Challenges of the Paris Climate Accord

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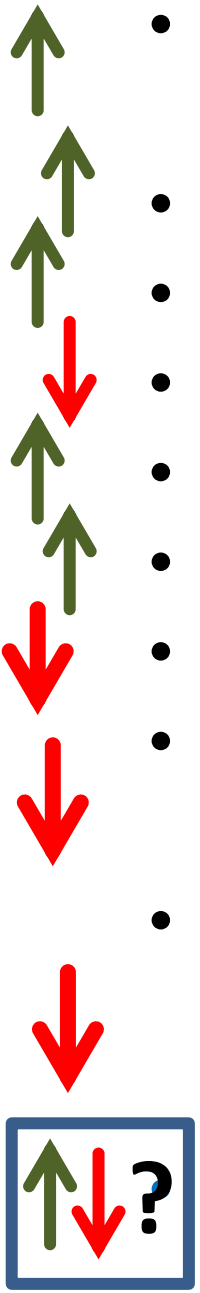
Despite the impressive formal success of the Paris climate conference in December last year, predictions of the future impact on climate policy range from highly optimistic to strongly pessimistic

- for there exists today a major mismatch between the ambitious Paris goals and the current "Intended Nationally Determined Contributions" presented in Paris.

What can scientists do to help realize the optimistic vision?

The ups and downs of 24 years of climate policy



- 1992 Rio de Janeiro, UNFCCC (United Nations Framework Convention on Climate Change)
- 1997 Kyoto protocol initiative (but see result 2005)
- 2003 “Global Marshall Plan” initiative (1990 Al Gore)
- 2005 Kyoto protocol signed, without US (and China,..)
- 2006 Stern report, Al Gore “An Inconvenient Truth”
- 2007 Nobel prize for IPCC
- 2008 global financial crisis
- 2009 failure of 15th COP, UNFCCC, Copenhagen (attended by Obama, Merkel and other heads of state)
- 2009-2015 climate problem relegated to backstage by urgent shorter term problems (global and EU financial crisis, revolutions, wars, refugee crisis, ….)

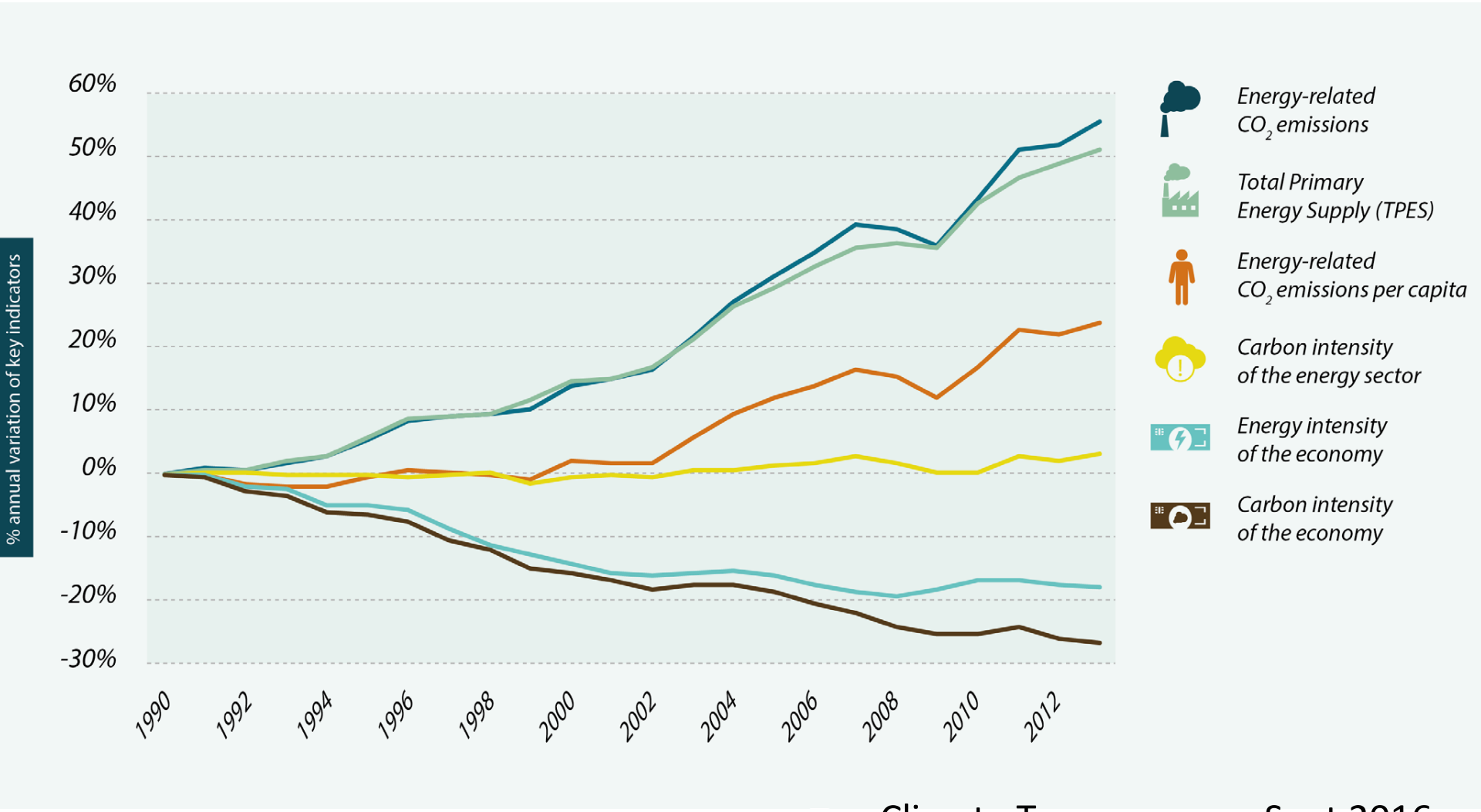
2016 surprising breakthrough of Paris accord

The mismatch between the Paris vision and current policies:

Illustrated for the G20 nations, which account for more than 80% of current CO2 emissions.

