

# Overview of the Millennium Institute's Threshold 21 iSDG Model and Method

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# Outline

- The System Dynamics method and tradition
- Threshold 21 (T21): National development Planning using system dynamics
- Validation of system dynamics models
- Interconnections of T21 with other models

# System Dynamics

- Three shifts in mind:
  1. To a circular, closed-loop view of causality,
  2. To an internal focus on performance
  3. To an operational view of how things actually work

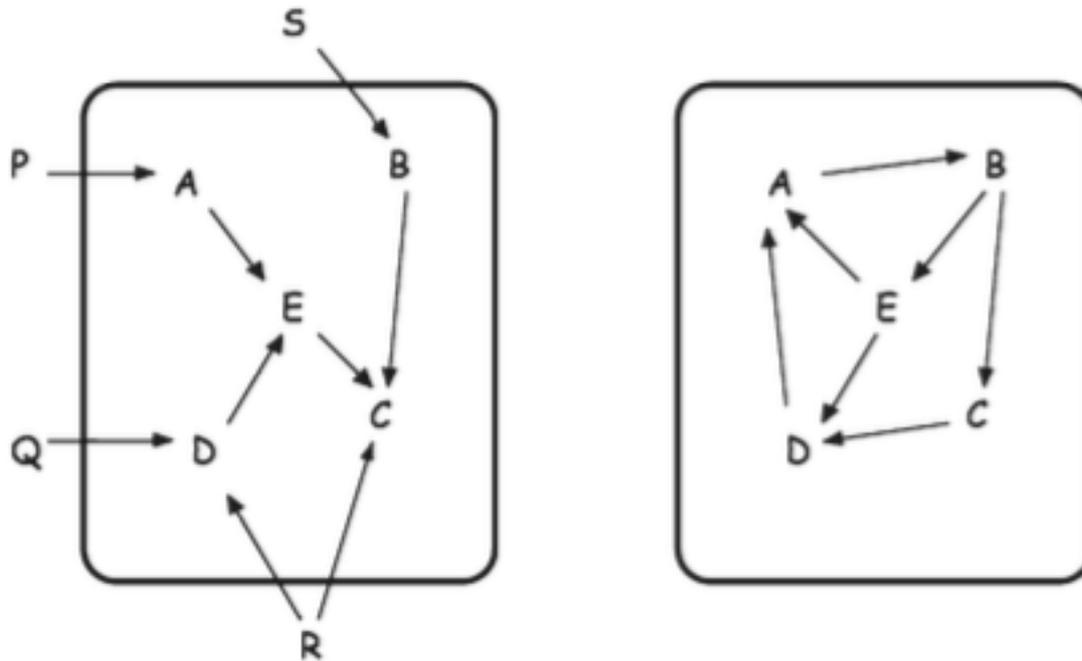
(Barry Richmond)

# Forrester's General Structure of Systems

- Feedback loops as the basic structural elements within the boundary
- Level (rate, stocks) variables, *and*
- Rate (flow) variables

(Forrester, 1969)

Richardson (2011): “the endogenous point of view”



