



# Integrated assessment modeling using **WorldDynamics.jl**

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# Summary

**Introduction**

**Part 1 - The World Dynamics family**

Break 1

**Part 2 - WorldDynamics.jl**

Break 2

**Part 3 - Creating a model**

**Final Remarks**

# WorldDynamics.jl

## Contributors

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## Acknowledgements



SYSTÈMES NUMÉRIQUES  
POUR L'HUMAIN  
ÉCOLE UNIVERSITAIRE DE RECHERCHE



# WorldDynamics.jl

## Main objectives

Transparency

Modularity

Documentation

*Julia*

# WorldDynamics.jl

<https://github.com/worlddynamics/WorldDynamics.jl>

# Part 1 - The World Dynamics family

## World1

World1A update

World1B update

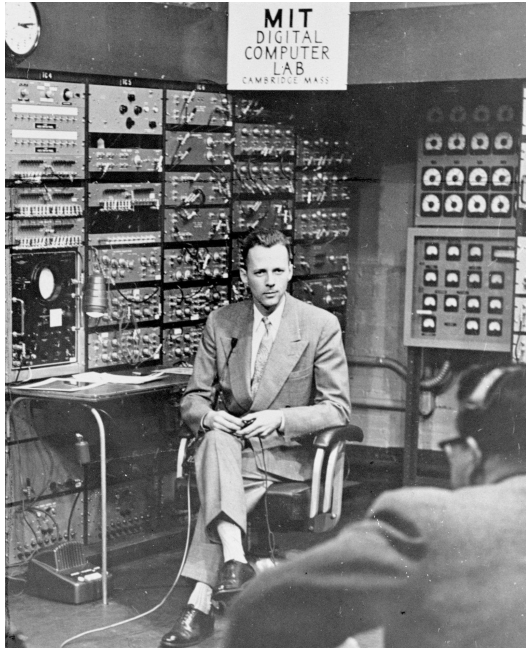
## World2

## World3

World3 - 1991 update

World3 - 2003 update

# World Dynamics



Jay Wright Forrester

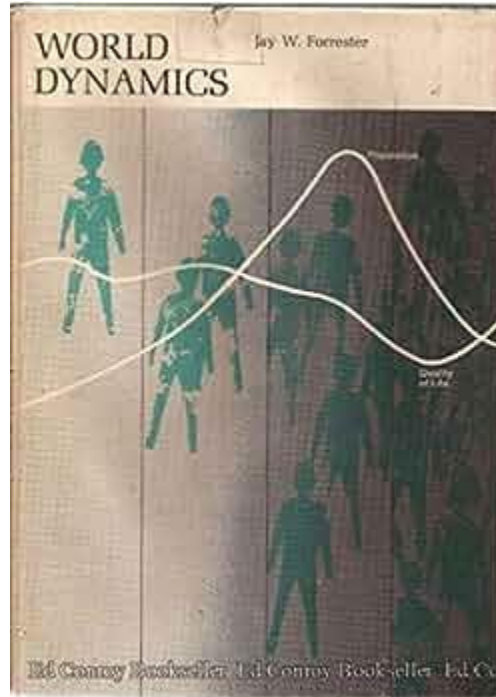








# World Dynamics (1971) - World2



# World2

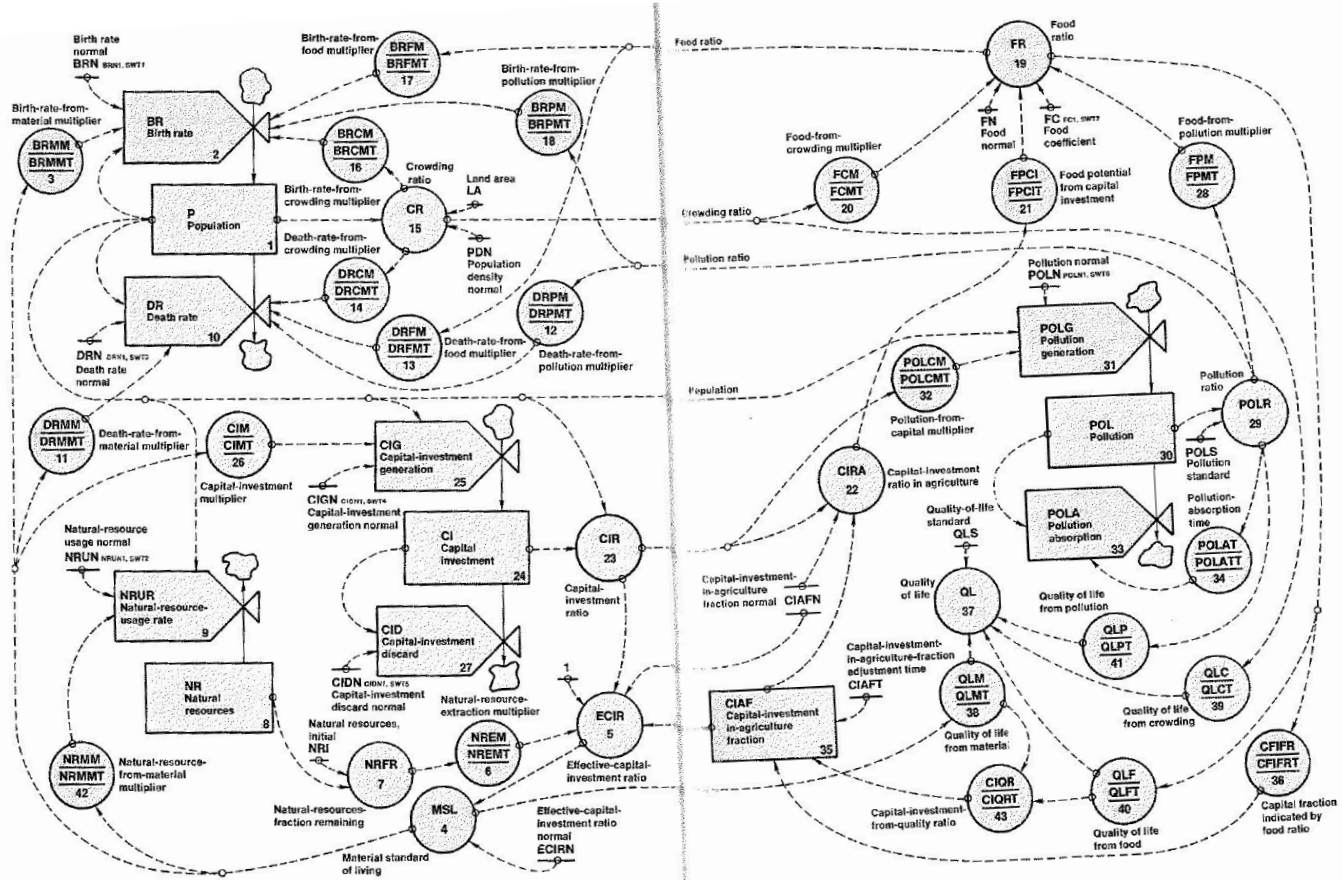


Figure 2-1 Complete diagram of the world model interrelating the five level variables — population, natural resources, capital investment, capital-investment-in-agriculture fraction, and pollution.

