You cannot solve the problem with the same thinking that created the problem *Albert Einstein*

Systemic Approach to Sustainable Development Strategies and Food Security

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INTEGRATED DEVELOPMENT MODEL

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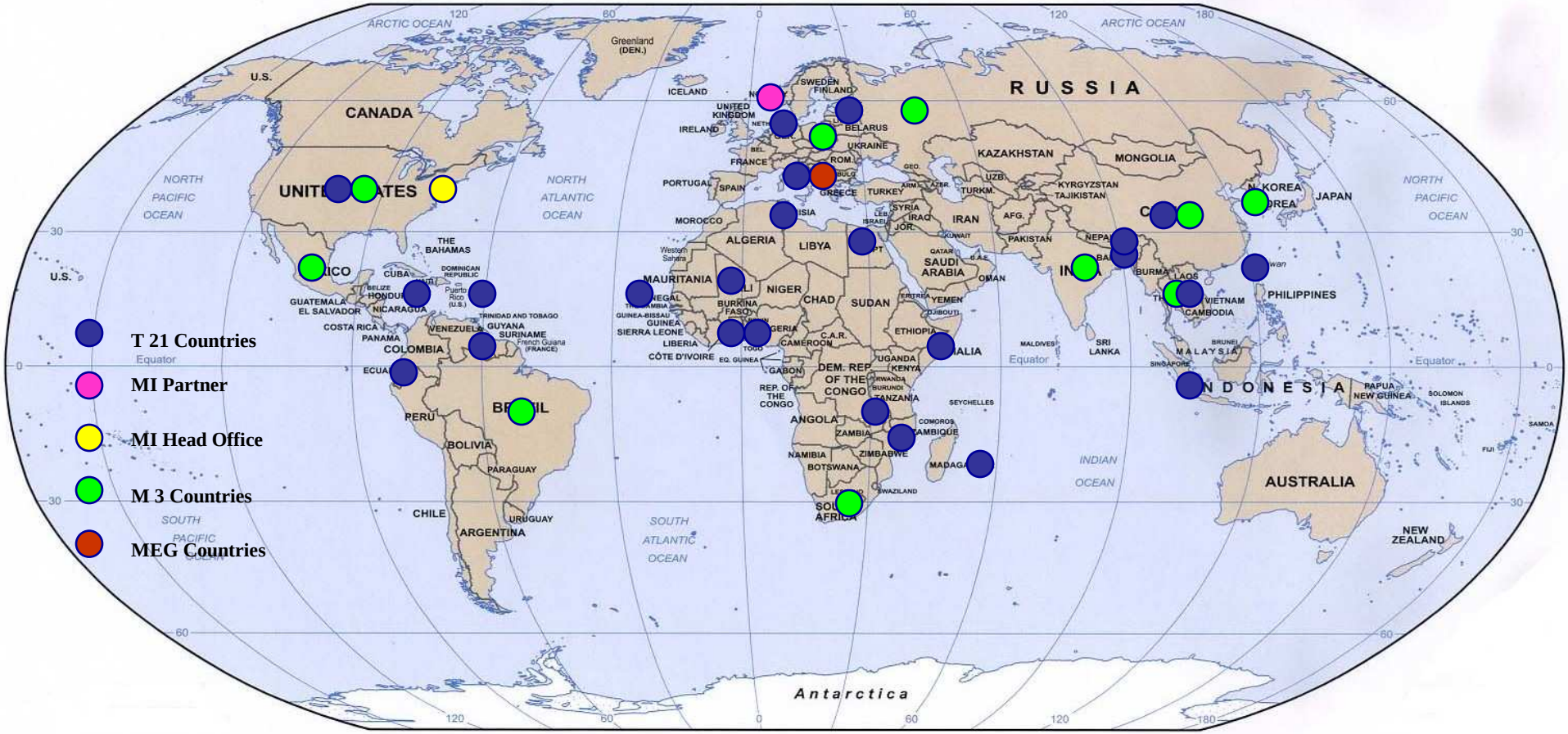
The Millennium Institute

