

# Soutenance de stage de fin d'étude

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March 9, 2022



## Contexte



# Contexte

Institutions



# Plan

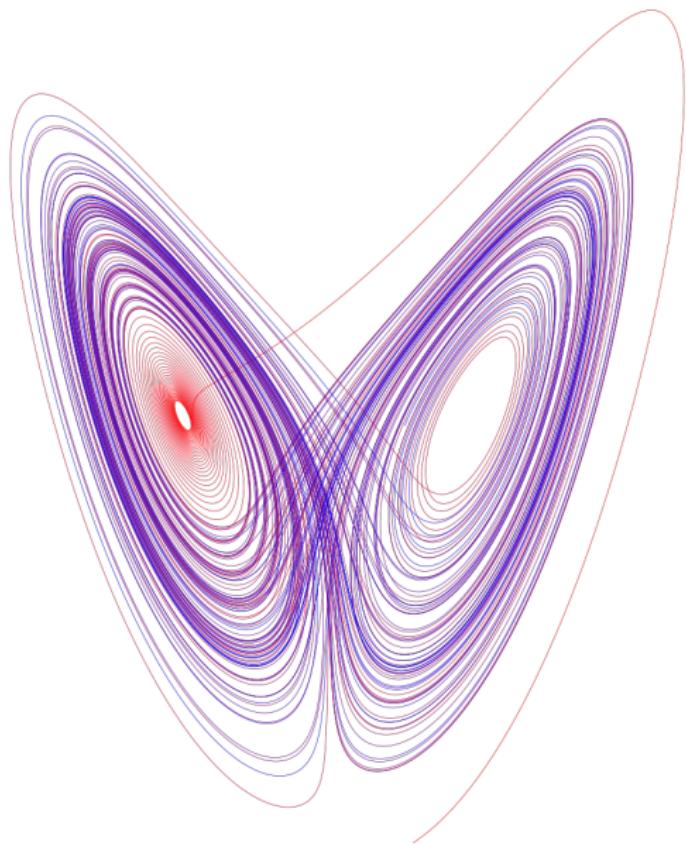
Apprentissage de dynamiques

World3

Pydynamo

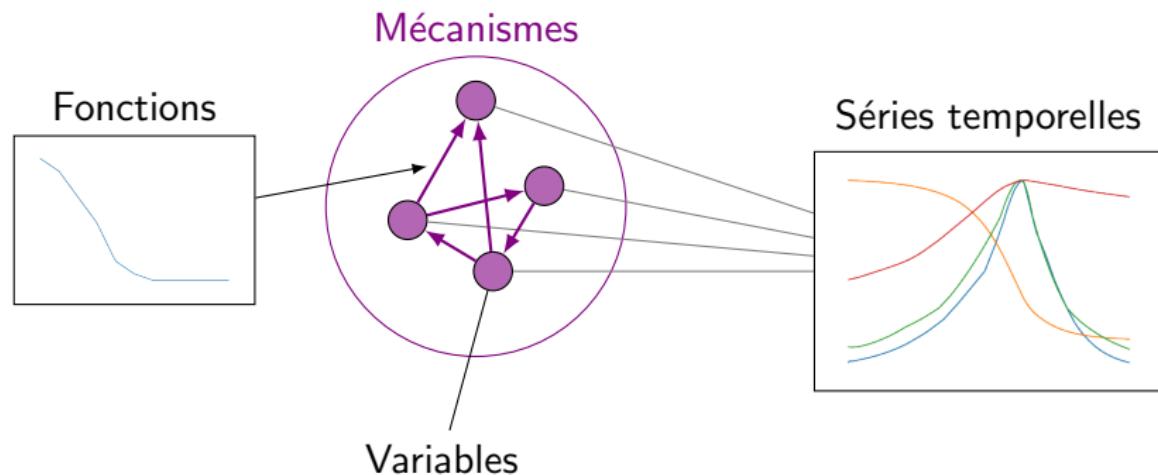
La recherche scientifique

## Apprentissage de dynamiques



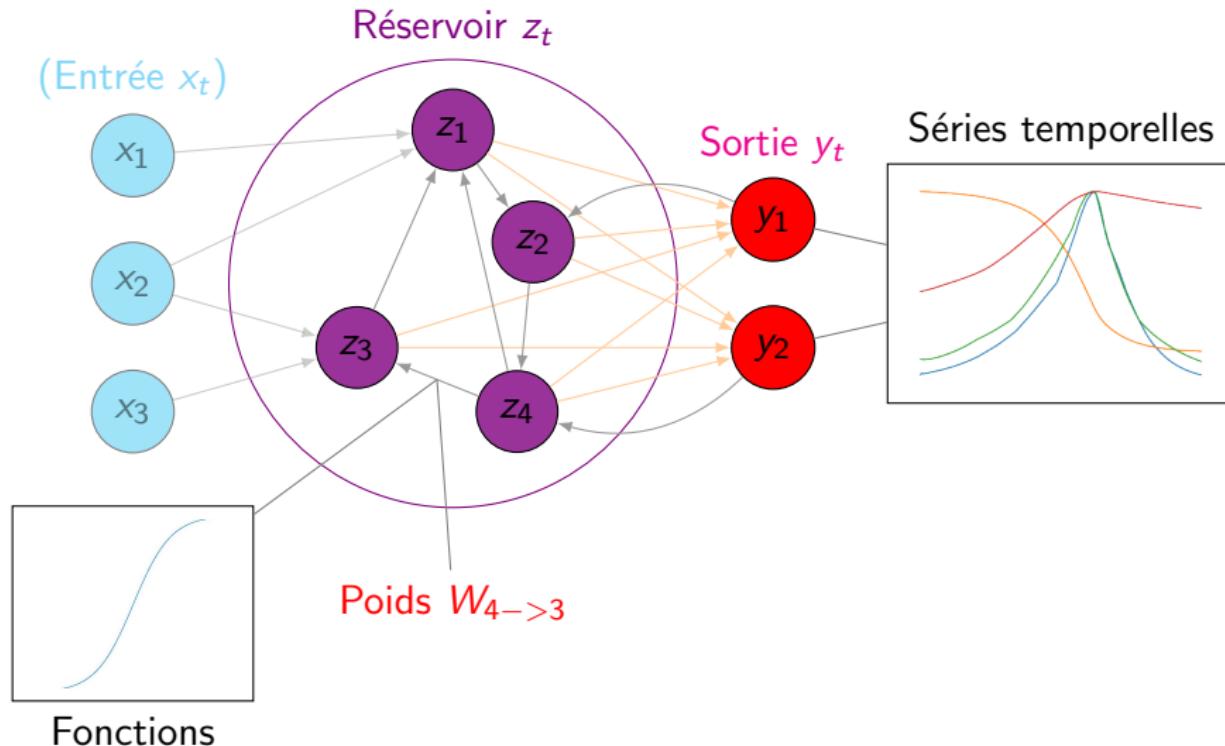
# Apprentissage de dynamiques

Système dynamique



