,C

SWT1=1970                                                          2.3,C

     BR     - BIRTH RATE (PEOPLE/YEAR)
     P      - POPULATION (PEOPLE)
     BRN    - BIRTH RATE NORMAL (FRACTION/YEAR)
     BRN1   - BIRTH RATE NORMAL NO. 1 (FRACTION/YEAR)
     SWT1   - SWITCH TIME NO. 1 FOR BRN (YEARS)
     BRFM   - BIRTH-RATE-FROM-FOOD MULTIPLIER
              (DIMENSIONLESS)
     BRMM   - BIRTH-RATE-FROM-MATERIAL MULTIPLIER
              (DIMENSIONLESS)
     BRCM   - BIRTH-RATE-FROM-CROWDING MULTIPLIER
              (DIMENSIONLESS)
     BRPM   - BIRTH-RATE-FROM-POLLUTION MULTIPLIER
              (DIMENSIONLESS)

BRMM.K=TABHL(BRMMT,MSL.K*BRMS,0,5,1)                               3,A

BRMMT=1.2/1/.85/.75/.7/.7                                          3.1,T

BRMS=1                                                             3.2,C

     BRMM   - BIRTH-RATE-FROM-MATERIAL MULTIPLIER
              (DIMENSIONLESS)
     BRMMT  - BIRTH-RATE-FROM-MATERIAL-MULTIPLIER TABLE
     MSL    - MATERIAL STANDARD OF LIVING (DIMENSIONLESS)
     BRMS   - BIRTH-RATE-FROM-MATERIAL SENSITIVITY
              (DIMENSIONLESS)
```

```
MSL.K=ECIR.K/(1-CIAFN)                                          4,A
```

MSL - MATERIAL STANDARD OF LIVING (DIMENSIONLESS)
ECIR - EFFECTIVE-CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)
CIAFN - CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION NORMAL (DIMENSIONLESS)

```
ECIR.K=(CIR.K)(1-CIAF.K)(NREM.K)                                5,A
```

ECIR - EFFECTIVE-CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)
CIR - CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)
CIAF - CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION (DIMENSIONLESS)
NREM - NATURAL-RESOURCE-EXTRACTION MULTIPLIER (DIMENSIONLESS)

```
NREM.K=TABLE(NREMT,NRFR.K,0,1,.25)                              6,A

NREMT=0/.15/.5/.85/1                                            6.1,T
```

NREM - NATURAL-RESOURCE-EXTRACTION MULTIPLIER (DIMENSIONLESS)
NREMT - NATURAL-RESOURCE-EXTRACTION-MULTIPLIER TABLE
NRFR - NATURAL-RESOURCE FRACTION REMAINING (DIMENSIONLESS)

```
NRFR.K=NR.K/NRI                                                 7,A
```

NRFR - NATURAL-RESOURCE FRACTION REMAINING (DIMENSIONLESS)
NR - NATURAL RESOURCES (NATURAL RESOURCE UNITS)
NRI - NATURAL RESOURCES, INITIAL (NATURAL RESOURCE UNITS)

```
NR.K=NR.J+(DT)(-NRUR.JK)                                        8,L

NR=NRI                                                          8.1,N

NRI=900E9                                                       8.2,C
```

NR - NATURAL RESOURCES (NATURAL RESOURCE UNITS)
NRUR - NATURAL-RESOURCE-USAGE RATE (NATURAL RESOURCE UNITS/YEAR)
NRI - NATURAL RESOURCES, INITIAL (NATURAL RESOURCE UNITS)

```
NRUR.KL=(P.K)(CLIP(NRUN,NRUN1,SWT2,TIME.K))(NRMM.K)      9,R

NRUN=1                                                   9.1,C

NRUN1=1                                                  9.2,C

SWT2=1970                                                9.3,C
```

NRUR - NATURAL-RESOURCE-USAGE RATE (NATURAL RESOURCE UNITS/YEAR)
P - POPULATION (PEOPLE)
NRUN - NATURAL-RESOURCE USAGE NORMAL (NATURAL RESOURCE UNITS/PERSON/YEAR)
NRUN1 - NATURAL-RESOURCE USAGE NORMAL NO. 1 (NATURAL RESOURCE UNITS/PERSON/YEAR)
SWT2 - SWITCH TIME NO. 2 FOR NRUN (YEARS)
NRMM - NATURAL-RESOURCE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)