- MI was established in 1983 to promote holistic, long-term strategic planning based on lessons learned in **Global 2000**
- MI's Vision is a world where decision makers apply knowledge and a systemic approach to bring about a sustainable, equitable, and peaceful society
- MI's Mission is to achieve this by
  - Enabling decision makers to use system dynamics tools to analyze and understand the links between the economy, society, and environment and the links with peace and security
  - Increasing their capacity to design and implement sustainable policies
  - Building capacity in countries to use these tools
  - Playing a catalytic role in creating a global network of system thinkers to help solve critical 21st century challenges

Our Areas of Expertise

- Climate Change Mitigation and Adaptation
- Food Security
- Energy Security
- Population dynamics and education
- Poverty reduction, MDGs, Malaria, HIV/AIDS
- Natural disasters and External shocks
- Sustainable Development and the Green Economy
- Business and Industry
- More Peace and Security being included

MI Around the World



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Toward Sustainable Development

- Human survival depends on natural resources and ecosystems
- In the 21st Century, we have passed the limits of environmental sustainability
- Climate change is a major example of the risks we face
- Food, water, and energy security, and protecting our eco-systems are essential for sustainability
- Continuing business-as-usual will greatly exceed the Earth's capacity and is not sustainable
- We need to make transformations at all levels in order to assure sustainability for our children and theirs

Challenges to Address

- Taking account of the vital interactions among the Economic, Environmental, and Social factors is essential
- Managing energy and natural resources is essential for economic and social progress
- Enabling social structures and governance to function equitably and assure peace is necessary
- Social and environmental services to reduce poverty and provide food security are needed, as well economic growth

To Deal with These Challenges

- Understand real relations in the situations we face, within and beyond economics
- Take account of interactions and feedback loops across different sectors and from different policies
- Manage depletion of natural capital and investment in human and appropriate physical capital
- Take account of longer term effects of policies

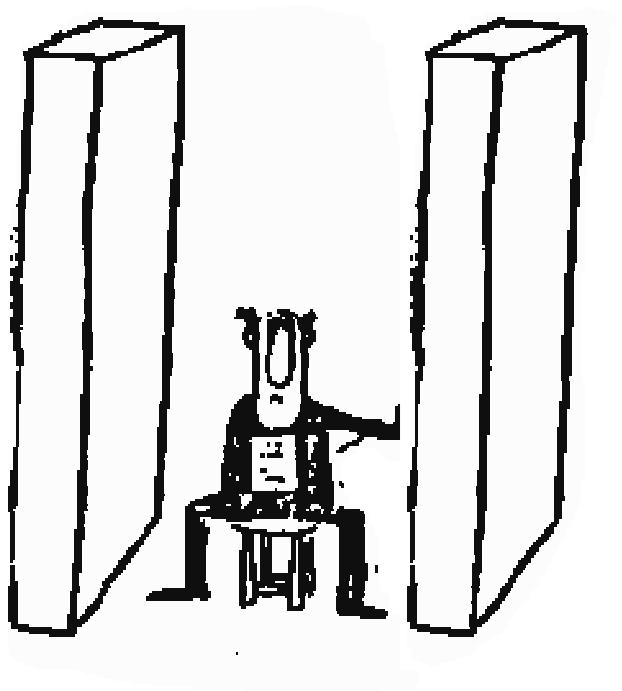
Limits of Normal Tools

- Conventional models focus on sector specific and beneficial economic results, assuming markets work
- They are short term or comparative static, and focus on direct causation, not indirect causes
- They don't include the environment or social externalities or equity
- A more comprehensive approach is needed