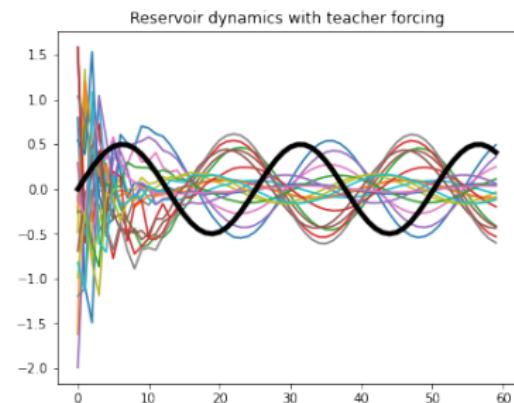
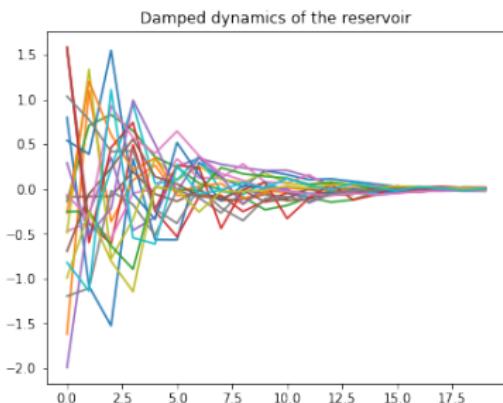
# Apprentissage de dynamiques

Echo State Network



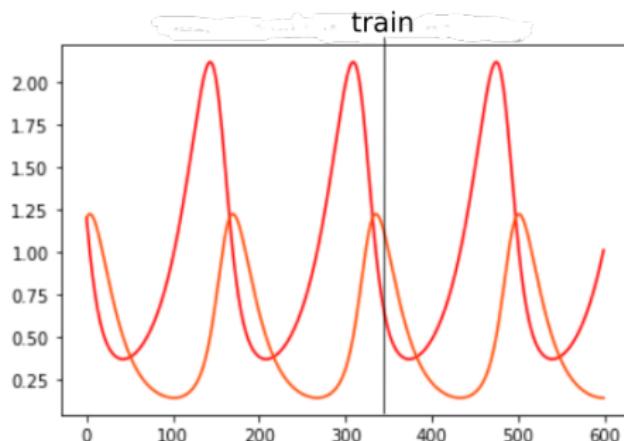
# Apprentissage de dynamiques

L'écho et le professeur

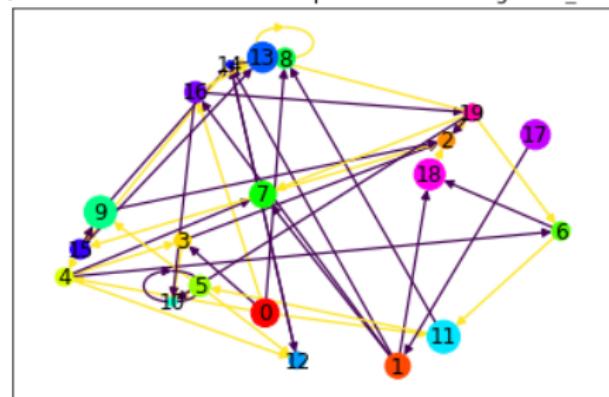


# Apprentissage de dynamiques

Dissection du réseau

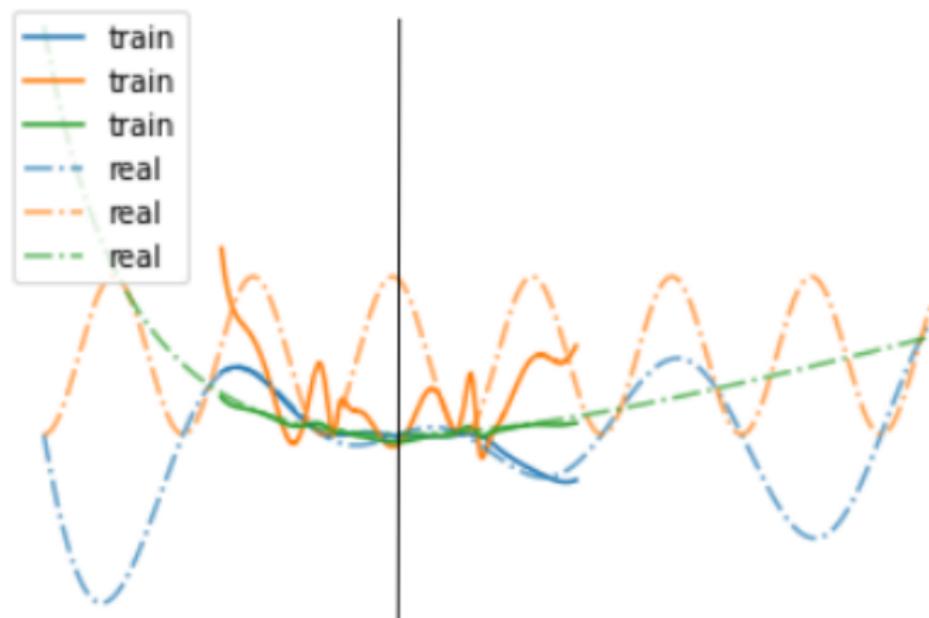


Graph representation of internal states  
(node size is their mean importance according to  $W_{out}$ )