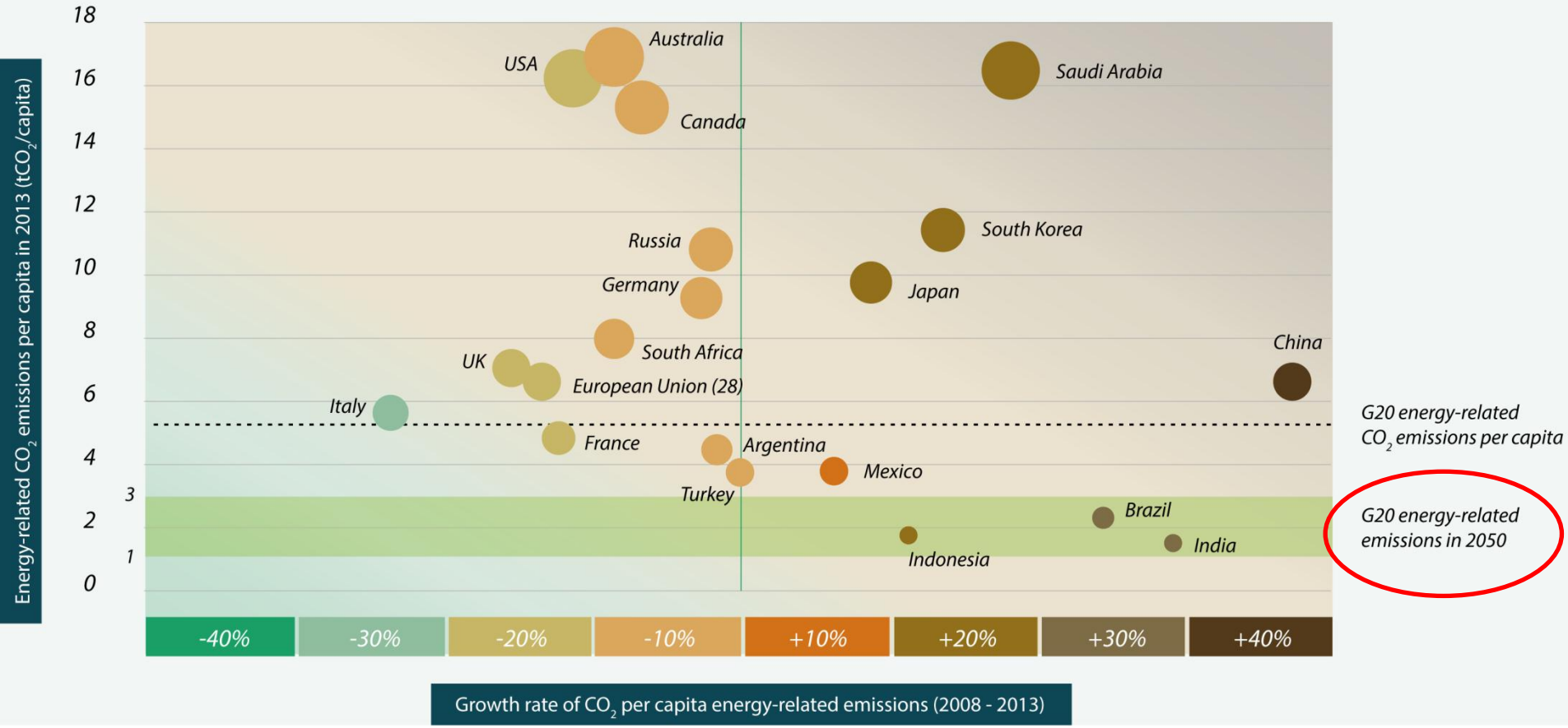
(Climate Transparency Report, Sept 2016)

Percentage change since 1990 of key climate change indicators for G20



Climate Transparency, Sept 2016

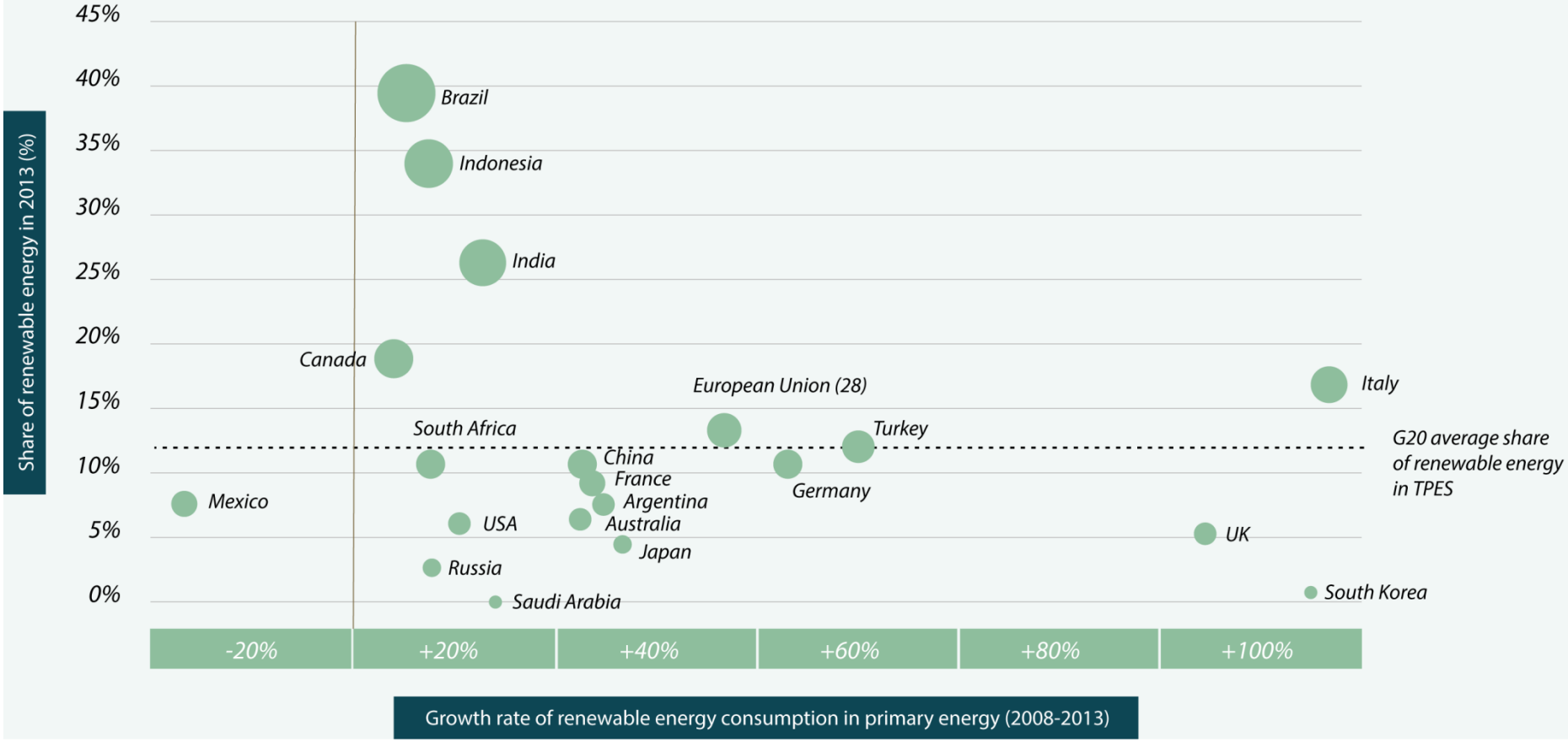
Level and growth of CO2 emissions per capita, 2008-2013, for G20