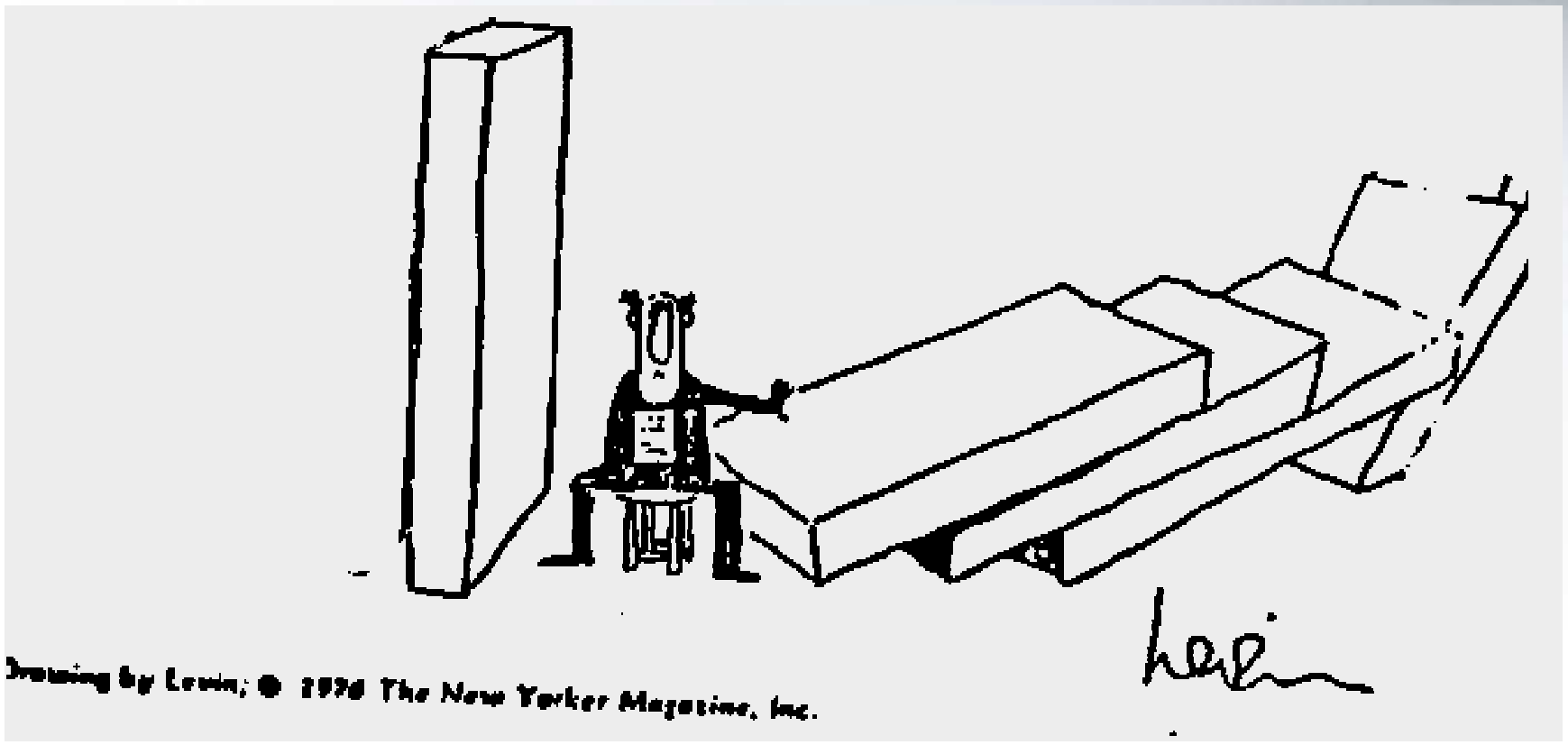
A Systemic Approach Works

- It takes account of the causal relations among economic, social, and environmental issues comprehensively
- It can incorporate any factor considered important
- It illustrates how activities in any sector can affect other sectors: directly and indirectly -- good and bad
- It takes account of lags before impacts are likely to become evident, which is not certain and may take many years