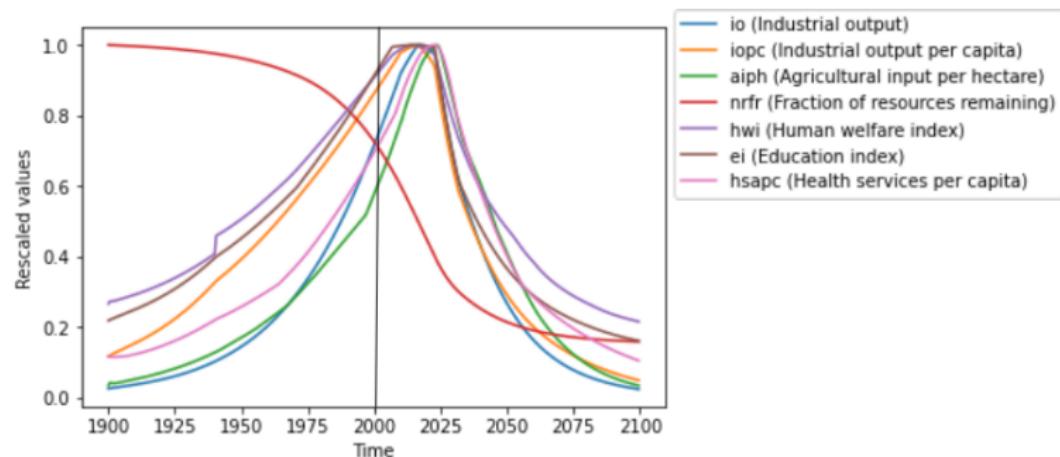
# Apprentissage de dynamiques

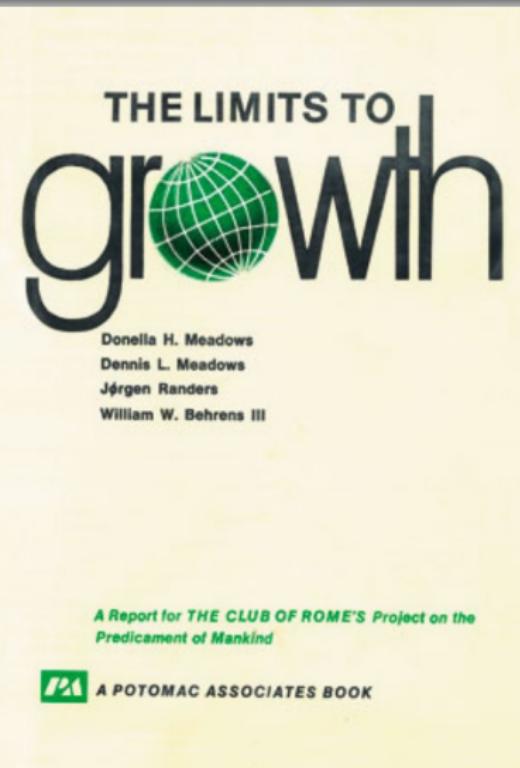
Approximation universelle



# Apprentissage de dynamiques

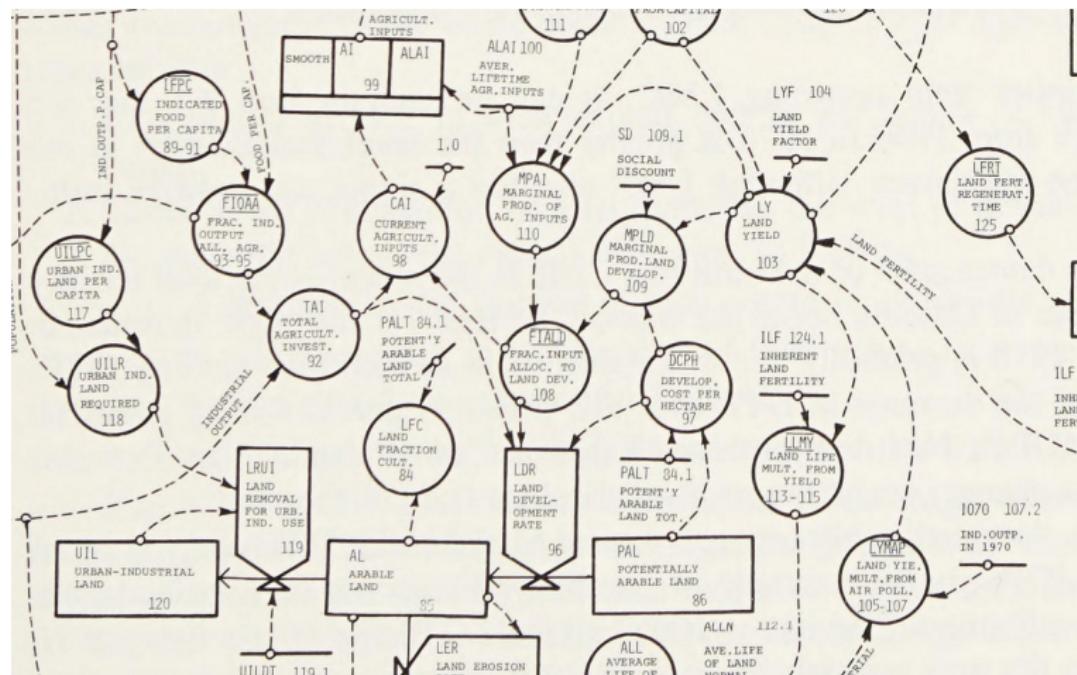
Limites





# World3

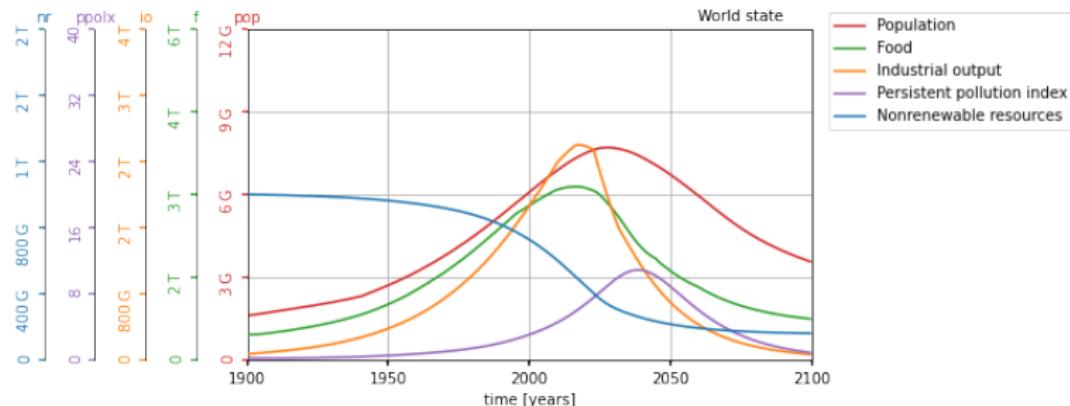