Bubble size → CO_2 per capita

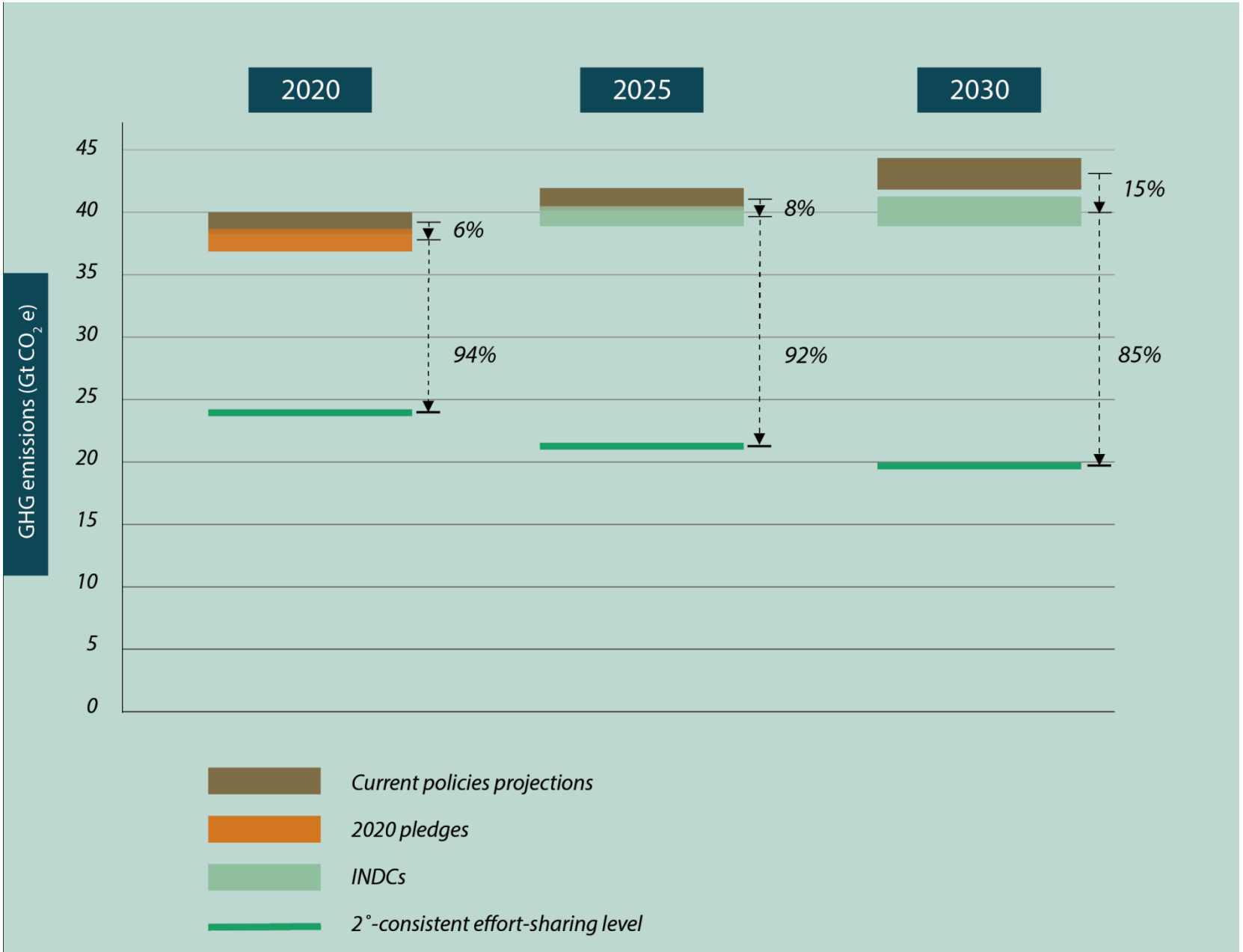
Climate Transparency, Sept 2016

Level and growth of renewable energy consumption, 2008-2013, for G20



Climate Transparency, Sept 2016

There remains a major gap between current policies, 2020 pledges and the GHG emission reductions needed to meet 2 degree target



Thus there is still very far to go in only a few decades to achieve the Paris goals.

What can and should scientists do to support the green transformation?

Past contributions of scientists to climate policy:

- Early warnings that humans were changing climate (1957 –Mauna Loa, CO2 data)
- Demonstration (1984) that with high probability observed recent climate change can no longer be attributed to natural causes
- Costs (2000) of limiting climate change to 2 deg C estimated as 1-4% of global GDP (thus **entirely acceptable**: at 2% global GDP growth, implies a delay in global GDP growth over 50 years of ½ to 2 years)

Why only weak impact on climate policy?

- it is no longer seriously denied that human induced climate change is real (climate denialists have suffered the same defeat as cigarette makers denying the dangers of smoking)

- but the real political response , beyond intentions, is so far woefully inadequate.

Suggest that scientists have focused on the wrong (negative) issues:

- The dangers of climate change (2 deg C represents already ½ the difference between today and the last ice age 20,000 years ago)
- The **costs** of mitigation policies, rather than the **benefits**. ***This has motivated free-riding***

Focus instead on **positive** aspects would highlight

- The pride and satisfaction of being a forerunner (see bottom-up pressure in Paris, Hilary Clinton)

But this requires new models that focus on positive welfare factors, not GDP costs (jobs, equality, social justice, **national self-esteem,** similar to: 1st man on the moon, national sport achievements, etc.)

Structure of Paris-relevant Integrated Assessment Models of Climate Change:

- Emphasis on **general welfare values** other than GDP (replaces free-riding blocking by forerunner competition)
- **Competition by many actors pursuing diverse, often conflicting goals** (rather than "invisible hand" of Adam Smith yielding stable optimal equilibrium of perfect market).
- Consideration of climate policy within the context of **multiple political goals**

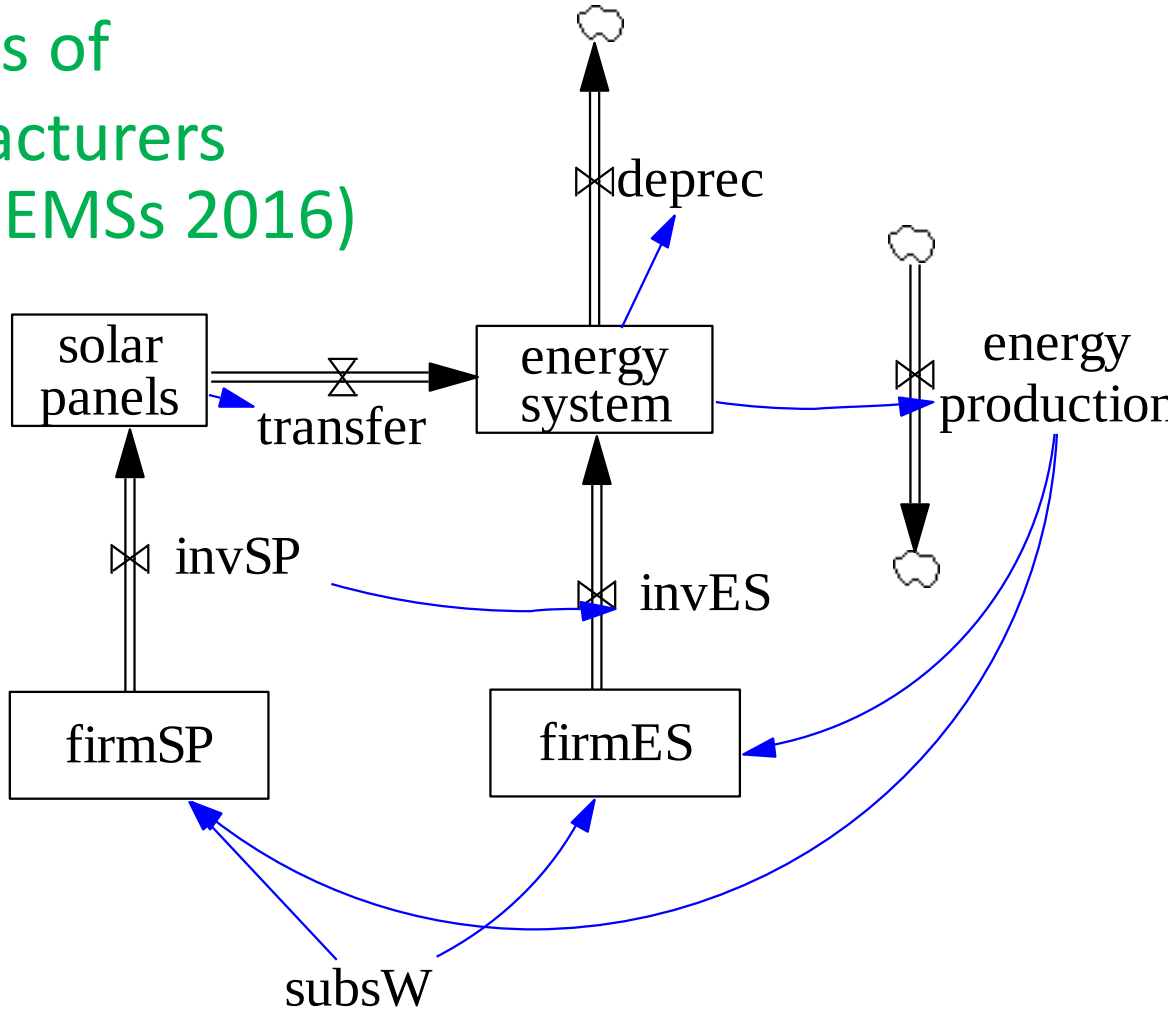
Examples:

1) European response to Chinese solar panel subsidies

("The solar panel dispute is by far the biggest trade controversy between the EU and China", European Institute for Asian Studies)

2) The unresolved Euro crisis

First example: EU response to Chinese subsidies of solar panel manufacturers (D. Kovalevsky, KH, iEMSs 2016)



EU solar energy system

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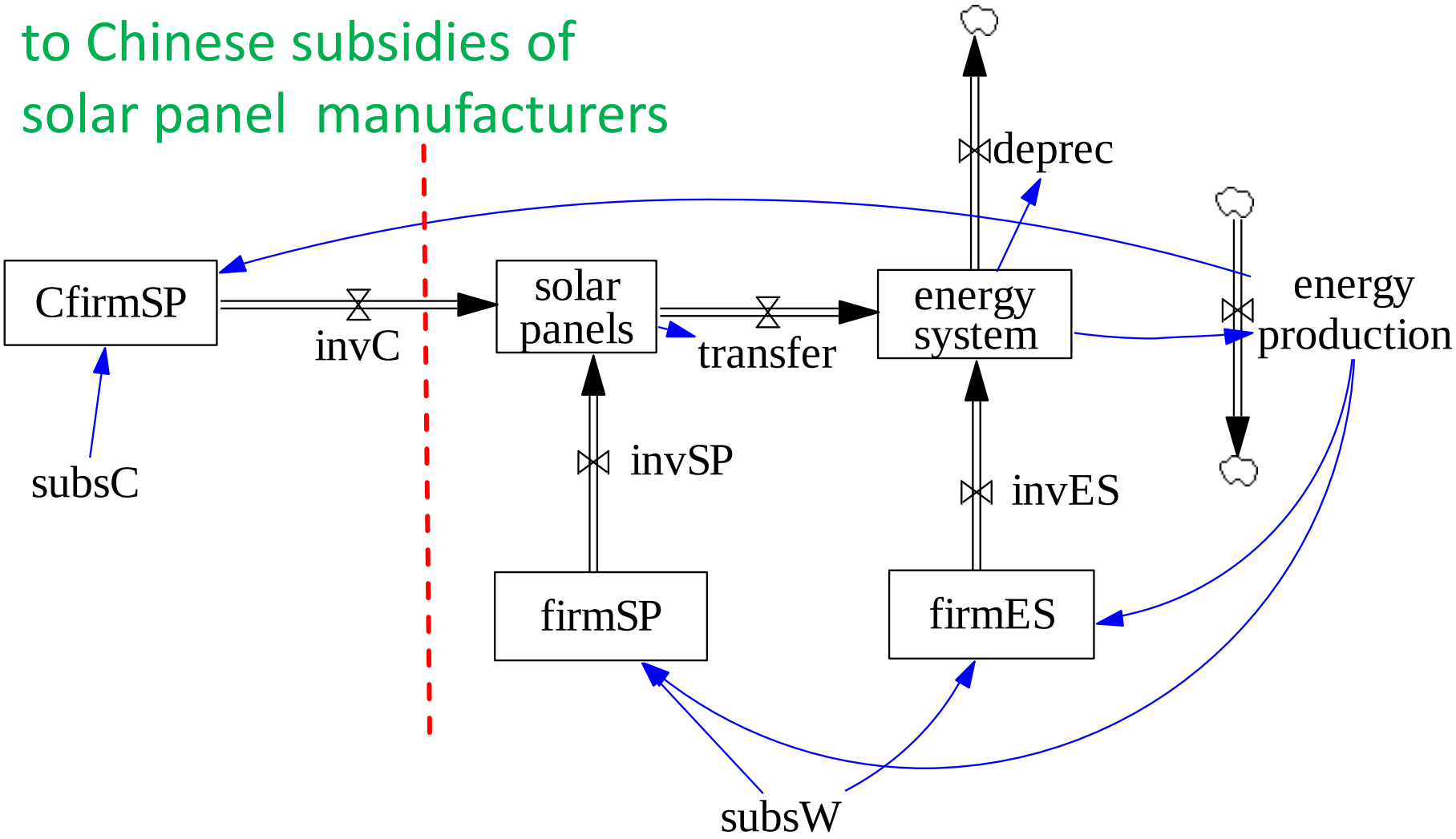


EU solar energy system

- with import of Chinese subsidized solar panels

Three possible responses to subsidized Chinese invasion of EU solar-panel market:

1. Counter with punitive import tariff

2. No action. Accept as permissible Chinese subsidy - consistent with policy of independent national contributions to 2 degree global target

3. Neutralize through matching increase of western solar-panel subsidies

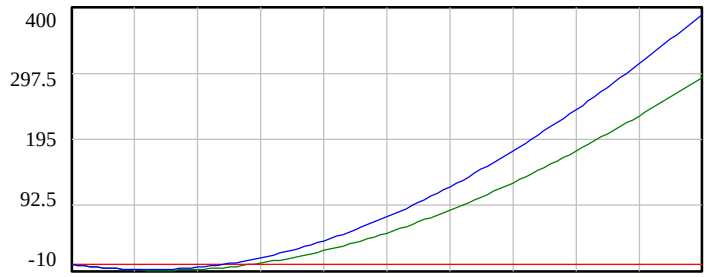
Judged by three basic actor types, characterized by different strategies:

B: Free-riding (**B**locking free-rider – lets others mitigate)

C: Forerunning, motivated by competitive advantage (**C**ompetitive forerunner – pursues mitigation independent of others)

E: Forerunning, motivated by ethics (e.g. **E**ncyclical of the Pope - cooperative **E**thical forerunner)

capital, solar panel firm



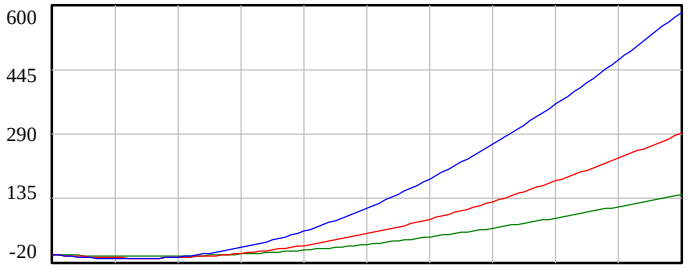
3: matched subsidies

1: punitive import tariff

2: no action

0 5 10 years

capital, energy system firm



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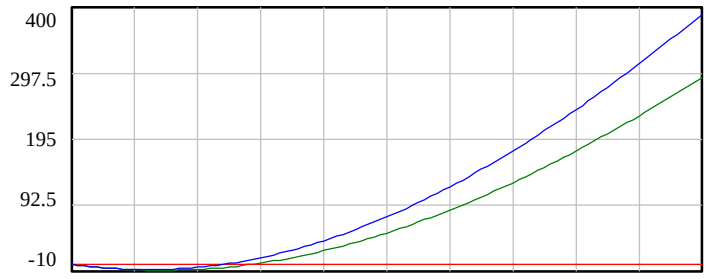