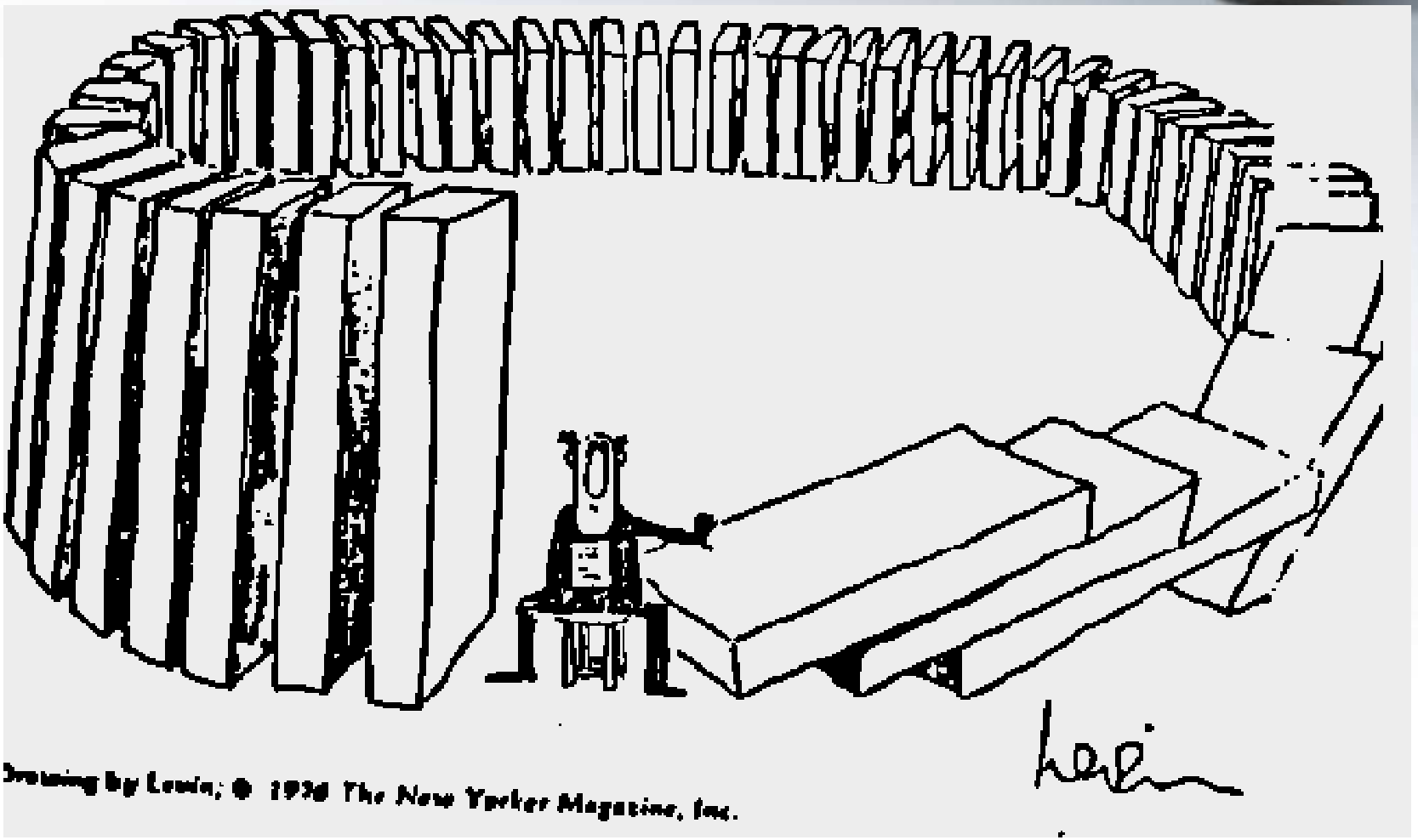
Why Take a Systemic View?



We Need to be Careful



To Avoid Unexpected Results!