# World2 - Standard Runs

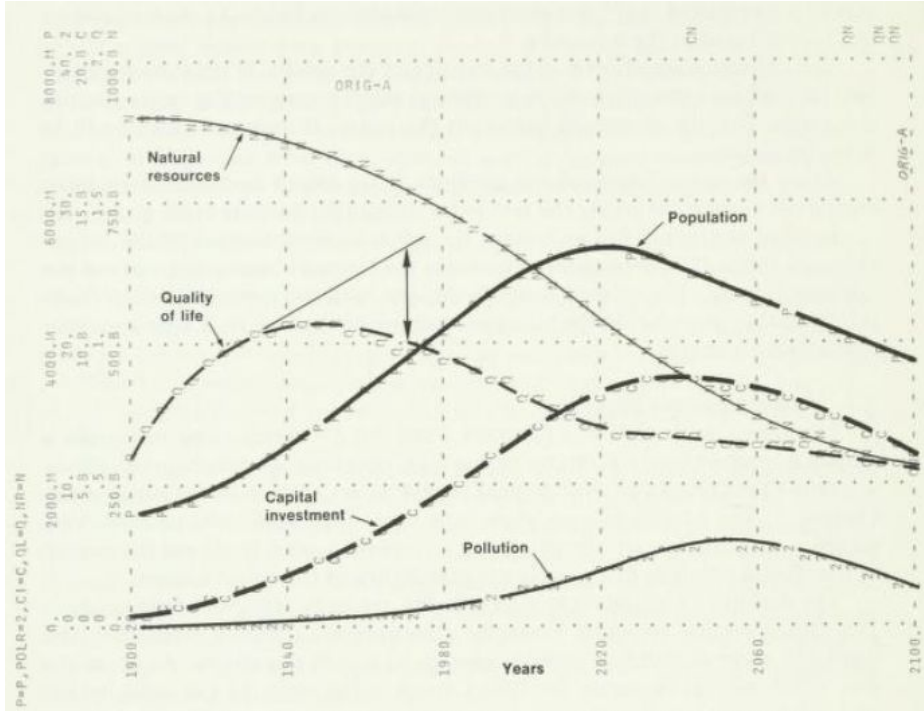


Figure 4-1 Basic behavior of the world model, showing the mode in which industrialization and population are suppressed by falling natural resources.

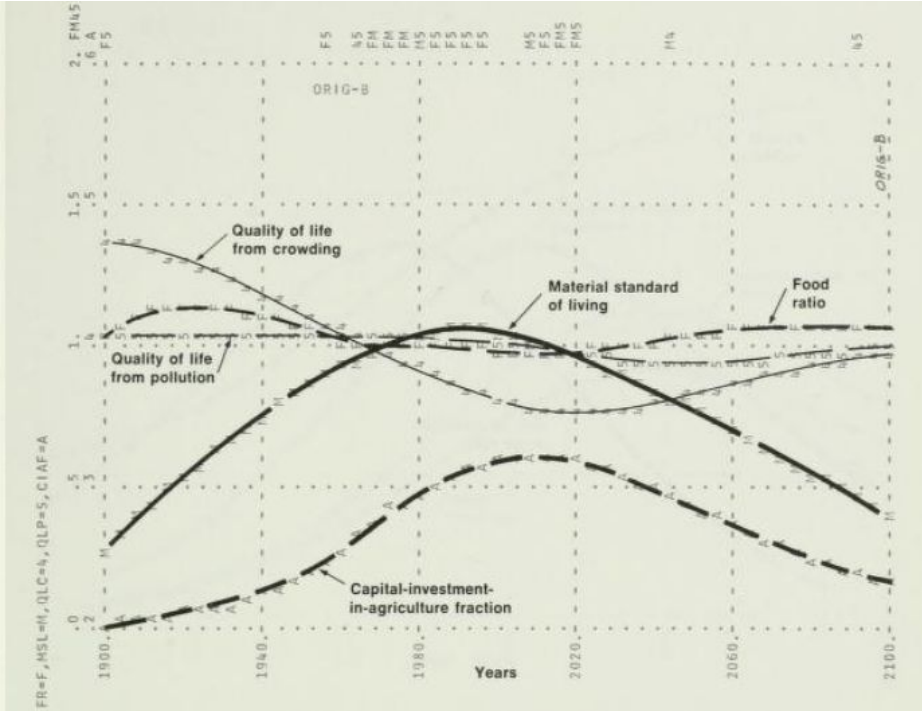
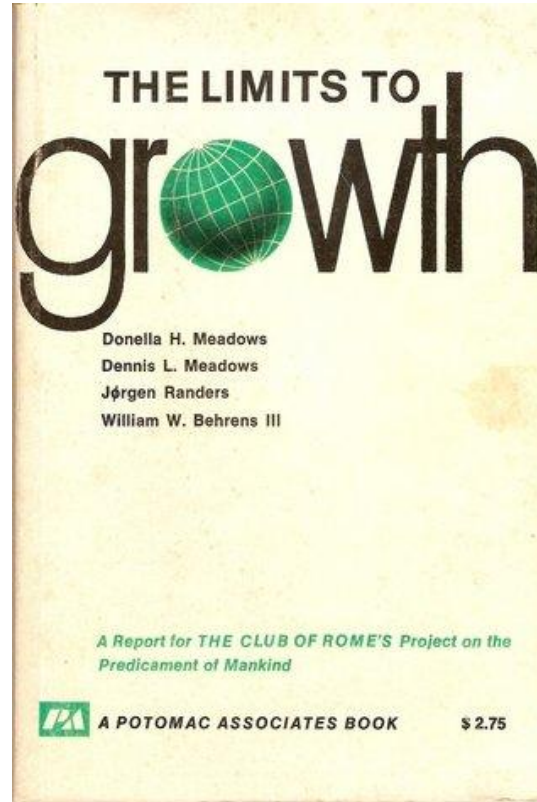


Figure 4-2 Original model as in Figure 4-1. Material standard of living reaches a maximum and then declines as natural resources are depleted.