## Le modèle



# World3

## Les simulations

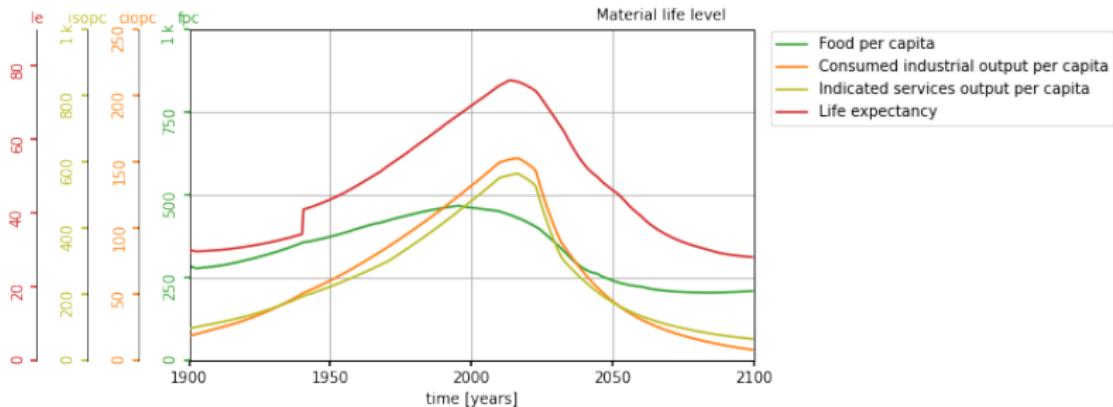
Scénario 1: Business as usual



World state

- Population
- Food
- Industrial output
- Persistent pollution index
- Nonrenewable resources