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punitive import tariff

B ↑ C ↑ E ↓

no action

B ↓ C ↓ E ↑

matched subsidies

B ↓ C ↑ E ↑↑

For ↑ against ↓

B = blocking free-rider
C = competitive forerunner
E = ethical forerunner

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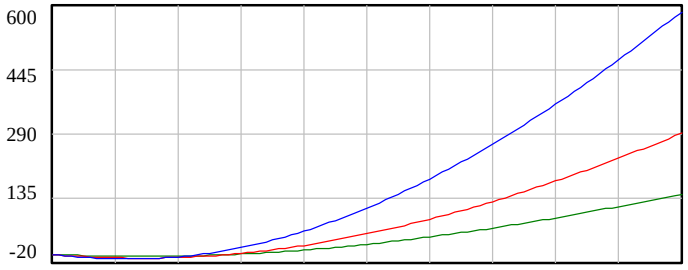

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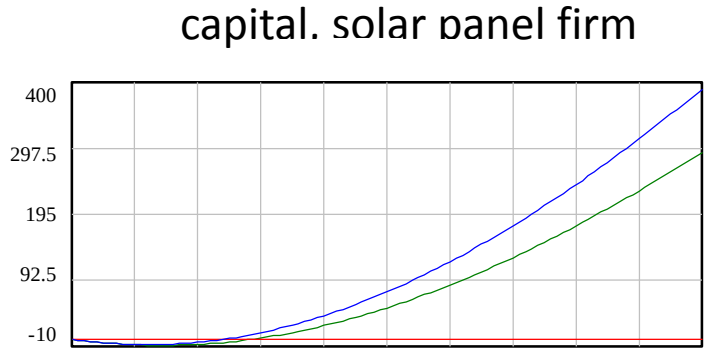

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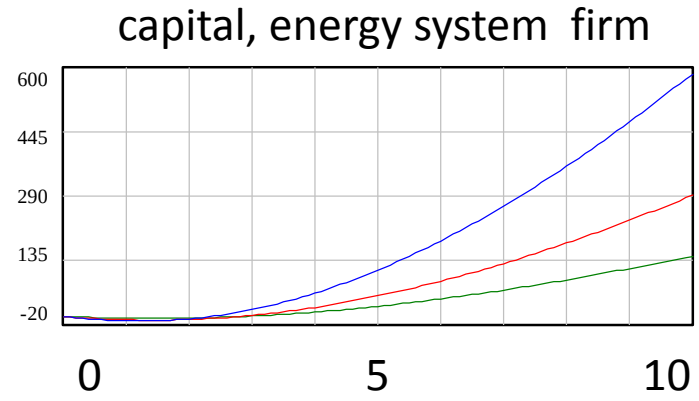

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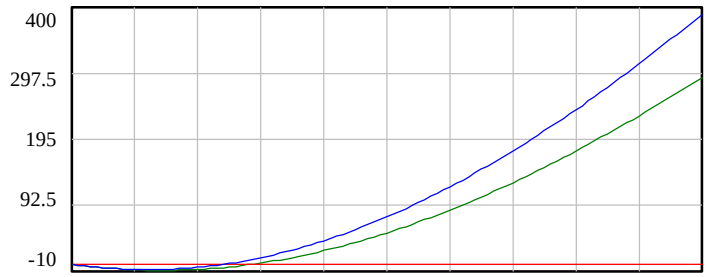
Solution negotiated

capital, solar panel firm



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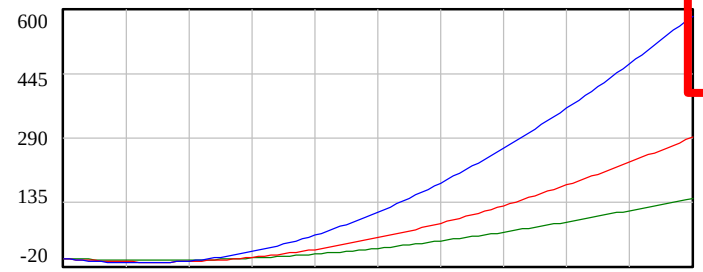

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Solution negotiated

Better solution for global climate (and Europe)

2nd example: Euro-crisis model:

How to balance the budget and redeem debt of southern European countries (Greece, Spain, Portugal, Cyprus)

(Nature Geoscience, KH, et al. Nov 2015)

An old controversy, with lessons from the Great Depression:

"Perfect market" theory: correct the budget and redeem debt, market will automatically adjust to an new equilibrium.

Keynes anti-cyclic theory: "perfect market" approach creates unstable market feedbacks producing major recessions and unemployment. Needed are government sponsored investments prior to budget adjustment.

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discredited by Great Depression of the 1930's

Keynes anti-cyclic theory: "perfect market" approach creates unstable market feedbacks producing major recessions and unemployment. Needed are government sponsored investments prior to budget adjustment.

Unfortunately, the Euro-countries adopted the - historically discredited - austerity path, with resultant severe recessions, high unemployment and political turmoil in Southern European countries.

This could have been avoided through a European Green Marshall plan.

But this was not seriously discussed – **because we failed to provide the relevant models?**