# The Limits to Growth (1972) - World3



# The Limits to Growth (1972) - World3



Jorgen Randers, Jay Forrester, Donella Meadows, Dennis Meadows, William W. Behrens III



# World3

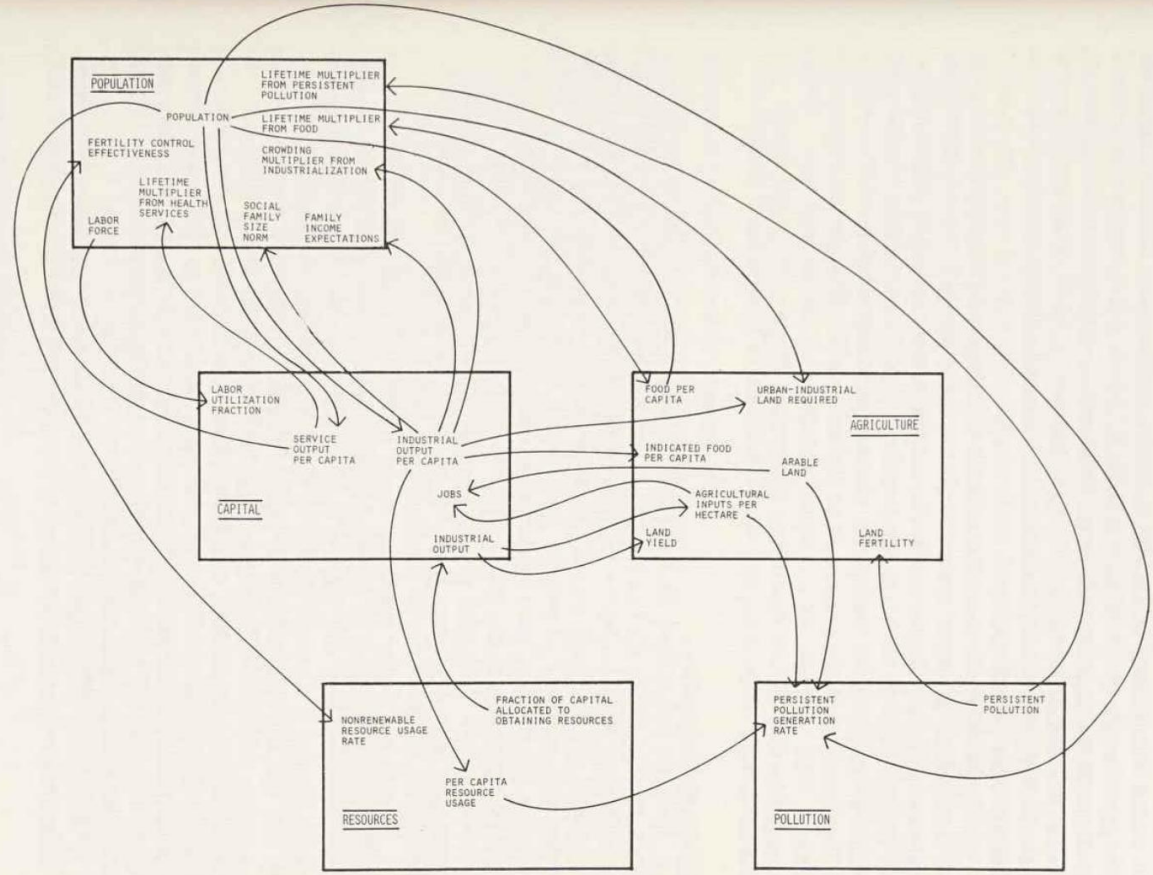


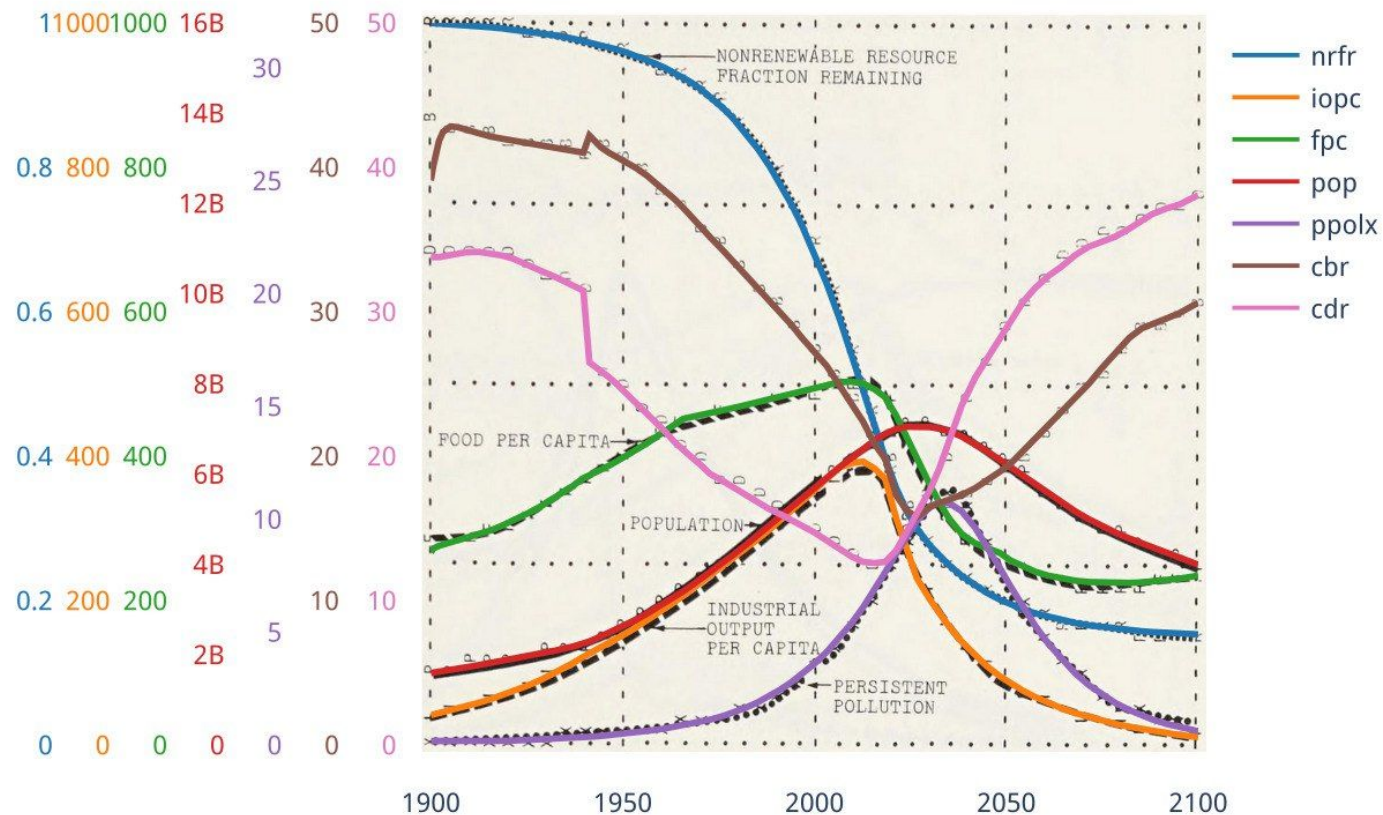
Figure 1-2 Interactions among the five basic sectors of World3