Material life level



# World3

Limites de Limits To Growth



# Pydynamo



# Pydynamo

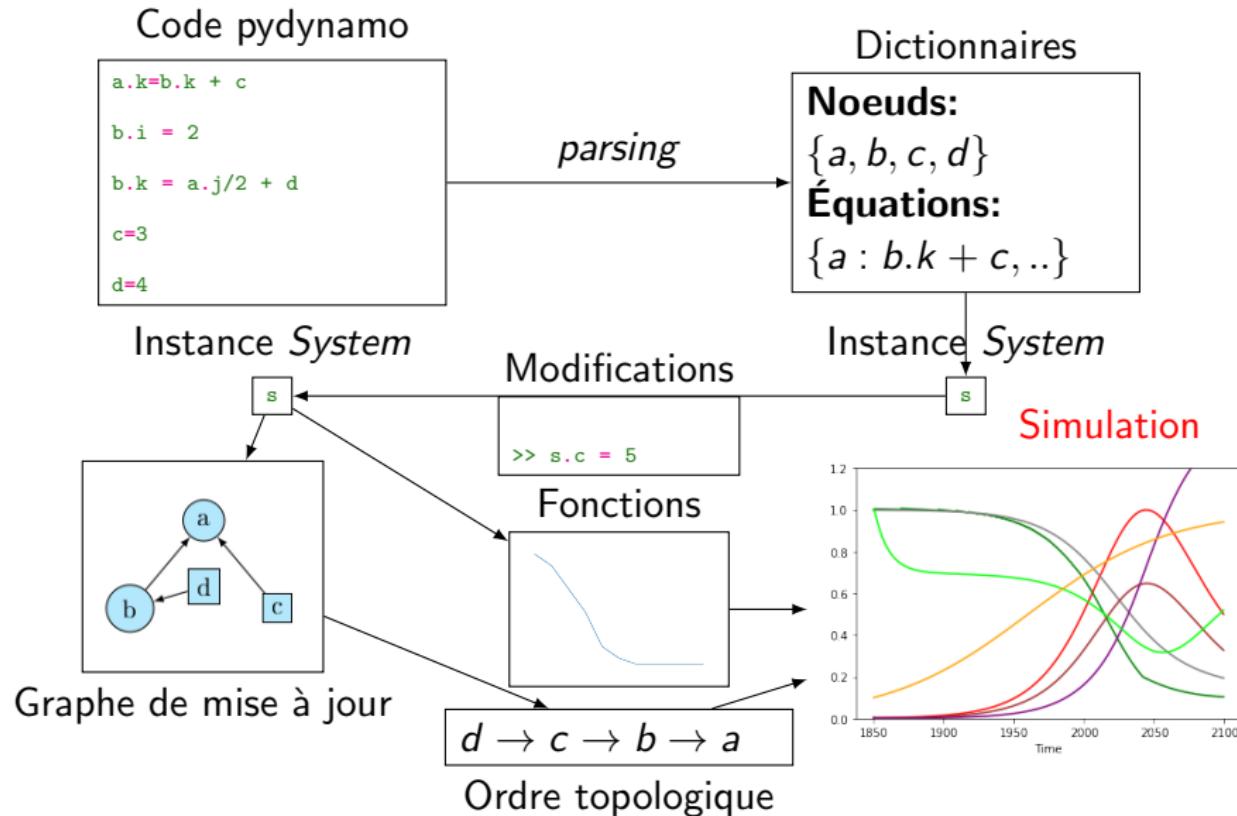
## La syntaxe

```
NOTE      AGRICULTURAL SECTOR
NOTE      LOOP 1: FOOD FROM INVESTMENT IN LAND DEVELOPMENT
NOTE
84   A    LFC.K=AL.K/PALT
     C    PALT=3.2E9
85   L    AL.K=AL.J+(DT)*(LDR.JK-LER.JK-LRUI.JK)
     N    AL=ALI
     C    ALI=.9E9
86   L    PAL.K=PAL.J+(DT)*(-LDR.JK)
     N    PAL=PALI
     C    PALI=2.3E9
87   A    F.K=LY.K*AL.K*LFH*(1-PL)
     C    LFH=.7
     C    PL=.1
88   A    FPC.K=F.K/POP.K
89   A    IFPC.K=CLIP(IFPC2.K,IFPC1.K,TIME.K,PYEAR)
90   A    IFPC1.K=TANBL(IFPC1T,IOPC.K,0,1600,200)
     T    IFPC1T=230/480/690/850/970/1070/1150/1210/1250
```

```
# Agricultural sector
## Loop1: food from investment in land development
lfc.k = al.k/palt
palt = 3.2e9
al.k = al.j + dt*(ldr.j - ler.j - lrui.j)
al.i = ali
ali = 0.9e9
pal.k = pal.j + dt*(-ldr.j)
pal.i = pali
pali = 2.3e9
f.k = ly.k*al.k*lfh*(1-pl)
lfh = 0.7
pl = 0.1
fpc.k = f.k/pop.k
ifpc.k = clip(ifpc2.k, ifpcl.k, time.k, pyear)
ifpcl.k = tabhl(ifpclt, iopc.k, 0, 1600, 200)
ifpclt = [230, 480, 690, 850, 970, 1070, 1150, 1210, 1250]
```

# Pydynamo

Fonctionnement



# Pydynamo

## La documentation

tpworld3

Search docs

World 2

World 3

World3 tutorial

All sectors

- Population sector
- Capital sector
- Agricultural sector
  - ltc: Land Fr Cult
  - palt: Potentially Arable Land Total
  - al: Arable Land
  - ali: Initial Arable Land
  - pali: Potentially Arable Land
  - pal: Initial Potentially Arable Land
  - f: Food
  - lfh: Land Fraction Harvested
  - pl: Processing Loss
  - fpc: Food Per Capita
  - ifpc: Indicated Food Per Capita
  - itpc1: Indicated Food Per Capita 1
  - itpc1t: Indicated Food Per Capita Table 1
  - ifpc2: Indicated Food Per Capita 2
  - itpc2t: Indicated Food Per Capita Table 2
  - tai: Total Agricultural Investment
  - fioaa: Fraction Of Industrial Output Allocated To Agriculture
  - fioaa1: Fraction Of Industrial Output Allocated To Agriculture 1
  - fioaa1t: Fraction Industrial Output Allocated To Agriculture Table 1
  - fioaa2: Fraction Of Industrial Output Allocated To Agriculture 2

View page source

## all: Average Life Of Land

Variable

Agricultural sector

Average Life Of Land [year]

```
all = alin * llmy
```

```
graph LR; alin --> all; llmy --> all;
```

all in the updating graph: ( how to read )

### In nodes

alin : average life of land normal

llmy : land life multiplier from land yield

### Out nodes

ler : land erosion rate

# Pydynamo

Le TP

jupyter TP Last Checkpoint: 02/16/2022 Autosave Failed! Logout Control Panel Python 3 (ipykernel) Not Trusted

Unexpected error while saving file: pydynamo/TP.ipynb [Error 28] No space left on device: '/home/boucher/notebooks/pydynamo/TP.ipynb' > '/home/boucher/notebooks/pydynamo/-TP.ipynb'