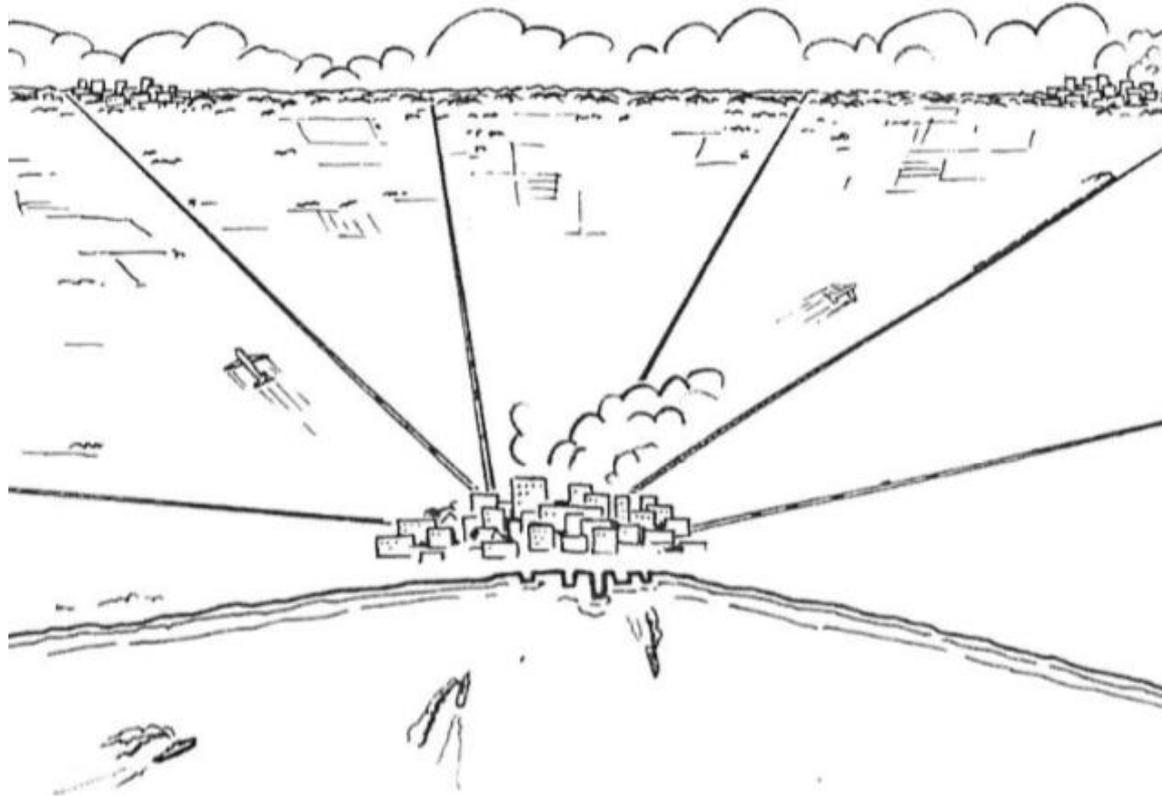


Figure 2-3 The urban area in its limitless environment.

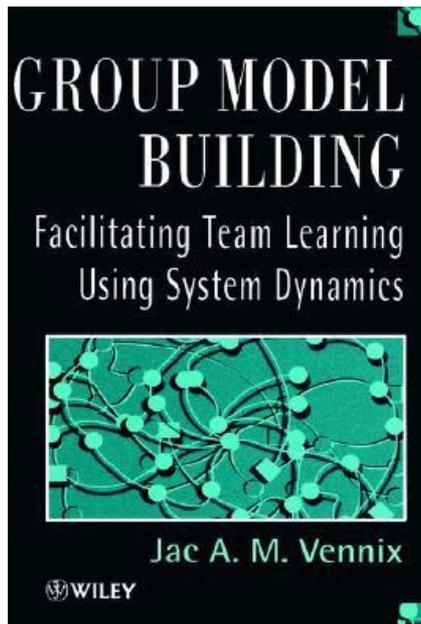
**Forrester, Urban Dynamics, 1969**

	<u>System Dynamics</u>	<u>Econometrics</u>
usual purpose	to improve intuitive understanding of dynamic system properties; to make qualitative long-term forecasts	to predict precise future values of economic variables; to test economic theory
typical time horizon	long	short
	<u>Input-Output</u>	<u>Optimization</u>
	to trace effects of policy or prospective changes through a network of interlocking flows	to choose the optimal policy from a set of alternatives
	short	short

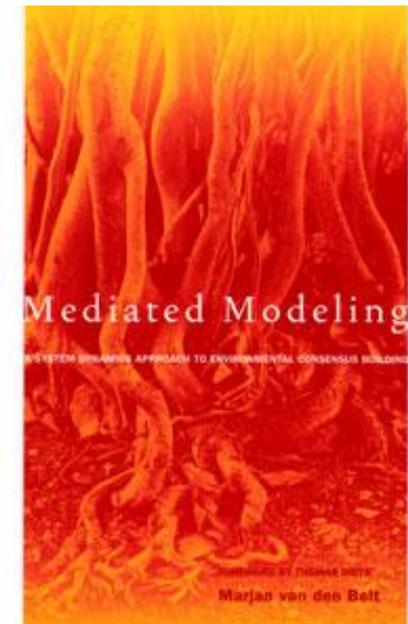
Meadows, 1976

# Participatory Modelling with SD: Group Model Building and Mediated Modelling

**Vennix, 1996**



**van den Belt, 2004**



# iSDG Model

## Integrated Development Planning Tool

*Hans R Herren*

*Matteo Pedercini*

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*Millennium Institute, Washington D.C.*