```
DR.KL=(P.K)(CLIP(DRN,DRN1,SWT3,TIME.K))(DRMM.K)(DRPM.K   10,R
  )(DRFM.K)(DRCM.K)

DRN=.025                                                 10.1,C

DRN1=.025                                                10.2,C

SWT3=1970                                                10.3,C
```

DR - DEATH RATE (PEOPLE/YEAR)
P - POPULATION (PEOPLE)
DRN - DEATH RATE NORMAL (FRACTION/YEAR)
DRN1 - DEATH RATE NORMAL NO. 1 (FRACTION/YEAR)
SWT3 - SWITCH TIME NO. 3 FOR DRN (YEARS)
DRMM - DEATH-RATE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)
DRPM - DEATH-RATE-FROM-POLLUTION MULTIPLIER (DIMENSIONLESS)
DRFM - DEATH-RATE-FROM-FOOD MULTIPLIER (DIMENSIONLESS)
DRCM - DEATH-RATE-FROM-CROWDING MULTIPLIER (DIMENSIONLESS)

```
DRMM.K=TABHL(DRMMT,MSL.K*DRMS,0,5,.5)                    11,A

DRMMT=2/1.4/1/.8/.7/.6/.53/.5/.5/.5/.5                   11.1,T

DRMS=1                                                   11.2,C
```

DRMM - DEATH-RATE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)
DRMMT - DEATH-RATE-FROM-MATERIAL-MULTIPLIER TABLE
MSL - MATERIAL STANDARD OF LIVING (DIMENSIONLESS)
DRMS - DEATH-RATE-FROM-MATERIAL SENSITIVITY (DIMENSIONLESS)

```
DRPM.K=TABLE(DRPMT,POLR.K,0,30,5)                              12,A

DRPMT=.98/1.1/1.3/1.6/2.1/2.8/4                                12.1,T

    DRPM  - DEATH-RATE-FROM-POLLUTION MULTIPLIER
            (DIMENSIONLESS)
    DRPMT - DEATH-RATE-FROM-POLLUTION-MULTIPLIER TABLE
    POLR  - POLLUTION RATIO (DIMENSIONLESS)

DRFM.K=TABHL(DRFMT,FR.K,0,2,.25)                               13,A

DRFMT=30/3/2/1.4/1/.7/.6/.5/.5                                 13.1,T

    DRFM  - DEATH-RATE-FROM-FOOD MULTIPLIER
            (DIMENSIONLESS)
    DRFMT - DEATH-RATE-FROM-FOOD-MULTIPLIER TABLE
    FR    - FOOD RATIO (DIMENSIONLESS)

DRCM.K=TABLE(DRCMT,CR.K,0,5,1)                                 14,A

DRCMT=1/1.1/1.3/1.6/2.1/3                                      14.1,T

    DRCM  - DEATH-RATE-FROM-CROWDING MULTIPLIER
            (DIMENSIONLESS)
    DRCMT - DEATH-RATE-FROM-CROWDING-MULTIPLIER TABLE
    CR    - CROWDING RATIO (DIMENSIONLESS)

CR.K=(P.K)/(LA*PDN)                                            15,A

LA=135E6                                                       15.1,C

PDN=26.5                                                       15.2,C

    CR    - CROWDING RATIO (DIMENSIONLESS)
    P     - POPULATION (PEOPLE)
    LA    - LAND AREA (SQUARE KILOMETERS)
    PDN   - POPULATION DENSITY NORMAL (PEOPLE/SQUARE
            KILOMETER)

BRCM.K=TABLE(BRCMT,CR.K,0,5,1)                                 16,A

BRCMT=1/.95/.8/.7/.65/.65                                      16.1,T

    BRCM  - BIRTH-RATE-FROM-CROWDING MULTIPLIER
            (DIMENSIONLESS)
    BRCMT - BIRTH-RATE-FROM-CROWDING-MULTIPLIER TABLE
    CR    - CROWDING RATIO (DIMENSIONLESS)
```

```
BRFM.K=TABHL(BRFMT,FR.K,0,4,1)                                    17,A

BRFMT=0/1/1.6/1.9/2                                               17.1,T

    BRFM  - BIRTH-RATE-FROM-FOOD MULTIPLIER
            (DIMENSIONLESS)
    BRFMT - BIRTH-RATE-FROM-FOOD-MULTIPLIER TABLE
    FR    - FOOD RATIO (DIMENSIONLESS)