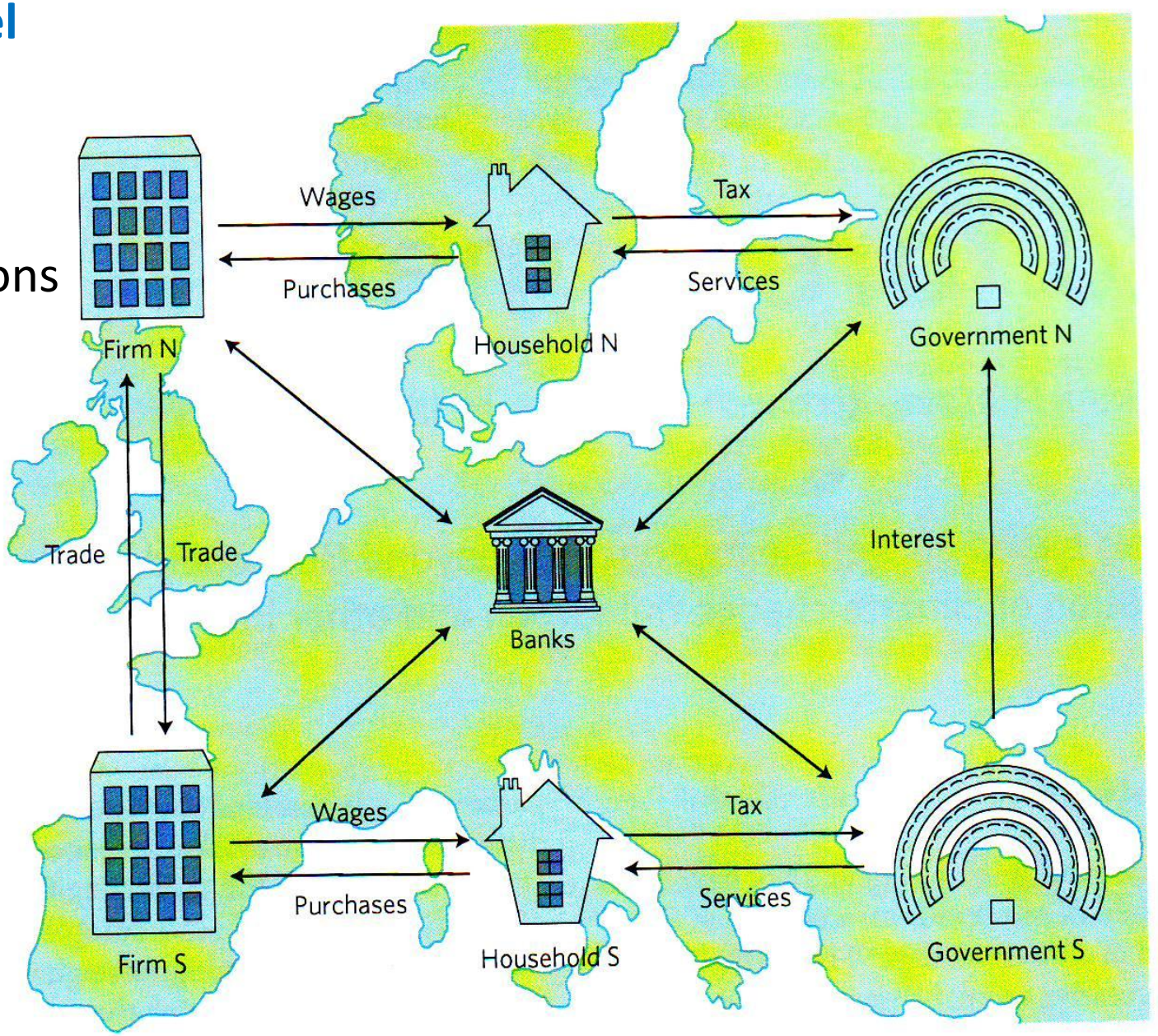
A Euro crisis model

Simple system-dynamics, 7- actor model of interactions between northern and southern

- **firms**
- **households**
- **governments**

and

- **banks**

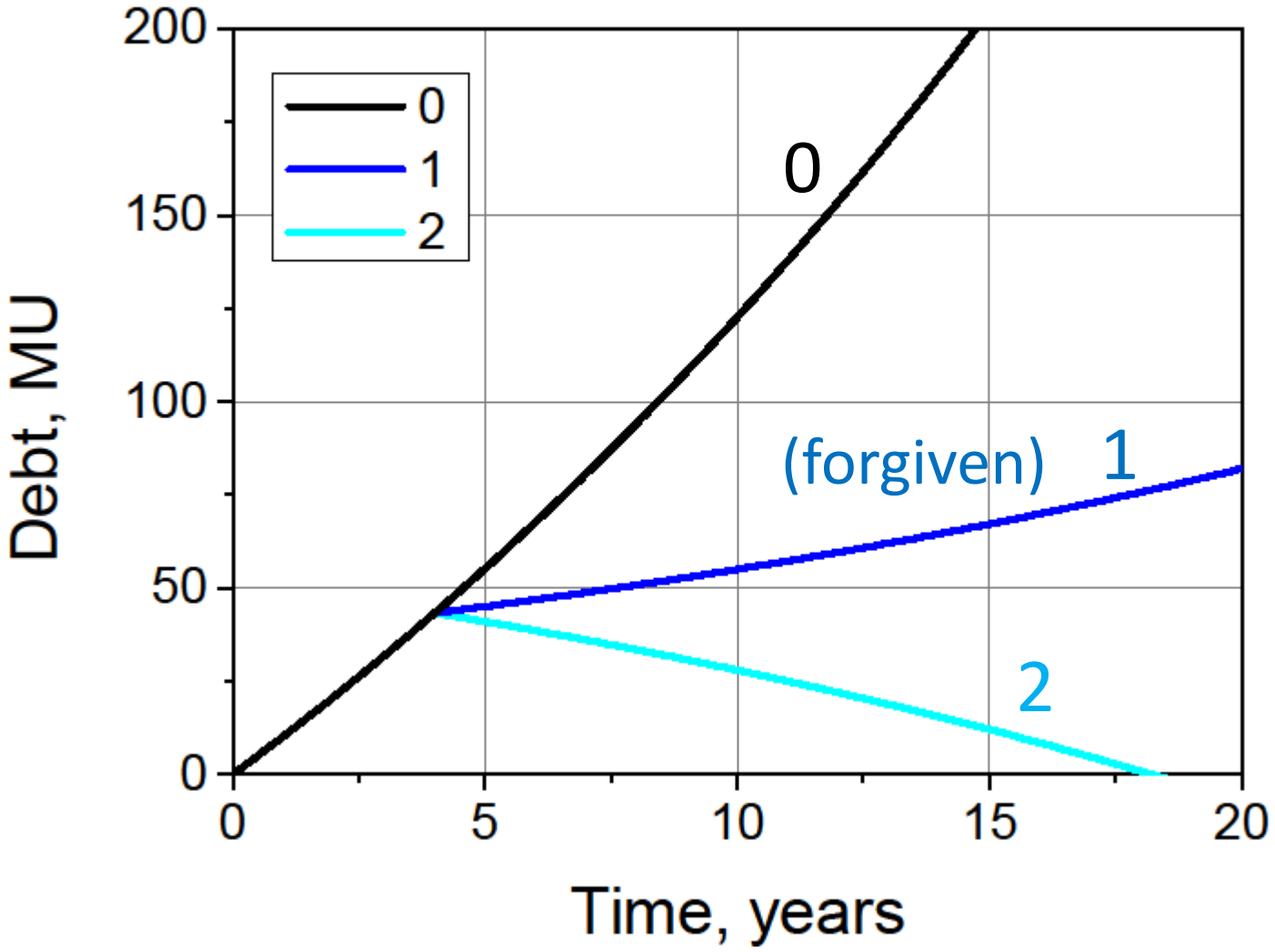


Three responses to the Euro crisis:

case 0: no response: a continual constant 10% budget overrun in the South,

case 1: balance the budget, with forgiveness of past debt by the North, or

case 2: create a budget surplus, enabling a long-term debt repayment to the North


200
150
100
50
0
Debt, MU
0
5
10
15
20
Time, years
0
1
2
0
(forgiven) 1
2

What is the impact of a sudden budget adjustment in Cases 1 and 2 on southern country