# T21

INTEGRATED DEVELOPMENT MODEL

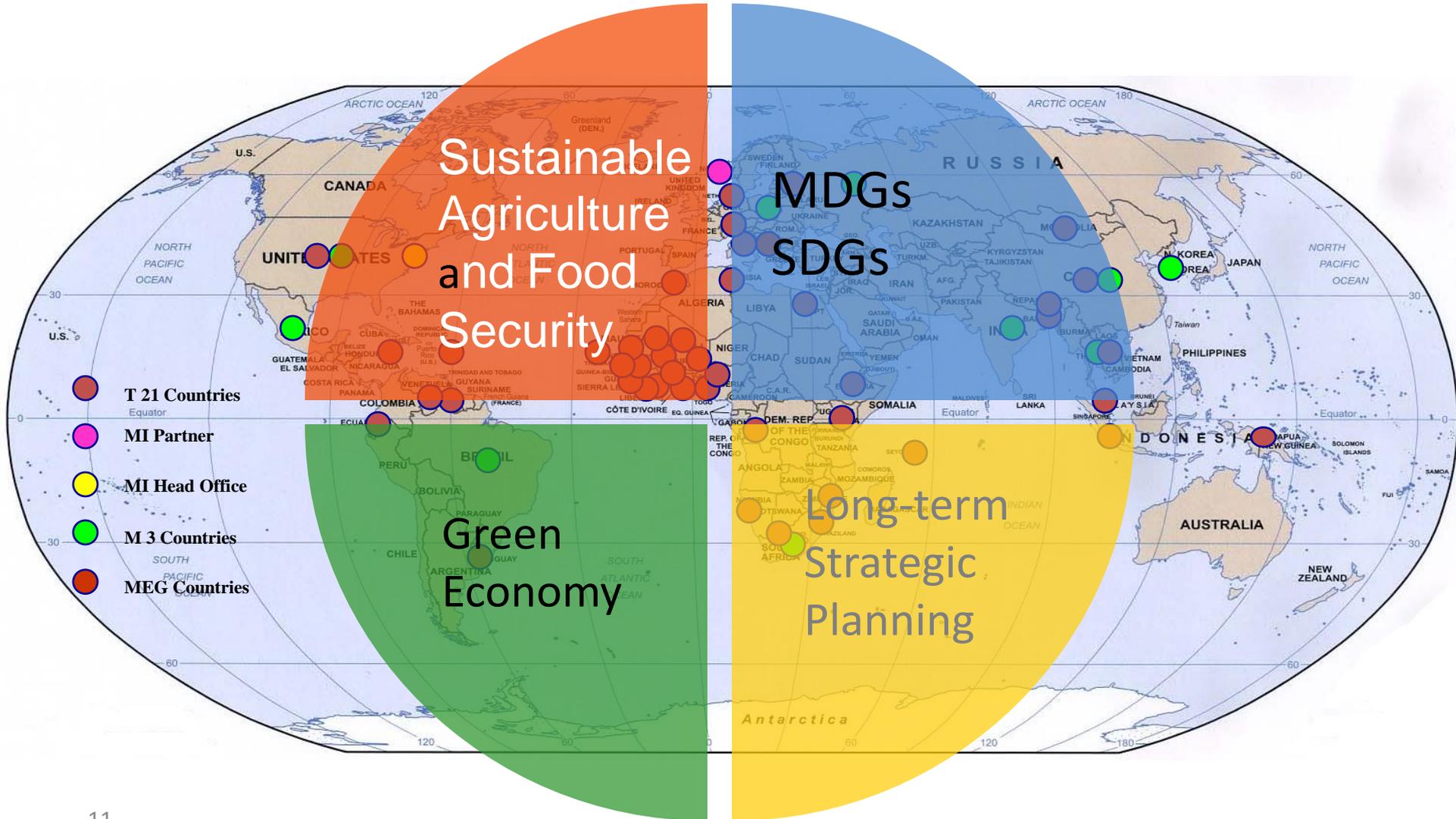


# The Millennium Institute

- **Develop analytical tools** to support strategic planning
- **Build capacity** among users to apply our tools
- **Work with stakeholders** to incorporate their concerns