BRPM.K=TABLE(BRPMT,POLR.K,0,30,5)                                 18,A

BRPMT=1/.97/.92/.82/.72/.6/.4                                     18.1,T

    BRPM  - BIRTH-RATE-FROM-POLLUTION MULTIPLIER
            (DIMENSIONLESS)
    BRPMT - BIRTH-RATE-FROM-POLLUTION-MULTIPLIER TABLE
    POLR  - POLLUTION RATIO (DIMENSIONLESS)

FR.K=(FPCI.K)(FCM.K)(FPM.K)                                       19,A

    FR    - FOOD RATIO (DIMENSIONLESS)
    FPCI  - FOOD POTENTIAL FROM CAPITAL INVESTMENT
            (DIMENSIONLESS)
    FCM   - FOOD-CROWDING MULTIPLIER (DIMENSIONLESS)
    FPM   - FOOD-FROM-POLLUTION MULTIPLIER
            (DIMENSIONLESS)

FCM.K=TABLE(FCMT,CR.K,0,5,1)                                      20,A

FCMT=2.4/1/.6/.4/.3/.2                                            20.1,T

    FCM   - FOOD-CROWDING MULTIPLIER (DIMENSIONLESS)
    FCMT  - FOOD-CROWDING-MULTIPLIER TABLE
    CR    - CROWDING RATIO (DIMENSIONLESS)

FPCI.K=TABHL(FPCIT,CIRA.K,0,6,1)                                  21,A

FPCIT=.5/1/1.4/1.7/1.9/2.05/2.2                                   21.1,T

    FPCI  - FOOD POTENTIAL FROM CAPITAL INVESTMENT
            (DIMENSIONLESS)
    FPCIT - FOOD-POTENTIAL-FROM-CAPITAL-INVESTMENT
            TABLE
    CIRA  - CAPITAL INVESTMENT RATIO IN AGRICULTURE
            (CAPITAL UNITS/PERSON)
```

```
CIRA.K=(CIR.K)(CIAF.K)/CIAFN                                    22,A

CIAFN=.3                                                        22.1,C
```

CIRA - CAPITAL INVESTMENT RATIO IN AGRICULTURE (CAPITAL UNITS/PERSON)
CIR - CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)
CIAF - CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION (DIMENSIONLESS)
CIAFN - CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION NORMAL (DIMENSIONLESS)

```
CIR.K=CI.K/P.K                                                  23,A
```

CIR - CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)
CI - CAPITAL INVESTMENT (CAPITAL UNITS)
P - POPULATION (PEOPLE)

```
CI.K=CI.J+(DT)(CIG.JK-CID.JK)                                   24,L

CI=CII                                                          24.1,N

CII=.4E9                                                        24.2,C
```

CI - CAPITAL INVESTMENT (CAPITAL UNITS)
CIG - CAPITAL-INVESTMENT GENERATION (CAPITAL UNITS/YEAR)
CID - CAPITAL-INVESTMENT DISCARD (CAPITAL UNITS/YEAR)
CII - CAPITAL INVESTMENT, INITIAL (CAPITAL UNITS)

```
CIG.KL=(P.K)(CIPC.K)(CLIP(CIGC,CIGC1,SWT4,TIME.K))              25,R

CIGC=1                                                          25.1,C

CIGC1=1                                                         25.2,C

SWT4=1970                                                       25.3,C
```

CIG - CAPITAL-INVESTMENT GENERATION (CAPITAL UNITS/YEAR)
P - POPULATION (PEOPLE)
CIPC - CAPITAL INVESTMENT PER CAPITA (CAPITAL UNITS/PERSON/YEAR)
CIGC - CAPITAL-INVESTMENT-GENERATION COEFFICIENT (DIMENSIONLESS)
CIGC1 - CAPITAL-INVESTMENT-GENERATION COEFFICIENT NO. 1 (DIMENSIONLESS)
SWT4 - SWITCH TIME NO. 4 FOR CIGC (YEARS)

```
CIPC.K=TABHL(CIPCT,MSL.K,0,5,1)                                    26,A

CIPCT=.005/.05/.09/.12/.14/.15                                     26.1,T

    CIPC  - CAPITAL INVESTMENT PER CAPITA (CAPITAL
            UNITS/PERSON/YEAR)
    CIPCT - CAPITAL-INVESTMENT-PER-CAPITA TABLE
    MSL   - MATERIAL STANDARD OF LIVING (DIMENSIONLESS)