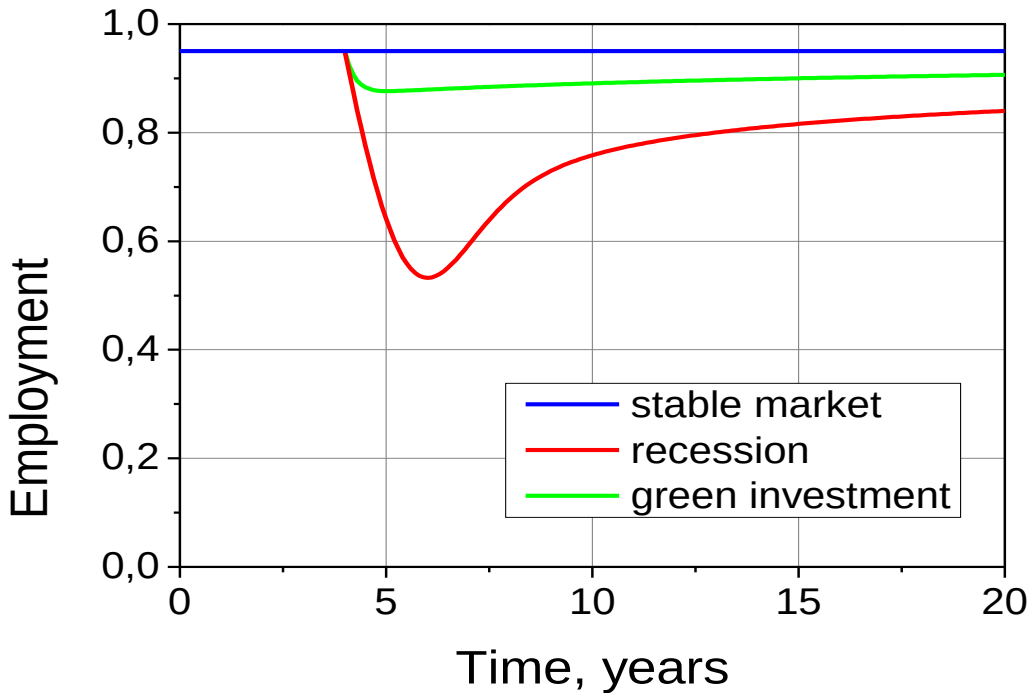
- employment level?
- average income level?
- investments?
- political response?
  (national, European, international)
- climate?

Impact on employment of balanced budget adjustment, with debt forgiveness, for

a) **austerity policy, assuming price adjustment** (perfect market, stable system, no unemployment)

b) **austerity policy, assuming firing of workers rather than price adjustments** (strong recession)

c) **green investment** (economic growth, only weak impact on unemployment)



Employment level, with and without debt repayment

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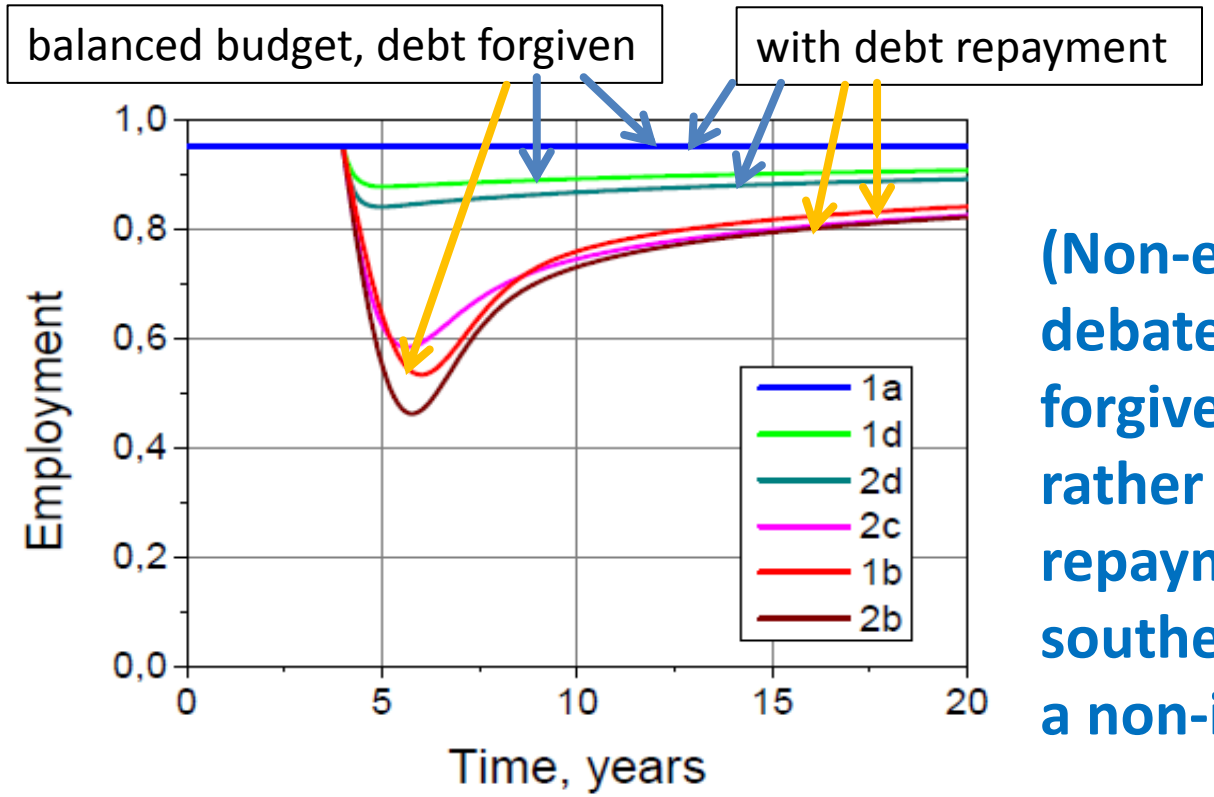
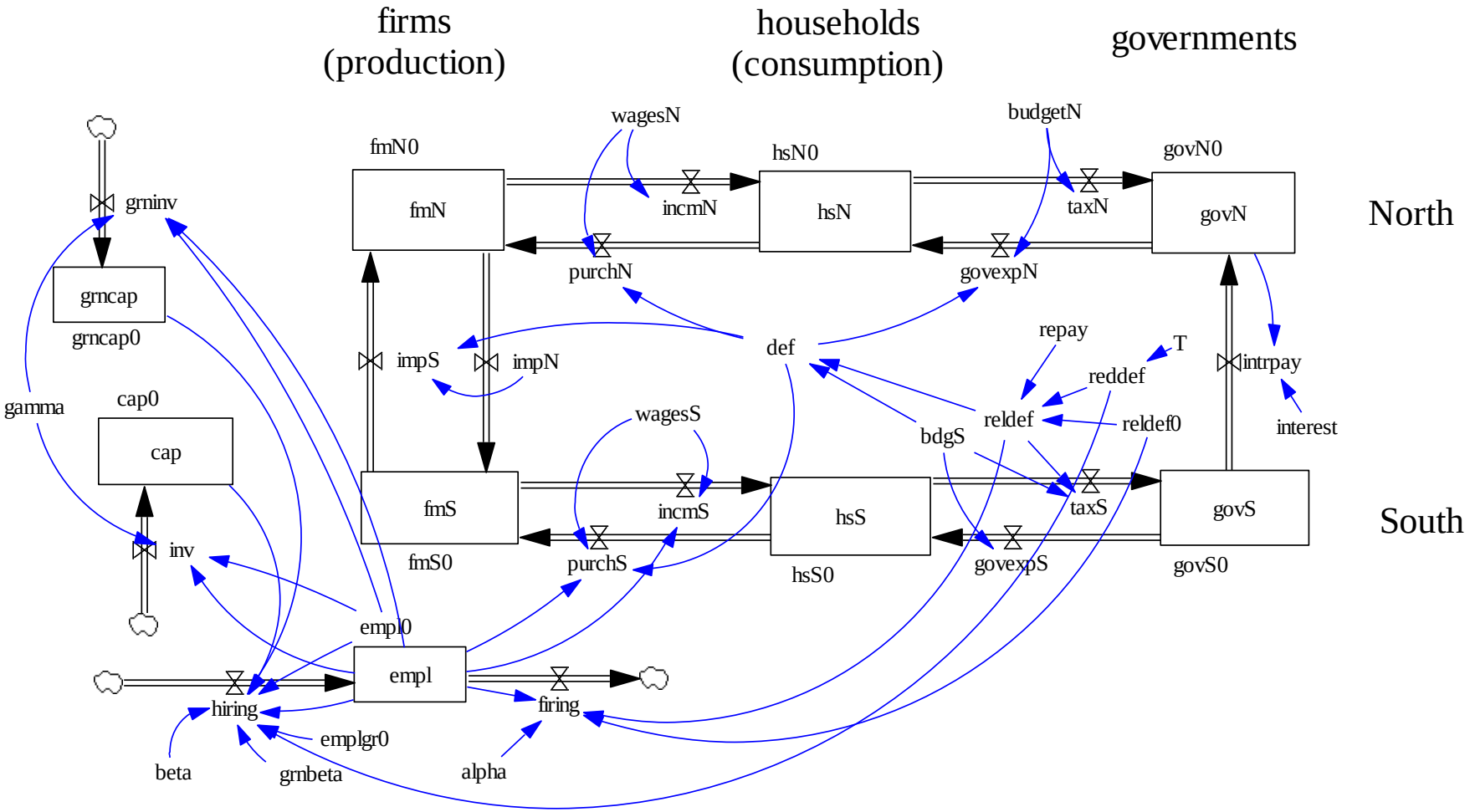