# World3 - Standard Run



# Part 2 - WorldDynamics.jl

## a. Under the hood

- i. Translation from Dynamo
- ii. Code organization

## b. Differences in modules

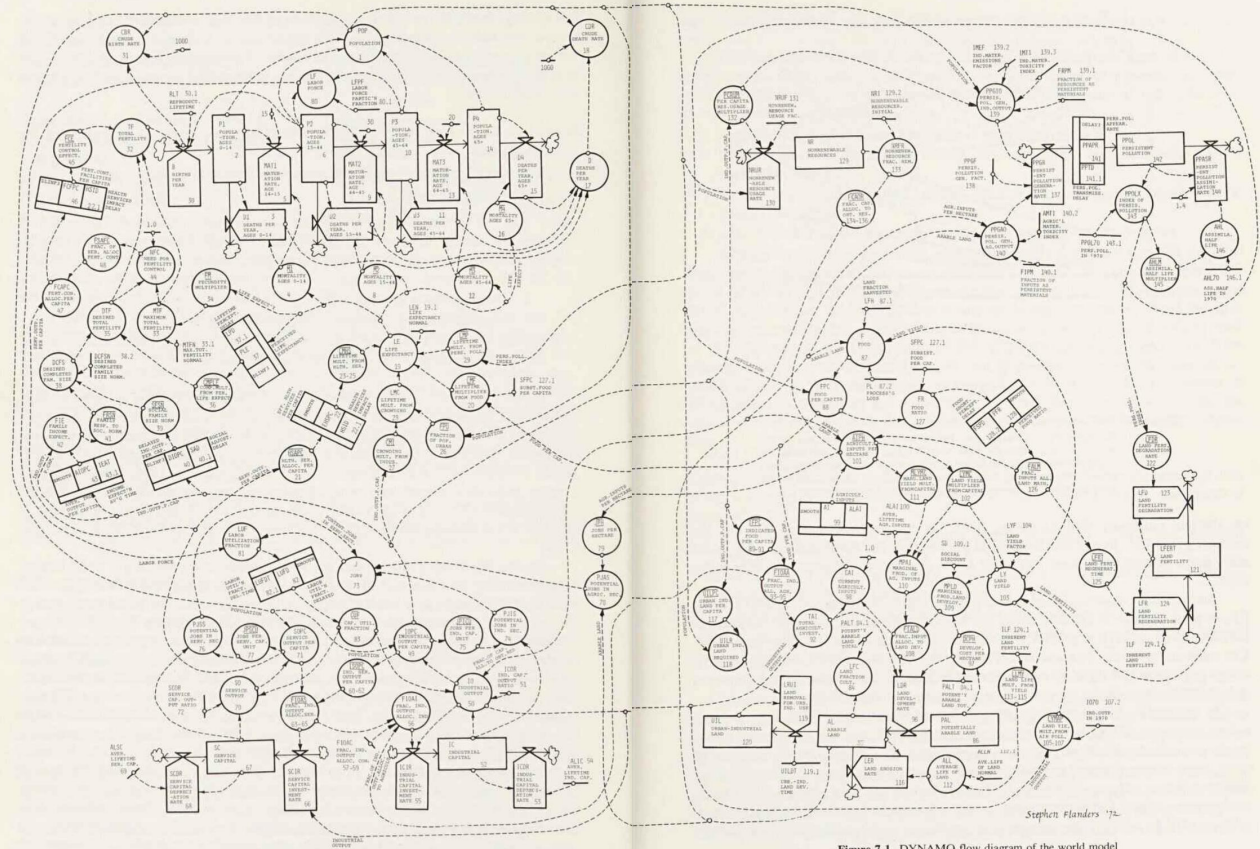
## c. Customizing the models

- i. Modifying parameters
- ii. Modifying interpolation tables
- iii. Updating the model with modern data
- iv. Adding equations
- v. Modifying equations

# Under the hood

Code...