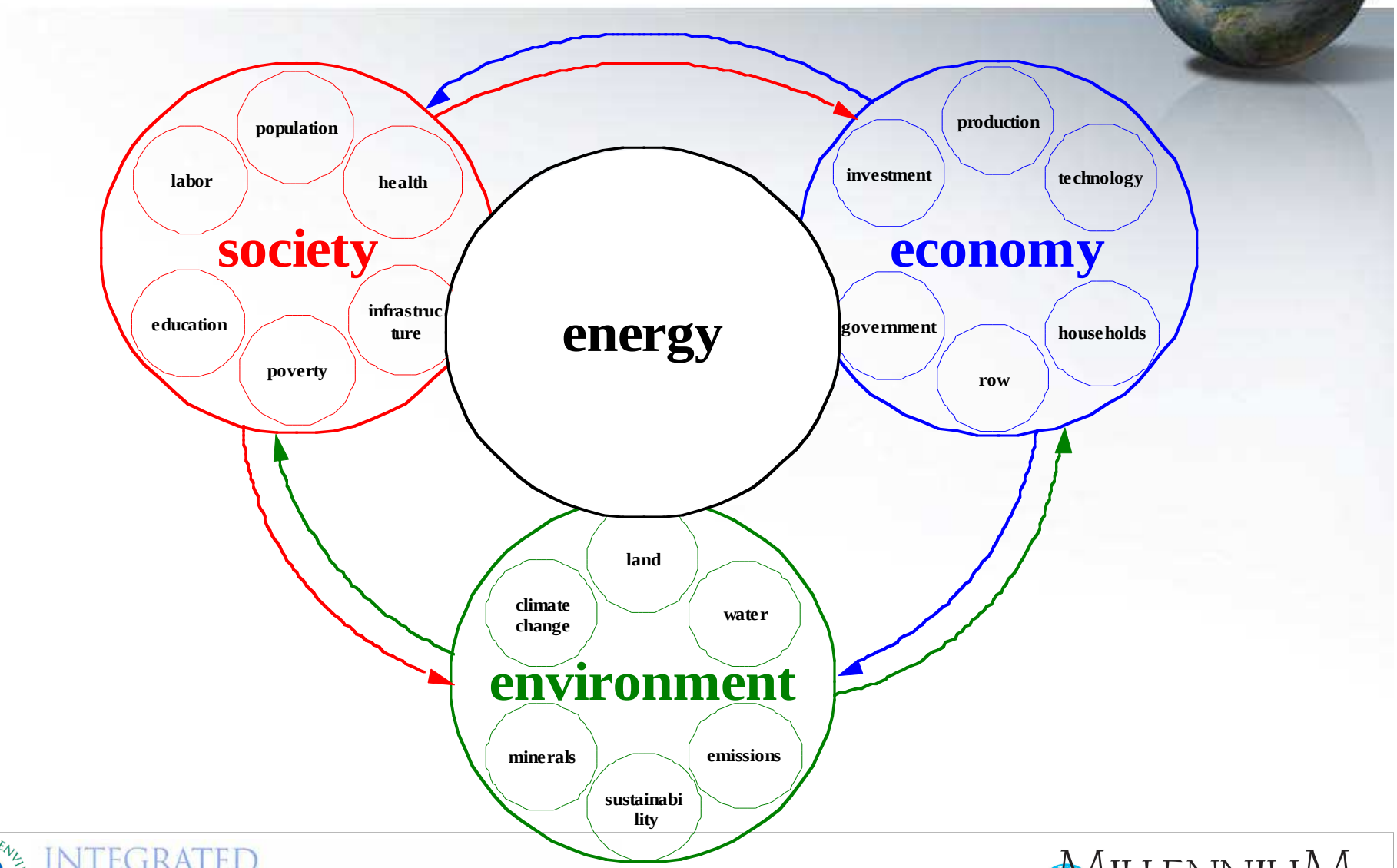
The Threshold 21 Model

- System dynamics methodology
  - Based on existing information and sector analyses
  - Reflects observed real world relations
  - Analyzes cross-sector links and feedback loops
- Composed of three main pillars
  - Economic -- SAM, key market balances, production in 3+ sectors, energy, government budgets, technology
  - Social -- dynamics in population, health, HIV/AIDS, education, employment, poverty, income distribution
  - Environmental – Land, water, minerals, GHG and other pollution, and country-specific issues and information