(Non-ending EU debate over forgiveness rather than repayment of southern debt is a non-issue)

Vensim sketch of interactions involved in resolving the Euro crisis.

Looks complicated, but runs in less than a second, was created and tested in a few days, and can be modified in a few minutes

- without any hassle in integrating nonlinear differential equations…



Conclusions of Euro-crisis model:

1. Severe recessions and unemployment was predictable and could have been avoided through a European Green Marshall plan.

2. This would have united rather than divided Europe: northern investments in renewable energy are equally effective with regard to climate if made in the North or the South

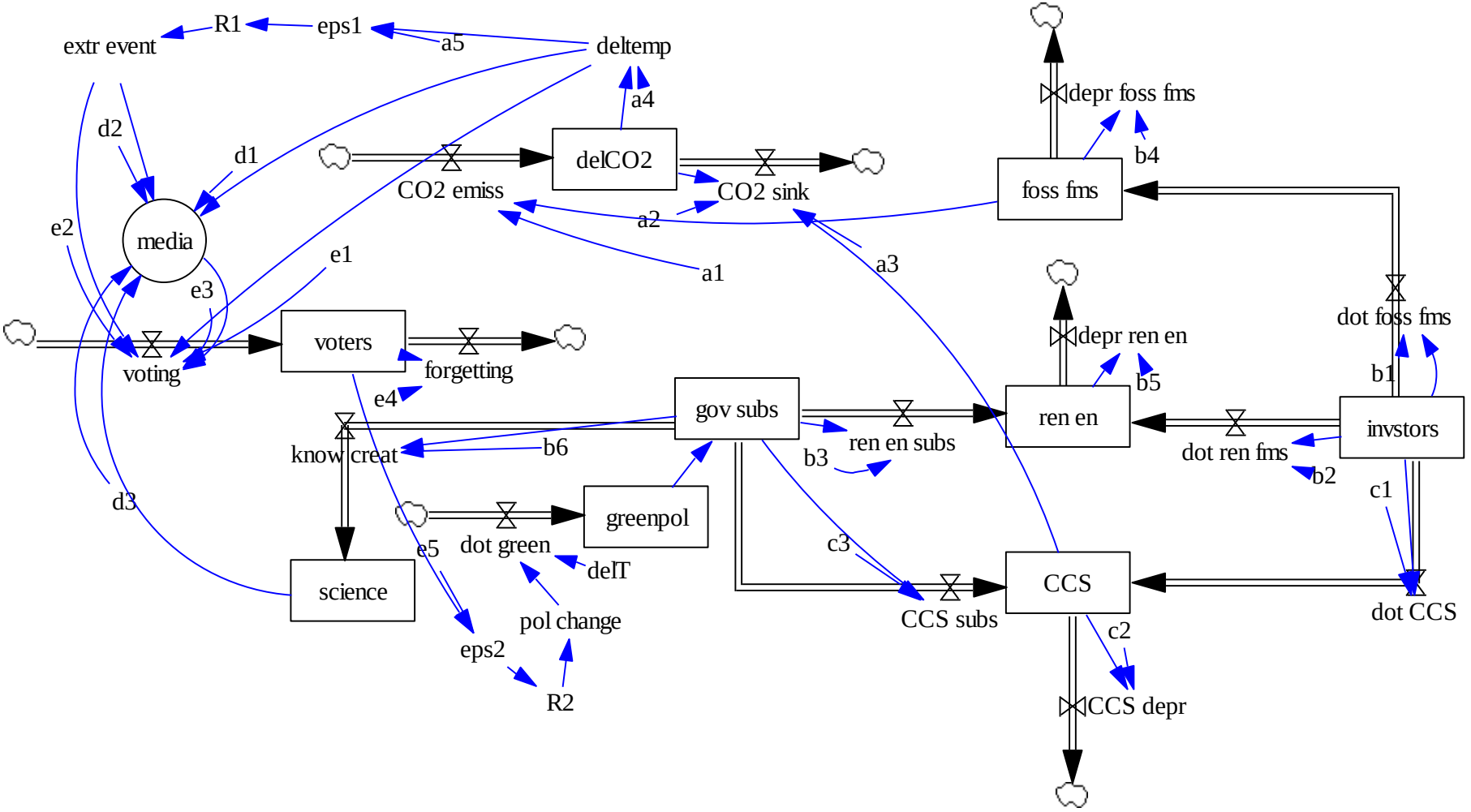
3. **We need new system-dynamic, actor-based models to transform the current "free rider" mentality of governments with regard to climate into "forerunners"**

Third example (work in progress):

An actor-based system-dynamic model of post-Paris climate policies, including

- international interactions
- national policies
- bottom-up forces of local initiatives

Vensim sketch of a general multi-actor, system-dynamics model of the green transformation (adaptable from local to global scales). **Actors:** investors, firms, governments, media, voters, scientists, citizen movements (cooperatives, NGOs,…)



Interactions modelled:

- Bottom-up and top-down forces in forming decisions
- Role of media, scientists, citizen groups, industrial lobbies , etc. – and, finally, the voting public
- Tipping points or system flips, resulting from: elections, extreme events (hurricanes, droughts, floods,..), catastrophes (Chernobyl, Fukushima,..), revolutions, ..., decreasing cost of renewables, …

Output:

- Ensemble of possible scenarios, with implications for policy response

Conclusions

- Actor-based system-dynamics models are needed to translate the diverse mental models of decision-makers into quantitative evolution models

- thereby translating the instantaneous “rates of change” pictures of decision makers into quantitative future evolution paths – an exercise exceeding the mental capability of humans in all but the simplest models

- The goal is not to present “the optimal solution”, but to provide a tool for the illumination of the unavoidable conflicts of interest arising in any transformation process – thereby supporting the search for a long-term just, equitable, green path to a sustainable planet.

In the context of the Paris accord:

What will prevail?

- Garret Hardin's pessimistic view ("The Tragedy of the Commons", Nature, 1968):
"A common good [i.e. our climate] can be preserved only if there exists a common enforcement mechanism"
(which does not exist internationally!)

- or the more optimistic view motivating this presentation:
"Bottom-up movements - supported by scientific analysis - will ultimately force national governments dependent on voters to implement more effective climate policies"

Thank you for the invitation,

and

thank you for listening