File Edit View Insert Cell Kernel Widgets LaTeX\_envs Help

In [8]:

```
1 print(w.equation('fcaor1'))
2 print(w.definition('nrfr'))
3 plot_non_linearity(w, 'fcaor1')
```

fcaor1.k = NLF\_fcaor1(nrfr,k)  
fraction of resources remaining

fcaor1 non-linear function

fraction of capital allocated to obtaining resources

nrfr

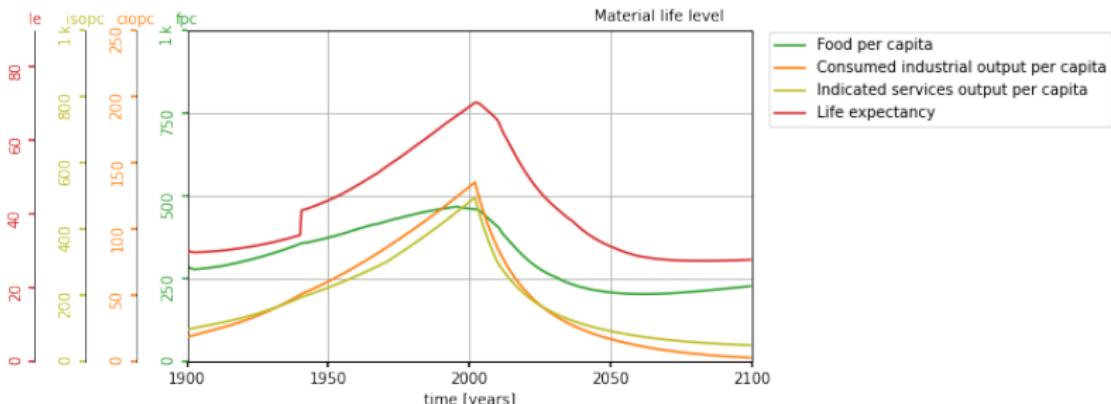
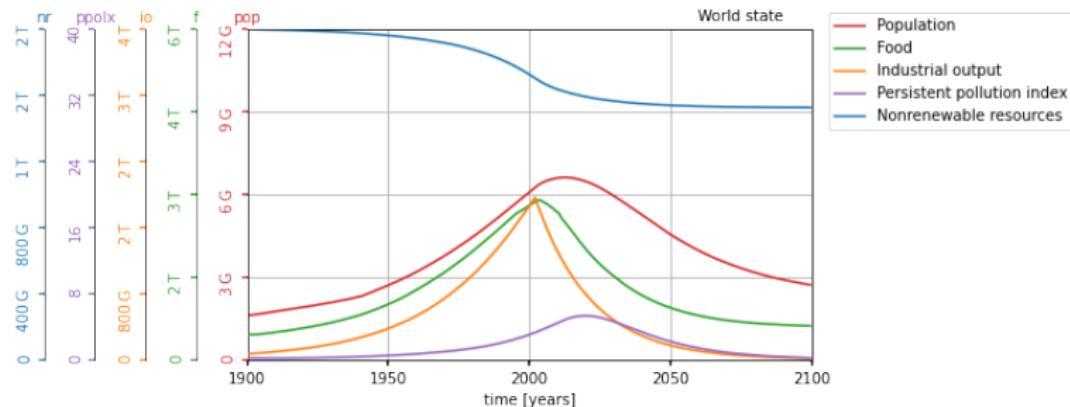
Il faut beaucoup creuser pour extraire du cuivre dans certaines mines !