CID.KL=(CI.K)(CLIP(CIDN,CIDN1,SWT5,TIME.K))                        27,R

CIDN=.025                                                          27.1,C

CIDN1=.025                                                         27.2,C

SWT5=1970                                                          27.3,C

    CID   - CAPITAL-INVESTMENT DISCARD (CAPITAL UNITS/
            YEAR)
    CI    - CAPITAL INVESTMENT (CAPITAL UNITS)
    CIDN  - CAPITAL-INVESTMENT DISCARD NORMAL
            (FRACTION/YEAR)
    CIDN1 - CAPITAL-INVESTMENT DISCARD NORMAL NO. 1
            (FRACTION/YEAR)
    SWT5  - SWITCH TIME NO. 5 FOR CIDN (YEARS)

FPM.K=TABLE(FPMT,POLR.K,0,30,5)                                    28,A

FPMT=1/.95/.87/.77/.65/.5/.32                                      28.1,T

    FPM   - FOOD-FROM-POLLUTION MULTIPLIER
            (DIMENSIONLESS)
    FPMT  - FOOD-FROM-POLLUTION-MULTIPLIER TABLE
    POLR  - POLLUTION RATIO (DIMENSIONLESS)

POLR.K=POL.K/POLS                                                  29,A

POLS=3.6E9                                                         29.1,C

    POLR  - POLLUTION RATIO (DIMENSIONLESS)
    POL   - POLLUTION (POLLUTION UNITS)
    POLS  - POLLUTION STANDARD (POLLUTION UNITS)

POL.K=POL.J+(DT)(POLG.JK-POLA.JK)                                  30,L

POL=POLI                                                           30.1,N

POLI=.2E9                                                          30.2,C

    POL   - POLLUTION (POLLUTION UNITS)
    POLG  - POLLUTION GENERATION (POLLUTION UNITS/YEAR)
    POLA  - POLLUTION ABSORPTION (POLLUTION UNITS/YEAR)
    POLI  - POLLUTION, INITIAL (POLLUTION UNITS)
```

```
POLG.KL=(P.K)(CLIP(POLN,POLN1,SWT6,TIME.K))(POLCM.K)      31,R

POLN=1                                                    31.1,C

POLN1=1                                                   31.2,C

SWT6=1970                                                 31.3,C
```

POLG - POLLUTION GENERATION (POLLUTION UNITS/YEAR)
P - POPULATION (PEOPLE)
POLN - POLLUTION NORMAL (POLLUTION UNITS/PERSON/YEAR)
POLN1 - POLLUTION NORMAL NO. 1 (POLLUTION UNITS/PERSON/YEAR)
SWT6 - SWITCH TIME NO. 6 FOR POLN (YEARS)
POLCM - POLLUTION-FROM-CAPITAL MULTIPLIER (DIMENSIONLESS)

```
POLCM.K=TABHL(POLCMT,CIR.K,0,5,1)                         32,A

POLCMT=.05/1/3/5.4/7.4/8                                  32.1,T
```

POLCM - POLLUTION-FROM-CAPITAL MULTIPLIER (DIMENSIONLESS)
POLCMT- POLLUTION-FROM-CAPITAL-MULTIPLIER TABLE
CIR - CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)

```
POLA.KL=POL.K/POLAT.K                                     33,R
```

POLA - POLLUTION ABSORPTION (POLLUTION UNITS/YEAR)
POL - POLLUTION (POLLUTION UNITS)
POLAT - POLLUTION-ABSORPTION TIME (YEARS)

```
POLAT.K=TABLE(POLATT,POLR.K,0,30,5)                       34,A

POLATT=1/1.4/2.4/3.6/5.2/7.2/10                           34.1,T
```

POLAT - POLLUTION-ABSORPTION TIME (YEARS)
POLATT- POLLUTION-ABSORPTION-TIME TABLE
POLR - POLLUTION RATIO (DIMENSIONLESS)

```
CIAF.K=CIAF.J+(DT/CIAFT)(CFIFR.J*CIQR.J-CIAF.J)          35,L

CIAF=CIAFI                                               35.1,N

CIAFI=.3                                                 35.2,C

CIAFT=15                                                 35.3,C
```

CIAF - CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION (DIMENSIONLESS)
CIAFT - CAPITAL-INVESTMENT-IN-AGRICULTURE-FRACTION ADJUSTMENT TIME (YEARS)
CFIFR - CAPITAL FRACTION INDICATED BY FOOD RATIO (DIMENSIONLESS)
CIQR - CAPITAL-INVESTMENT-FROM-QUALITY RATIO (DIMENSIONLESS)
CIAFI - CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION, INITIAL (DIMENSIONLESS)