# Our Work



# iSDG - The Challenge

- Goal 1
- Goal 2
- Goal 3
- Goal 4
- Goal 5
- Goal ...
- Goal 17

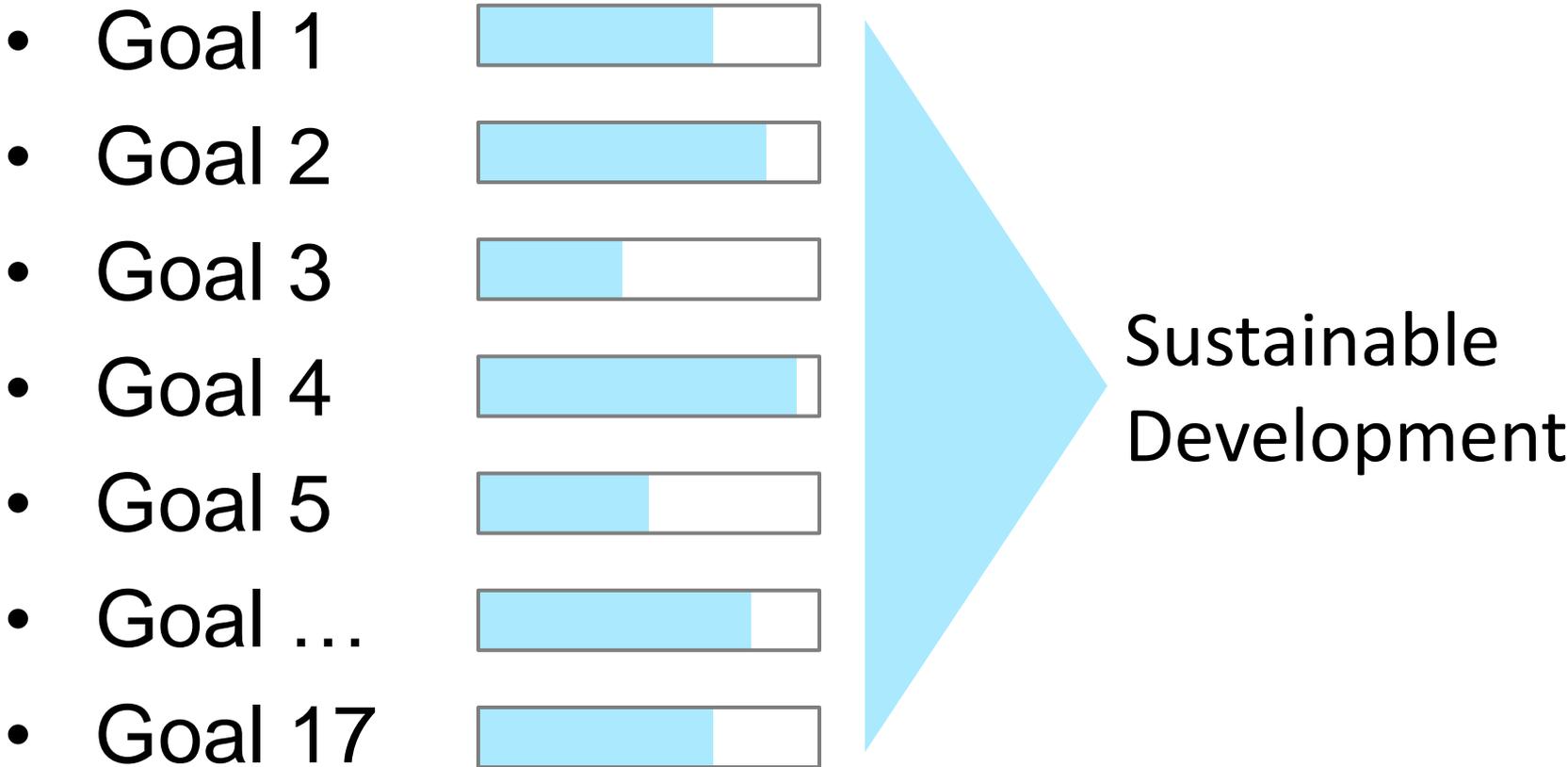
## Resources:

- How much?
- Where?
- When?
- Financing?