20 / 31

# Pydynamo

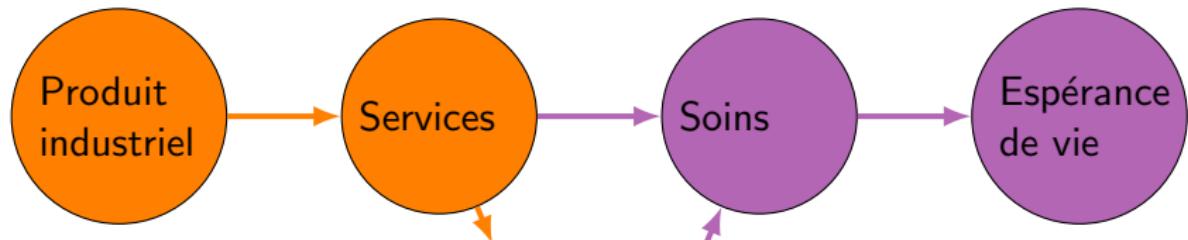
Décroissance

## Scénario de décroissance industrielle

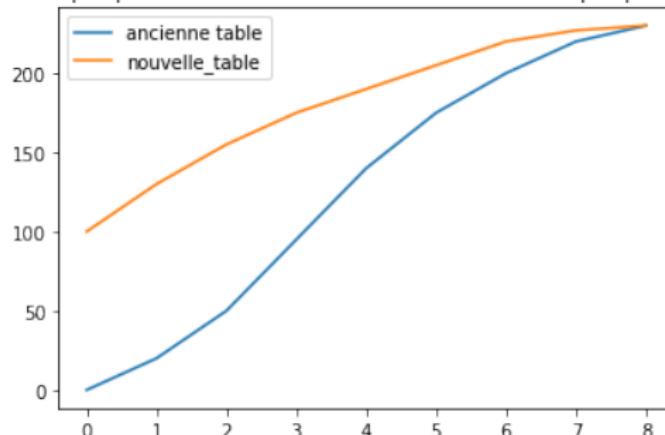


# Pydynamo

Décroissance: santé autonome

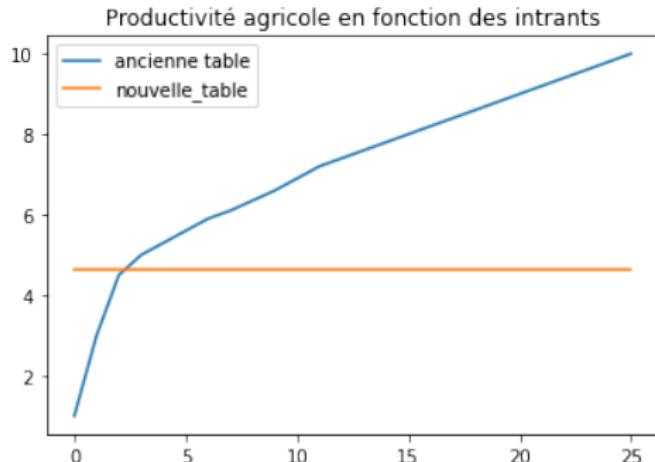
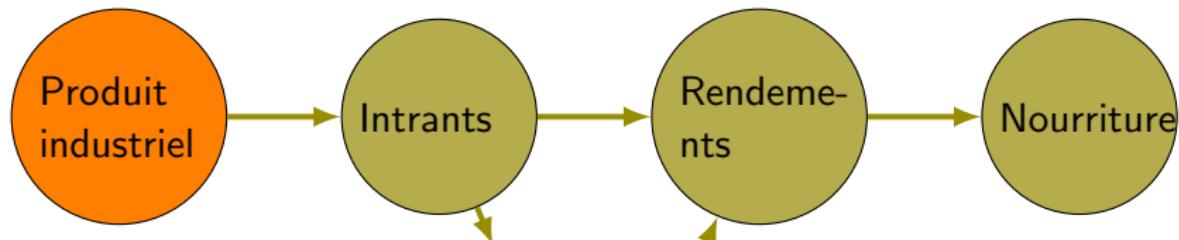


Soins par personne en fonction des services totaux par personne



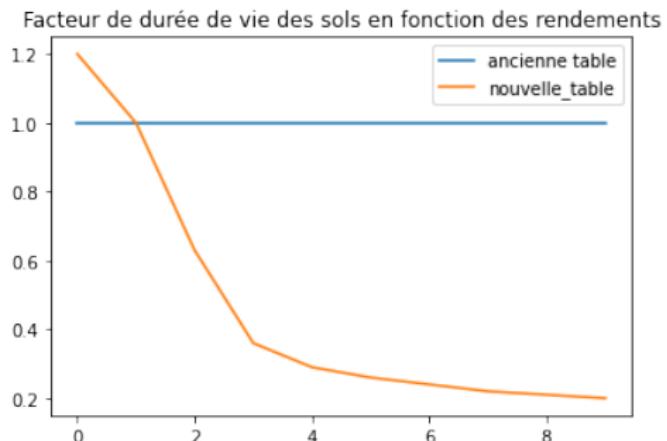
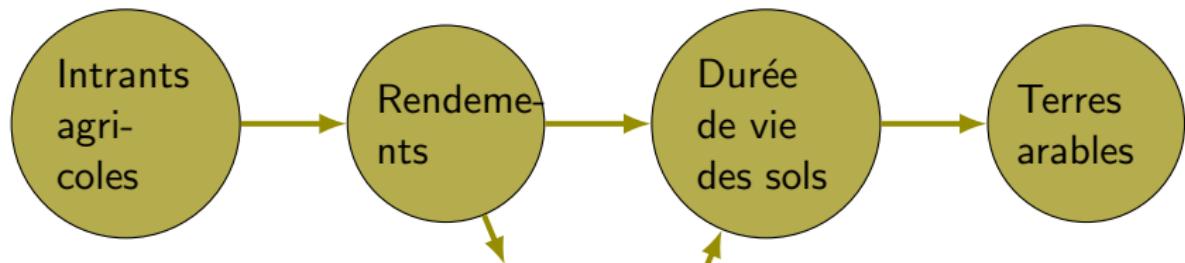
# Pydynamo

