What are Futures Studies?

Past
Where is the Past? Can we visit it?

Present
Here

Future
Where is the Future? Can we visit it?
What are Futures Studies?

Past

Present

Future

Where is the Past? Can we visit it?

Here

Where is the Future? Can we visit it?
What are Futures Studies?

Four Key Questions to Study Futures

1. Can we predict the future?
   - Earthquakes, March 11, 2011
   - Lehman Shock, Sept. 15, 2008
   - Weather Forecasting: Chaos

2. Can we know the future?
   - Scenario Analysis of Multiple Futures

3. Can we control the future?
   - Self-organizing Complex Systems

4. Can we influence the Future?
   - Take Actions guided by Visions and Simulations
What are Futures Studies?

Futures Seminars in Awaji Island
Japan, 1993 - 1999

Renewing Communities as Sustainable Global Village
Aug. 16 – 19, 1993
What are Futures Studies?

Five Inseparable Fields of Studies

1. Wisdom and Self-Awareness Studies *(Mind)*
   Keys: Enlightenment, Meditation, Well-being

2. Future-Oriented Methodological Studies *(Model)*
   Keys: Non-linear Modeling and Simulations

3. Human-Nature Interface Studies *(Nature)*
   Keys: Natural Farming, Sustainable Environment

4. Human-Technology Interface *(Technology)*
   Keys: Renewable Energies, High Technologies

5. Inter-Human Networking Studies *(Economy)*
   Keys: Network Economies, Diversified Cultures
What are Futures Studies?

How are Five Fields of Studies Related?

- Mind
- Model
- Nature
- Technology
- Economy
What are Futures Studies?

FOCAS: Future-Oriented Complexity and Adaptive Studies

Interdependent
What are Futures Studies?

FOCAS Dynamics

Past

Present

Future

Mind

Model

Nature

Technology

Economy

Nature

Model

Technology

Economy
What are Futures Studies?

FOCAS: Future-Oriented Complexity and Adaptive Studies

Missing Fields of Studies

<table>
<thead>
<tr>
<th>Mind</th>
<th>Model</th>
<th>Nature</th>
<th>Culture</th>
<th>Paradigm</th>
<th>Environment</th>
<th>Development</th>
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### What are Futures Studies?

**FOCAS: Future-Oriented Complexity and Adaptive Studies**

#### Missing Fields of Studies

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<tr>
<td></td>
<td>(Climate Change)</td>
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<td>(Social Media)</td>
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Sustainable development of national land is vital for a country’s long-term peace and stability and for its people’s happiness and well-being. Future planning issues, including international relationship, social problems, nature conservation, economy growth and effective governance, will require further research and policy implementation.
What is System Dynamics?

“Renaissance man”

Prof. Jay Forrester
1918 – 2016 (aged 98)

Michelangelo
1475 - 1564
Architect
Sculptor
Painter
Poet

Leonardo de Vinci
1452 - 1519
Artist, Mathematician
Engineer, Doctor

Artists, Mathematicians
What is System Dynamics?

“Renaissance man”

the trend of the last century that has been moving away from the “Renaissance man” toward fragmented specialization.

Michelangelo
1475 - 1564

Leonardo de Vinci
1452 - 1519
There is now a promise of reversing the trend of the last century
"Renaissance man"

We can now work toward an integrated, systemic, educational process that is more efficient, more applicable to a world of increasing complexity, and more compatible with a unity in life.

--- The Beginning of System Dynamics, 1989
Banquet Talk, Stuttgart, Germany, p.15---

System dynamics provides a foundation underlying all subjects. When that foundation is mastered, an individual will have mobility to move from field to field.

- Keynote Address for Systems Thinking and Dynamic Modeling Conference for K-12 Education, June 27-29, 1994, at Concord Academy Concord, MA, USA -

Jay Forrester
You can see the Forrest (whole) for the Trees (parts)!

- Business
- Challenges of Terrorism & Military
- Economics
- Education (K-12)
- Energy & Resources
- Environment & Ecology
- Health Policy
- Information Science

- Infrastructure & Resiliency
- Methodology in SD
- Operations Management & Supply Chains
- Organization
- Psychology
- Public Policy
- Strategy
This book was published by the three original authors of ”The Limits to Growth” in preparation for the twentieth anniversary of the book’s publication. The model is called WORLD3-91.