Sustainable  
Development

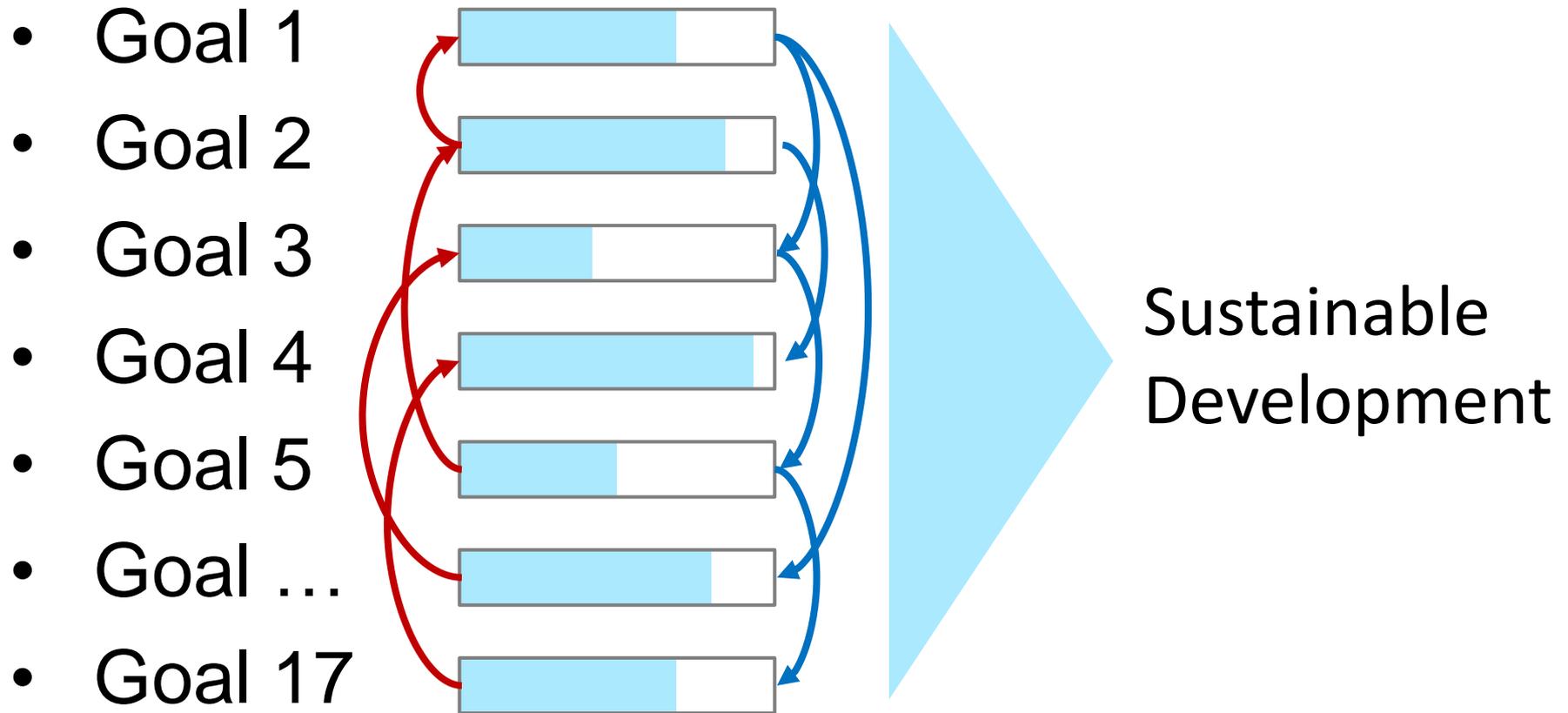
# iSDG – Coherent Framework

## Assess expected performance (BAU)



# iSDG – Sectors' Interactions

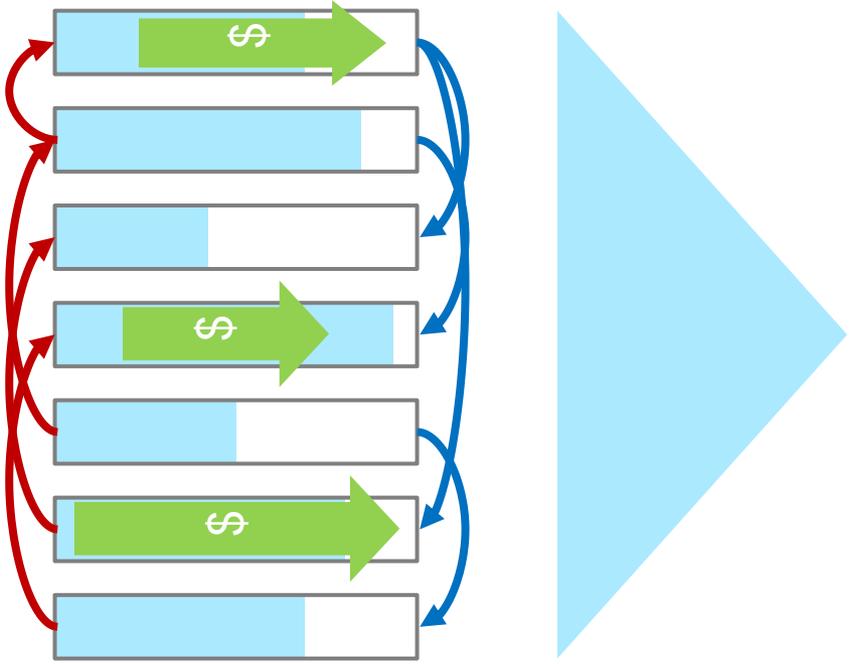
Analyze interactions across sectors



# iSDG – Strategic Planning

Design effective and timely resource allocation and financing strategy

- Goal 1
- Goal 2
- Goal 3
- Goal 4
- Goal 5
- Goal ...
- Goal 17



Sustainable  
Development

# The iSDG Interface



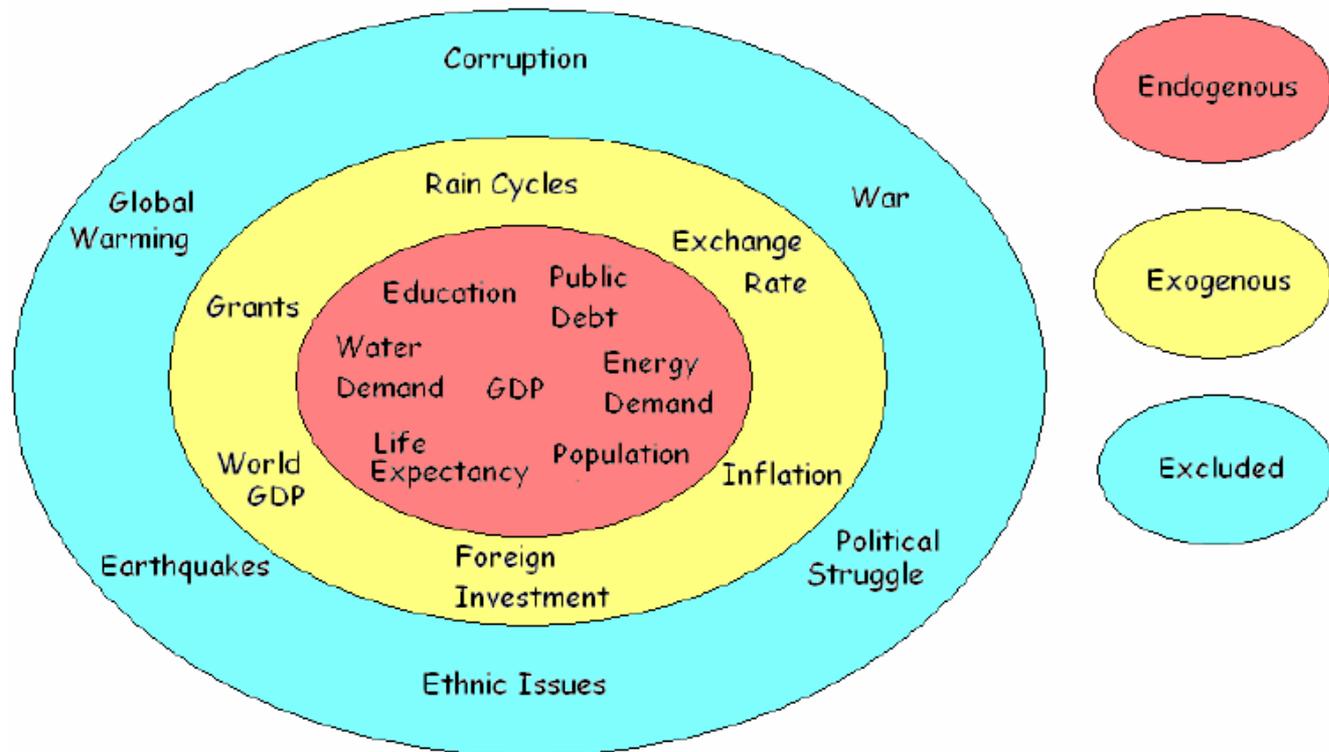


Figure 4: Bull's eye diagram for the Threshold 21 Model (Pederchini, 2007)