```
CFIFR.K=TABLE(CFIFRT,FR.K,0,2,.5)                        36,A

CFIFRT=1/.6/.3/.15/.1                                    36.1,T
```

CFIFR - CAPITAL FRACTION INDICATED BY FOOD RATIO (DIMENSIONLESS)
CFIFRT- CAPITAL-FRACTION-INDICATED-BY-FOOD-RATIO TABLE
FR - FOOD RATIO (DIMENSIONLESS)

```
QL.K=(QLS)(QLM.K)(QLC.K)(QLF.K)(QLP.K)                   37,S

QLS=1                                                    37.1,C
```

QL - QUALITY OF LIFE (SATISFACTION UNITS)
QLS - QUALITY-OF-LIFE STANDARD (SATISFACTION UNITS)
QLM - QUALITY OF LIFE FROM MATERIAL (DIMENSIONLESS)
QLC - QUALTIY OF LIFE FROM CROWDING (DIMENSIONLESS)
QLF - QUALITY OF LIFE FROM FOOD (DIMENSIONLESS)
QLP - QUALITY OF LIFE FROM POLLUTION (DIMENSIONLESS)

```
QLM.K=TABHL(QLMT,MSL.K,0,5,1)                            38,A

QLMT=.2/1/1.7/2.3/2.7/2.9                                38.1,T
```

QLM - QUALITY OF LIFE FROM MATERIAL (DIMENSIONLESS)
QLMT - QUALITY-OF-LIFE-FROM-MATERIAL TABLE
MSL - MATERIAL STANDARD OF LIVING (DIMENSIONLESS)

```
QLC.K=TABLE(QLCT,CR.K,0,5,.5)                                    39,A

QLCT=2/1.3/1/.75/.55/.45/.38/.3/.25/.22/.2                       39.1,T

    QLC   - QUALTIY OF LIFE FROM CROWDING
            (DIMENSIONLESS)
    QLCT  - QUALITY-OF-LIFE-FROM-CROWDING TABLE
    CR    - CROWDING RATIO (DIMENSIONLESS)

QLF.K=TABHL(QLFT,FR.K,0,4,1)                                     40,A

QLFT=0/1/1.8/2.4/2.7                                             40.1,T

    QLF   - QUALITY OF LIFE FROM FOOD (DIMENSIONLESS)
    QLFT  - QUALITY-OF-LIFE-FROM-FOOD TABLE
    FR    - FOOD RATIO (DIMENSIONLESS)

QLP.K=TABLE(QLPT,POLR.K,0,30,5)                                  41,A

QLPT=1.1/1/.88/.71/.55/.35/.12                                   41.1,T

    QLP   - QUALITY OF LIFE FROM POLLUTION
            (DIMENSIONLESS)
    QLPT  - QUALITY-OF-LIFE-FROM-POLLUTION TABLE
    POLR  - POLLUTION RATIO (DIMENSIONLESS)

NRMM.K=TABHL(NRMMT,MSL.K,0,10,1)                                 42,A

NRMMT=0/1/1.8/2.4/2.9/3.3/3.6/3.8/3.9/3.95/4                     42.1,T

    NRMM  - NATURAL-RESOURCE-FROM-MATERIAL MULTIPLIER
            (DIMENSIONLESS)
    NRMMT - NATURAL-RESOURCE-FROM-MATERIAL-MULTIPLIER
            TABLE
    MSL   - MATERIAL STANDARD OF LIVING (DIMENSIONLESS)

CIQR.K=TABHL(CIQRT,QLM.K/QLF.K,0,2,.5)                           43,A

CIQRT=.7/.8/1/1.5/2                                              43.1,T

    CIQR  - CAPITAL-INVESTMENT-FROM-QUALITY RATIO
            (DIMENSIONLESS)
    CIQRT - CAPITAL-INVESTMENT-FROM-QUALITY-RATIO TABLE
    QLM   - QUALITY OF LIFE FROM MATERIAL
            (DIMENSIONLESS)
    QLF   - QUALITY OF LIFE FROM FOOD (DIMENSIONLESS)
```