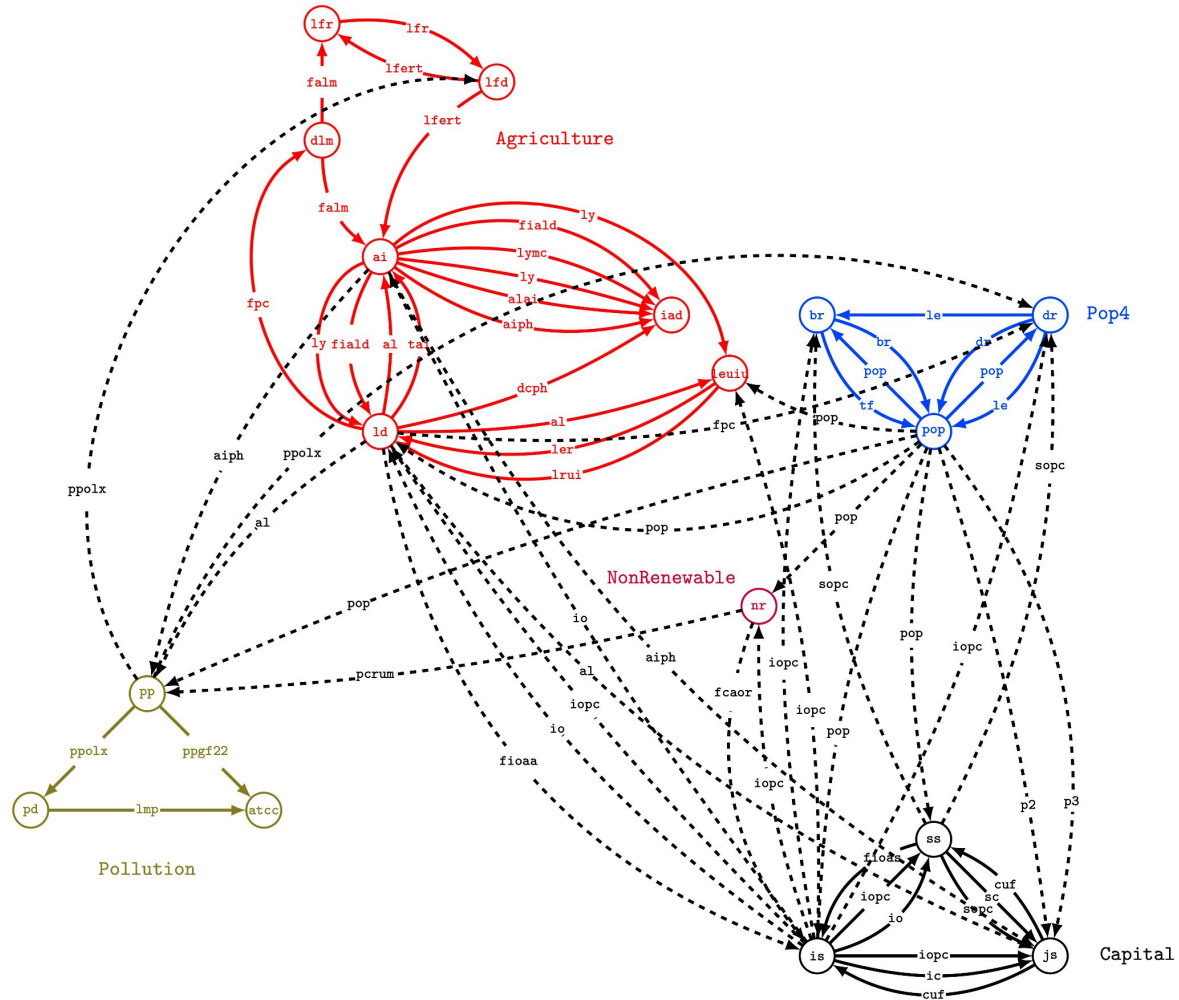
# World3



Stephen Flanders '75-

Figure 7-1 DYNAMO flow diagram of the world model

# World3





# Customizing the models

## Code...

1. Modifying parameters
2. Modifying interpolation tables
3. Updating the model with modern data
4. Adding equations
5. Modifying equations

# Part 3 - Creating a model

**Code...**

<https://worlddynamics.github.io/WorldDynamics.jl/stable/tutorial/#Implementing-a-new-model>



# Next steps

## Other development

Earth4All.jl

Vensim2MTK.jl

Experiments with PINNs

## New contributors

Clergue Maël

Lucia Nasti

Luca Pepe Sciarria

**You can support us here:**



[github.com/worlddynamics/WorldDynamics.jl](https://github.com/worlddynamics/WorldDynamics.jl)

[github.com/worlddynamics/Earth4All.jl](https://github.com/worlddynamics/Earth4All.jl)

# Talks from team members at

**Pierluigi Crescenzi**

*A Julia framework for world  
dynamics modeling and simulation*

07-28, 14:00–14:30 (US/Eastern), 32-D463 (Star)

**Aurora Rossi**

*Graph alignment problem within  
GraphsOptim.jl*

07-27, 11:30–11:40 (US/Eastern), 32-123



# WorldDynamics.jl

Thank you!



[github.com/worlddynamics/WorldDynamics.jl](https://github.com/worlddynamics/WorldDynamics.jl)