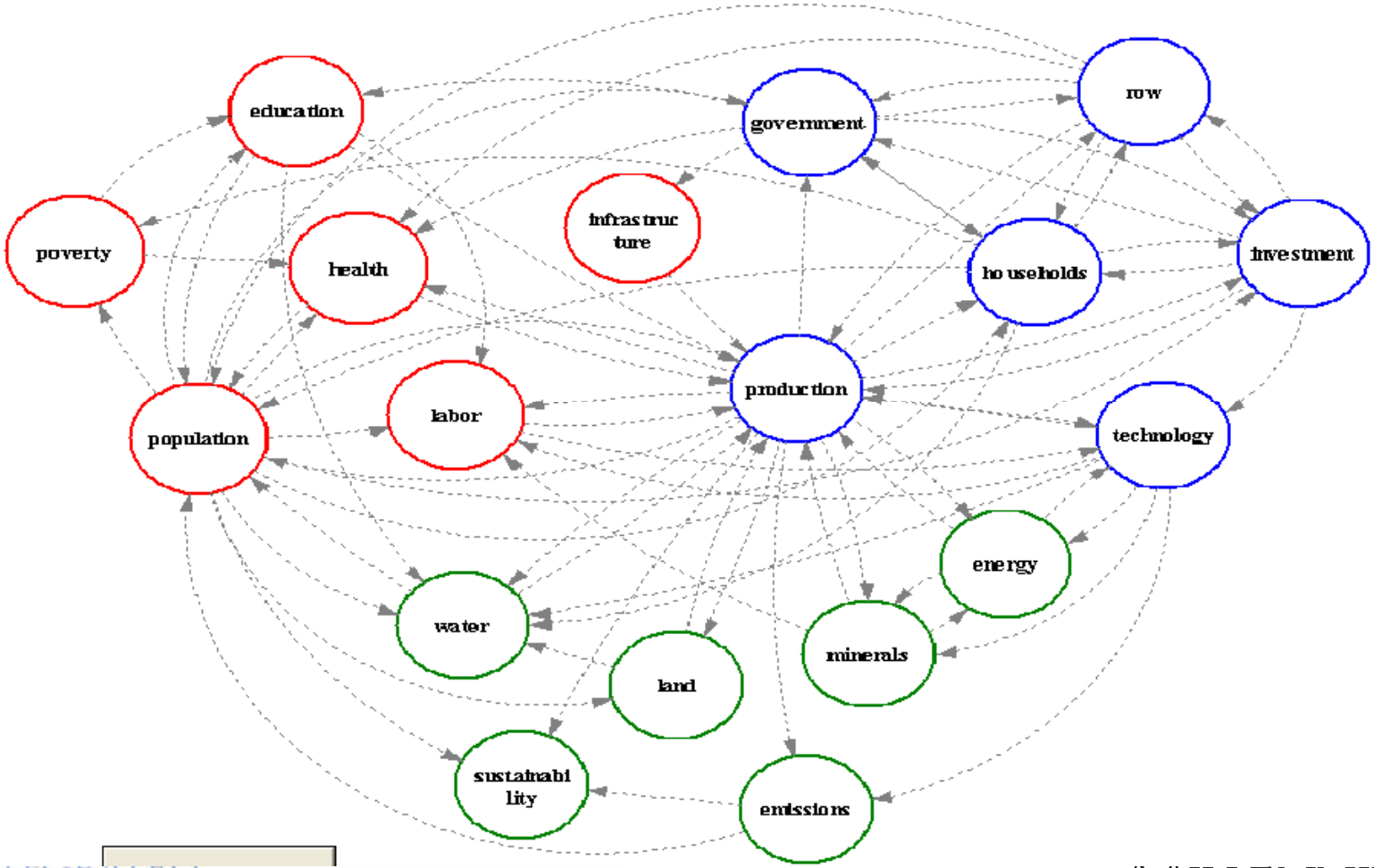
T21 Characteristics

- Adapted to priority goals and vision for each individual target area based on available data, structure, and patterns of activity
- Highlights inter-sectoral feedbacks
- Tracks progress on MDGs and other indicators -- can add SDGs
- Calibrated against history to provide reality checks
- Generates multiple medium-to-long-term scenarios
- Transparent and easy to use