By Chelsea Green Publishing Company
This book was published by the three original authors of "The Limits to Growth" as the 30-year update of the. The previous model World3-91 is renamed World 3.
Limits To Growth (2004) - World3-03: 10 Scenarios -

population 世界人口

Time (year) 1900 1920 1940 1960 1980 2000 2020 2040 2060 2080 2100

Person 0 2.5 B 5 B 7.5 B 10 B

population 世界人口: S1 population 世界人口: S6
population 世界人口: S2 population 世界人口: S7
population 世界人口: S3 population 世界人口: S8
population 世界人口: S4 population 世界人口: S9
population 世界人口: S5 population 世界人口: S10
“Modeling Long-Term Sustainability”

Sustainability as Reproducibility

① Physical Reproducibility
Keys: Investment and Capital Depreciation, Non-renewable Resources

② Social Reproducibility
Keys: Consumption and Population

③ Ecological Reproducibility
Keys: Sink (Garbage & Wastes) and Source (Regeneration)
① Physical Reproducibility
Keys: Investment and Capital Depreciation, Non-renewable Resources

Macro Growth Model

![Graph showing the relationship between time and capital, investment, output, and consumption.]

- **Capital**: Run
- "Output (Income)"**: Run
- Consumption**: Run
- Investment**: Run

Time (Year)


Investment

Saving

Output (Income)

Capital-Output Ratio

Marginal Propensity to Consume

Initial Capital
Modeling Long-Term Sustainability

Physical Reproducibility

Keys: Investment and Capital Depreciation, Non-renewable Resources

MACRO_MODEL

Time (Year) 2001 2026 2052 2077 2102

Capital : Current 1 1 1 1 1 1
"Output (Income)" : Current 2 2 2 2 2 2
Consumption : Current 3 3 3 3 3 3
Investment : Current 4 4 4 4 4 4
"Non-Renewable Resources" : Current 5 5 5 5 5 5

Initial Capital

Depreciation Rate

Capital-Output Ratio Table

Initial Non-Renewable Resources

Raw Material Input

Non-Renewable Resources

Marginal Propensity to Consume

Consumption

Output (Income)

Capital-Output Ratio

Saving

Depreciation

Investment
Accounting System Dynamics
- Financial Statement: Balance Sheet -

Assets

- Accounts Receivable
- Cash / Deposits
- Fixed Assets (Property, Plant & Equipment)
- PP&E Purchase
- Depreciation

Cash Flow

- Accounts Payable
- Liabilities
- Debts (Short & Long Term)
- Loans

Shareholders' Equity

- Capital Stock
- New Issues of Shares

Orders

- Inventories (Raw Materials, Goods in Process, Finished goods)
- Raw Materials
- Wages
- Production
- Shipment

Financial Statement:

- Balance Sheet
- Sales
- Revenue
- Cost of Goods Sold
- Operating Expenses
- Gross Margin
- Income From Operations
- Non-Operating Revenues
- Earnings Before Income Tax
- Income Taxes
- Net Income
- Dividends

- Accounts Payable
- Payment
- Reimbursement
- Debts (Short & Long Term)
- Loans
- Interest Rates
- Interest Payment

Money Flow:

- Money
- <Sales Revenue>
- <Non-Operating Revenues>
- <Expenses>
- <Loans>
- <Dividends>
- <New Issues of Shares>
- <Raw Materials>
- <Operating Expenses>
- <Non-Operating Expenses>
- <Income Taxes>
- <Income Taxes>
**Solar Panel Modeling**

- Accounting System Dynamics -

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Solar Cell Power Generation (Kw) in 2001 at Prof. Yamaghi’s House

<table>
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<th>Month</th>
<th>1</th>
<th>2</th>
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<td>208</td>
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<td>154</td>
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</table>
Solar Panel Modeling - Accounting System Dynamics -

**Assets**
- Net Cash Flow
- Cash Inflow
- Cash Outflow
- Cash
- Solar Investment
- Solar Cell Generator

**Liabilities**
- Debt
- Loan Period
- Monthly Redemption
- Solar Loan
- Subsidy

**Equity**
- Revenues by Electricity Sales
- Total Revenues
- Interest Payment
- Interest Rate
- Months
- Equity
- Assets
- Liabilities
- Equity
Solar Panel Modeling
- Accounting System Dynamics -
In Conclusion:

For A Better Future out of the Fragmented World-View

Use your Brain (FOCAS Dynamics)

Use your Computer (System Dynamics)