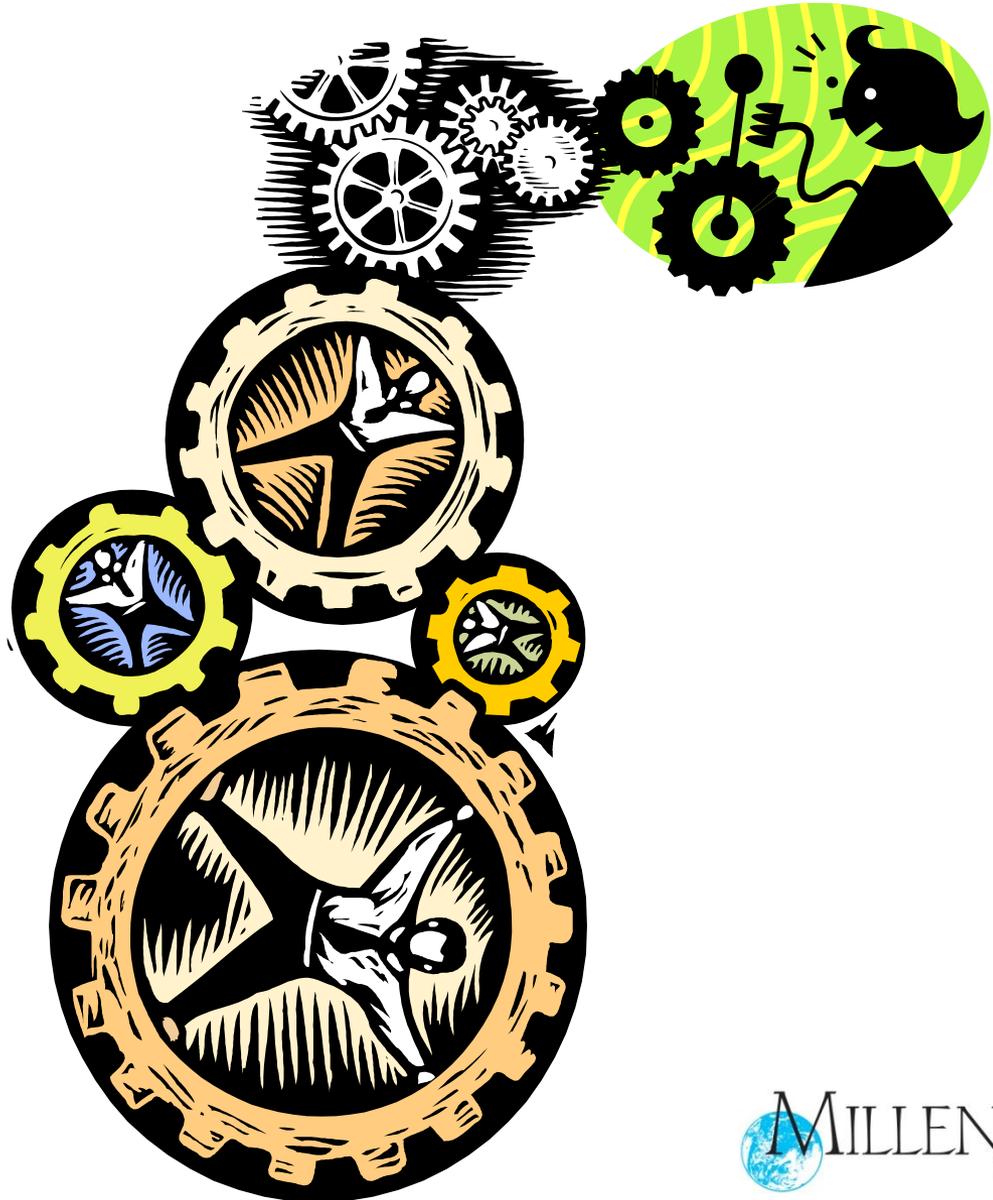
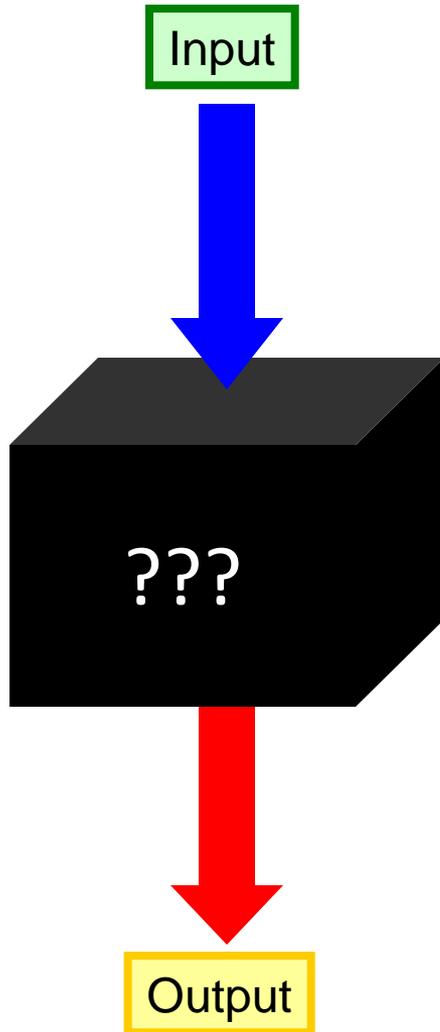
<b>Society</b>	<b>Economy</b>	<b>Environment</b>
1. Population	9. Agriculture	17. Land
1. Fertility	10. Industry	18. Water demand
1. Mortality	11. Services	19. Water Supply
1. Education	12. Aggregate Production and Investment	20. Electricity Demand
1. Health Care	13. Households	21. Electricity Generation
1. Infrastructure	14. Government	22. Fossil Fuel Demand
1. Employment	15. Finance	23. Fossil Fuel Production
1. Poverty	16. Balance of Payments	24. Fossil Fuel Emissions

Table 3: Sectors of the Threshold 21 Tanzania Model

# Modeling Tools for Planning

Method	Time Horizon		
	Short	Medium	Long
Spreadsheet	[Blue gradient bar]		
Macro-econometrics	[Blue gradient bar]		
CGE	[Blue gradient bar]		
<b>Integrated Simulation</b>	[Blue gradient bar] [Red gradient bar] [Green gradient bar]		
Energy Systems	[Green gradient bar]		
Climate-Economy	[Green gradient bar] [Blue gradient bar]		

# Strengths of the Approach



# Validation of System Dynamics Models

- Structure validity
  - Direct structure tests
  - Structure-oriented behavior tests
- Behavior validity
  - Behavior pattern tests

(Barlas, 1996)

# Interconnections with Other Models

- Improve through validation/feedback
- Hybrid models
- Connect national models
- Global models

# iSDG Model

*Thank You for  
Your Time!*

*Questions?*

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Predominant Mode of Analysis

Exogenous Endogenous

Striving for understanding and leverage, but failing ☺☹	Achieving understanding and leverage ☺☺☺
Accepting fate, Predicting, Preparing ☹☹	Confused, Misguided, Misguiding ☹☹☹

Exogenous

Endogenous

True (Predominant) State of Affairs