Décroissance: agroécologie



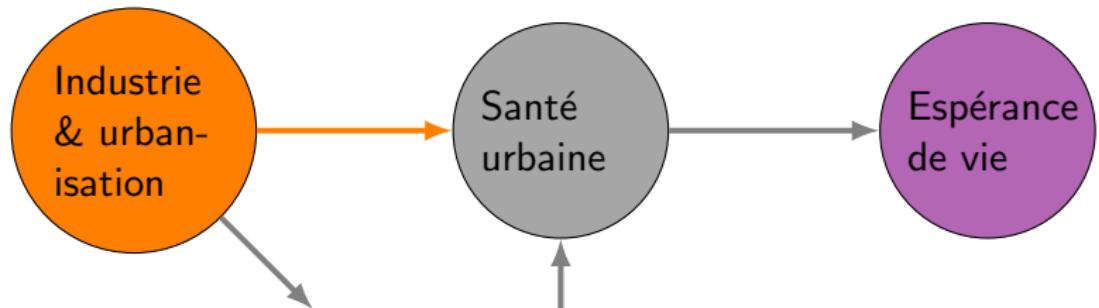
# Pydynamo

Décroissance: agroécologie

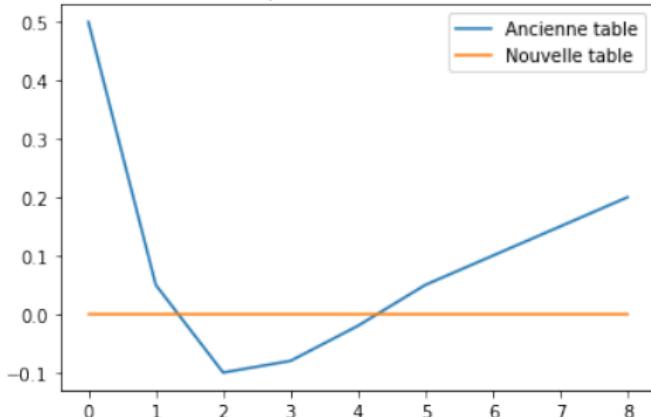


# Pydynamo

Décroissance: urbanisme



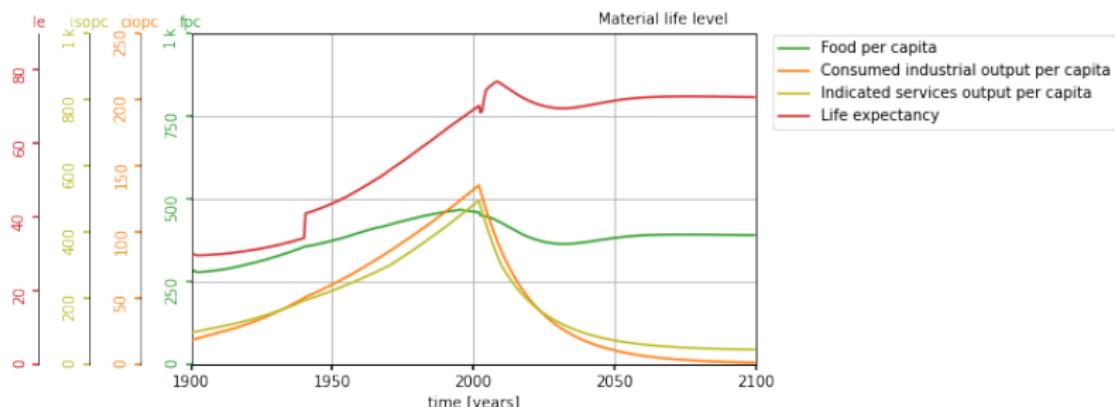
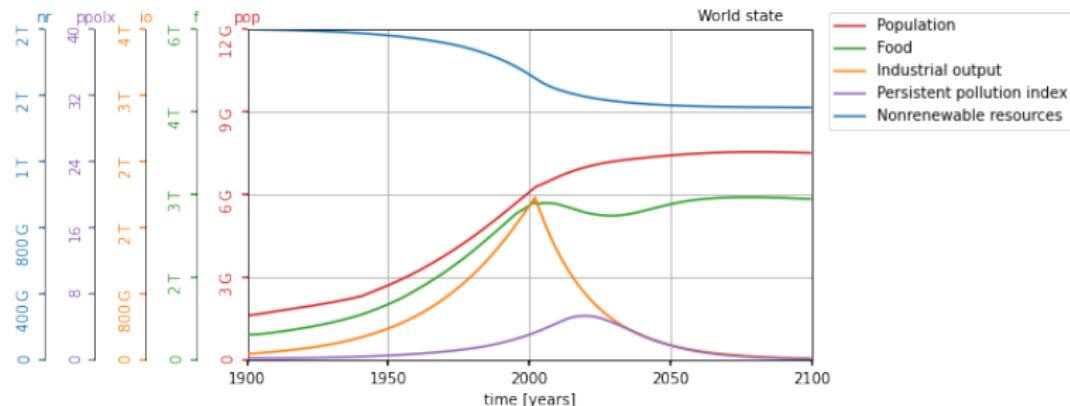
Nouvelle table pour cmi avec la nature urbaine



# Pydynamo

Décroissance: réunion des alternatives

## Deuxième réunion des alternatives



La recherche scientifique

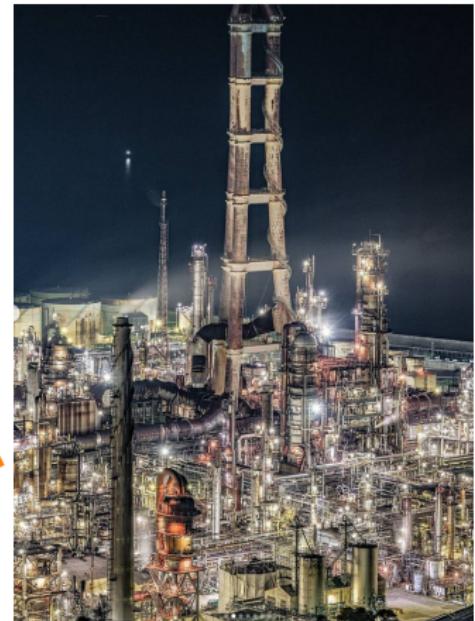
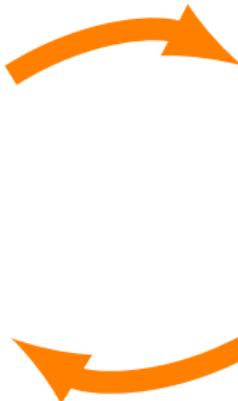


# La recherche scientifique

N'est pas neutre

Macrosystème technique

Science



Albert Besnard, La Vérité entraînant les Sciences à sa suite répand sa lumière sur les hommes (1890)  
@frederico\_italiano, Tetsurou Kobayashi

# La recherche scientifique

En question



©requisitus 2014, Hong Kong

# La recherche scientifique

## Questions



@africanceremonies, Dinka Cattle Camp, South Sudan ,2006

# Quelques sources

Pour la partie sur la recherche scientifique

## Livres

- ▶ Technocritiques, François Jarriges
- ▶ Fragilité de la puissance, Alain Gras
- ▶ Némésis médicale, Ivan Illich
- ▶ Petit éloge de l'anarchisme, James Scott

## Audios

- ▶ Anthropologie de la nature, cours au collège de France de Philippe Descola
- ▶ Technotombeau, Floraisons
- ▶ Allons-nous continuer la recherche scientifique, discours au CERN d'Alexandre Grotendieck

## Blogs, sites

- ▶ Critique du scientisme: <https://sniadecki.wordpress.com/>
- ▶ Mythes de la rationalité : <https://www.terrestres.org/2022/02/25/guerre-des-mondes-guerre-des-mythes/>
- ▶ L'état et l'avènement des sociétés industrielles:  
<https://sniadecki.wordpress.com/2021/07/05/jarrire-sources-catastrophe>
- ▶ Low-tech: <https://lapenseeconomique.com/6312-2/>

## Documentaires

- ▶ Décolonisons l'écologie, Anabelle et Jeremy