The Basic T21 Structure



The Key Connections in T21



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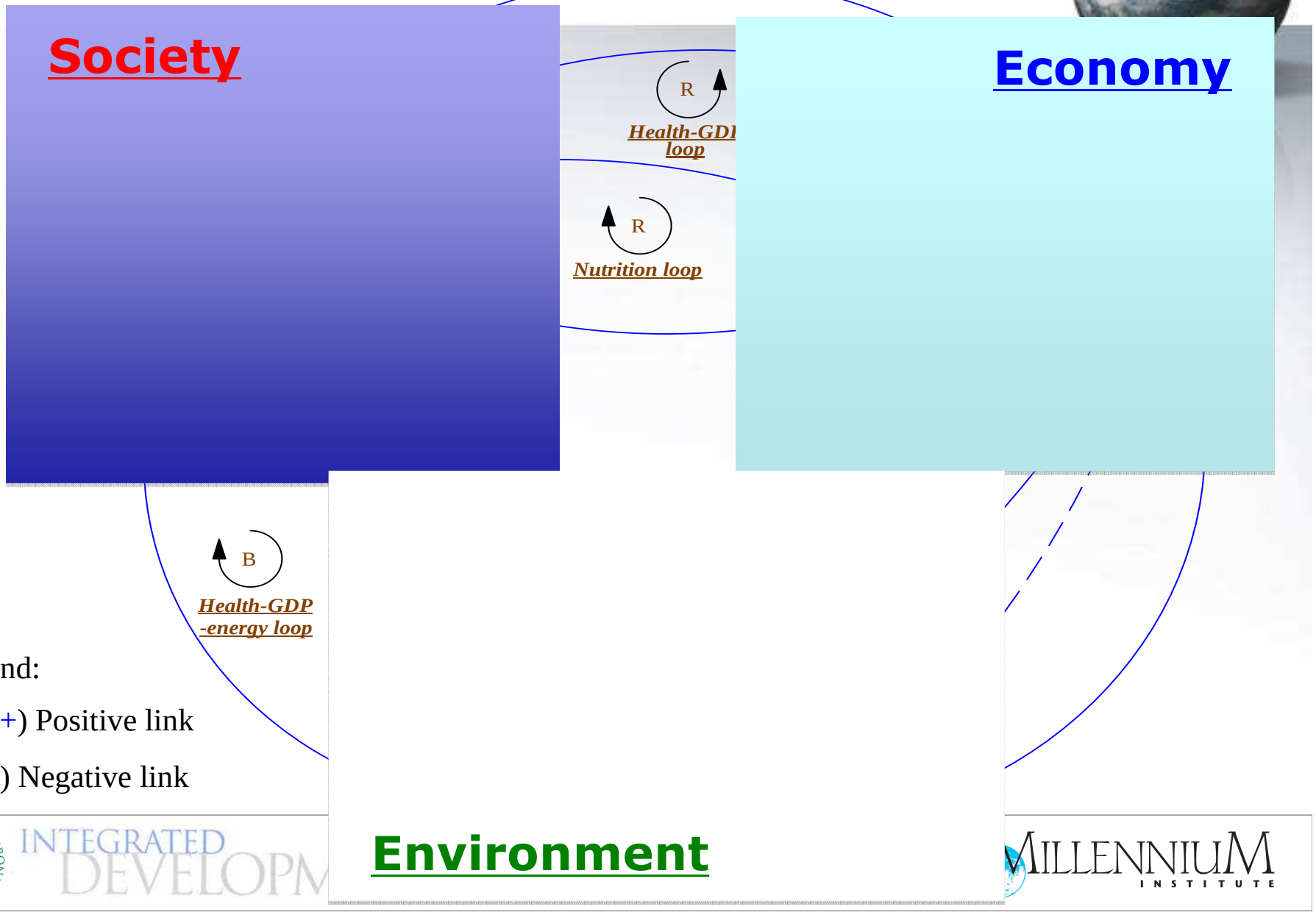
Causal Link Approach



Legend:

➡ (+) Positive link

⇢ (-) Negative link

Application of T21

- Generate scenarios to examine and compare effects of
  - different green economy, food security, and other policies
  - different assumptions about CC and other factors
  - how longer terms benefits can be managed and negative feedbacks mitigated
- Compare results to demonstrate which sets of policies can be most effective across all three pillars
- Identify emerging risks and tipping points to be taken account of
- Build broad stakeholder support for approaches by involving them in the process and demonstrating results
- Establish milestones for monitoring and evaluation of progress

Examples of T21 Work

- China Model and GHG emissions
- Jamaica Model and Natural disasters
- Bhutan on equitable distribution of public expenditures
- Mozambique and HIV/AIDS
- UNEP on the Green Economic Report
- Dealing with Agriculture more extensively, Mongolia, Barilla, Kenya

Demonstration of T21

Addressing UN DESA Issues

- T21 includes much on food production, consumption and security,
- Considers agriculture sustainability, dependence on other resources, GHG emissions, etc.
- It is extending to ecosystem management, resource sustainability, climate adaptation for food security, and other factors,
- It can be further extended to include nutritional levels, urbanization impacts, and any other quantifiable factor

Steps for UN DESA Project

- Identify key issues to address for food security
- Develop appropriate causal relations within agricultural sector and with others
- Gather the needed data and calibrate the model
- Generate scenarios to illustrate the results of different policies compared to BAU
- Use model results to support DESA analysis and policy recommendations

Agriculture in T21

- Subsectors for crops, livestock, and fisheries
- Relations to other sectors, water, industry, population, forestry, and GHG emissions
- Shifting consumption, e,g, less meat
- Inclusion of nutrition in population dynamics, labor productivity, urbanization
- Major shifts in agriculture to adapt to climate change and assure sustainability

GER Agriculture results

Year		2011	2030					2050				
Scenario	Unit	BAU	a) BAU 2	a) BAU1	BAU	G1	G2	BAU2	BAU1	BAU	G1	G2
Agricultural sector variables												
Crop production	Bn $/Yr	629	795	786	752	806	836	913	898	849	941	996
Livestock production	Bn $/Yr	439	588	588	588	589	590	715	716	718	721	726
Employment	M people	1075	1371	1331	1284	1351	1393	1656	1580	1489	1618	1703
b) Soil quality	Dmnl	0.92	0.80	0.82	0.86	0.94	0.97	0.73	0.75	0.81	0.98	1.03
c) Agriculture water use	KM3/Yr	3389	4276	4288	4300	3535	3526	4878	4903	4935	3210	3207
Harvested land	Bn Ha	1.20	1.27	1.27	1.27	1.25	1.25	1.31	1.31	1.31	1.26	1.26
Deforestation	M Ha/Yr	15	22	19	15	7	7	25	21	15	7	7
Calories per capita per day (available for supply)	Kcal/P/D	2787	3050	2973	2840	3001	3093	3273	3178	2981	3238	3382
Calories per capita per day (available for household consumption)	Kcal/P/D	2081	2315	2256	2120	2237	2305	2476	2406	2227	2414	2524

Thank You for Your Attention

Questions and comments are welcome

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What Partners and Clients Are Saying

- "MI's integrated dynamic models have been vital for GM's sales forecasts"

  Paul Ballew, GM

- "MI's long-term, integrated perspective is essential"

  Pablo Guerrero, World Bank

- "MI's T21 analytical tool is essential for effective national development strategies"
  Ed Cain, Carter Center
- Fascinating!

  David Cohen, Counterparts International

- If only we had known such a tool existed….

  Chorus of planning experts from 11 countries in Southern Africa

- We need to use this tool at the Headquarters, in our embassies and help our country partner acquire it…

  Dutch Ambassador Ton Boon von Ochsen

- I want that T 21 planning team in my office…

  Président Amadou T Touré, Mali

- It has been my dream since ten years to get the the POIJ departments to work together…now its happening with T21; With T21 I can see team building and networking across the ministries and government agencies and effective communication

  Wesley Hugh, Director Planning office Jamaica