

Problem statement

«Problem»
The aggregate production function approach common to IAMs (Integrated Assessment Models)

- Makes a black box of the economy, and
- Ignores finance, money, and the fragilities they represent for the socioecological system.

“Statement”

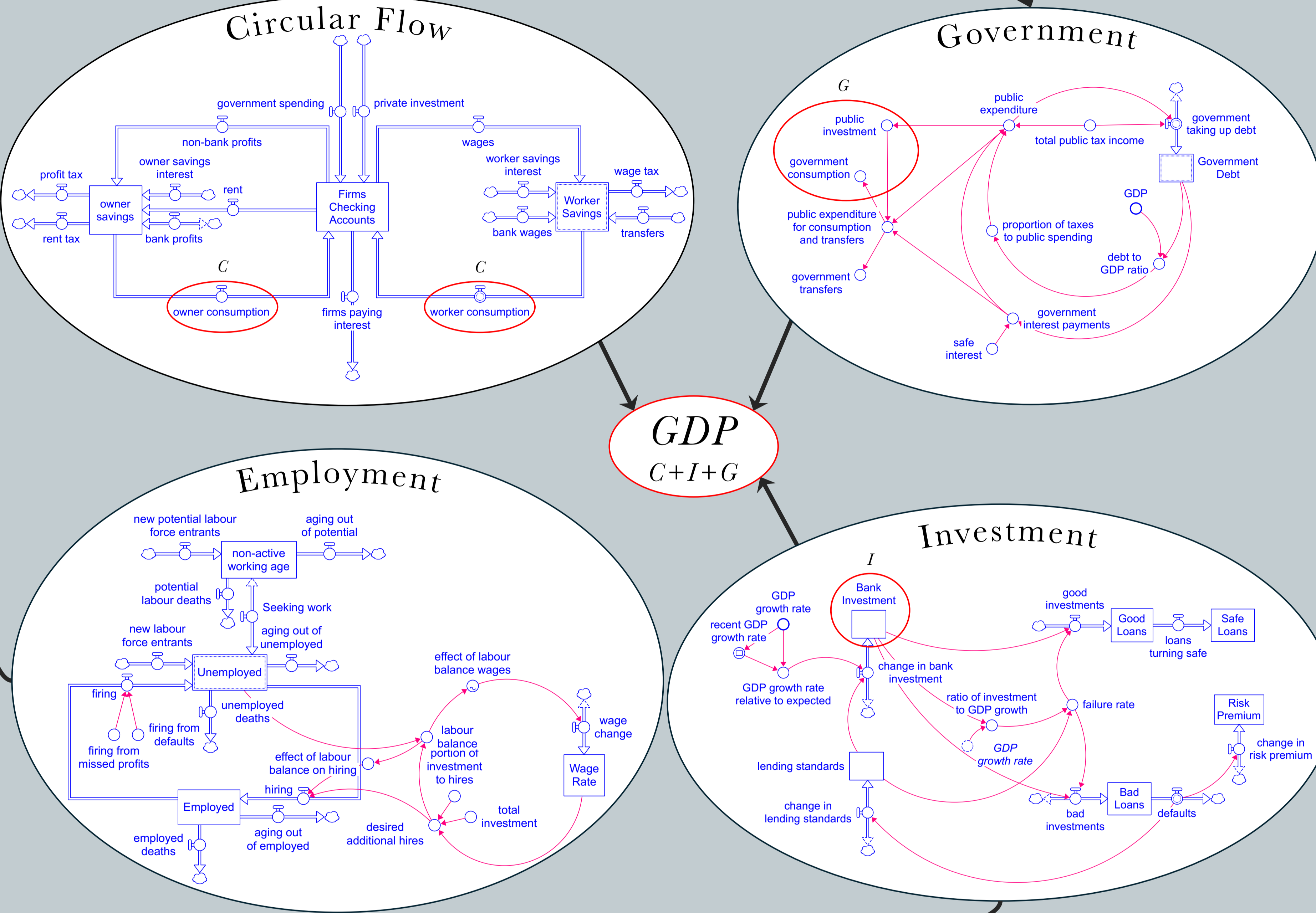
For IAM’s to build intuition with stakeholders the structure of the economic system needs to be explicit (not black box), and the fragilities of finance and money needs representing. FRIDA’s economy model sector aims to do this.

FRIDA V1.1

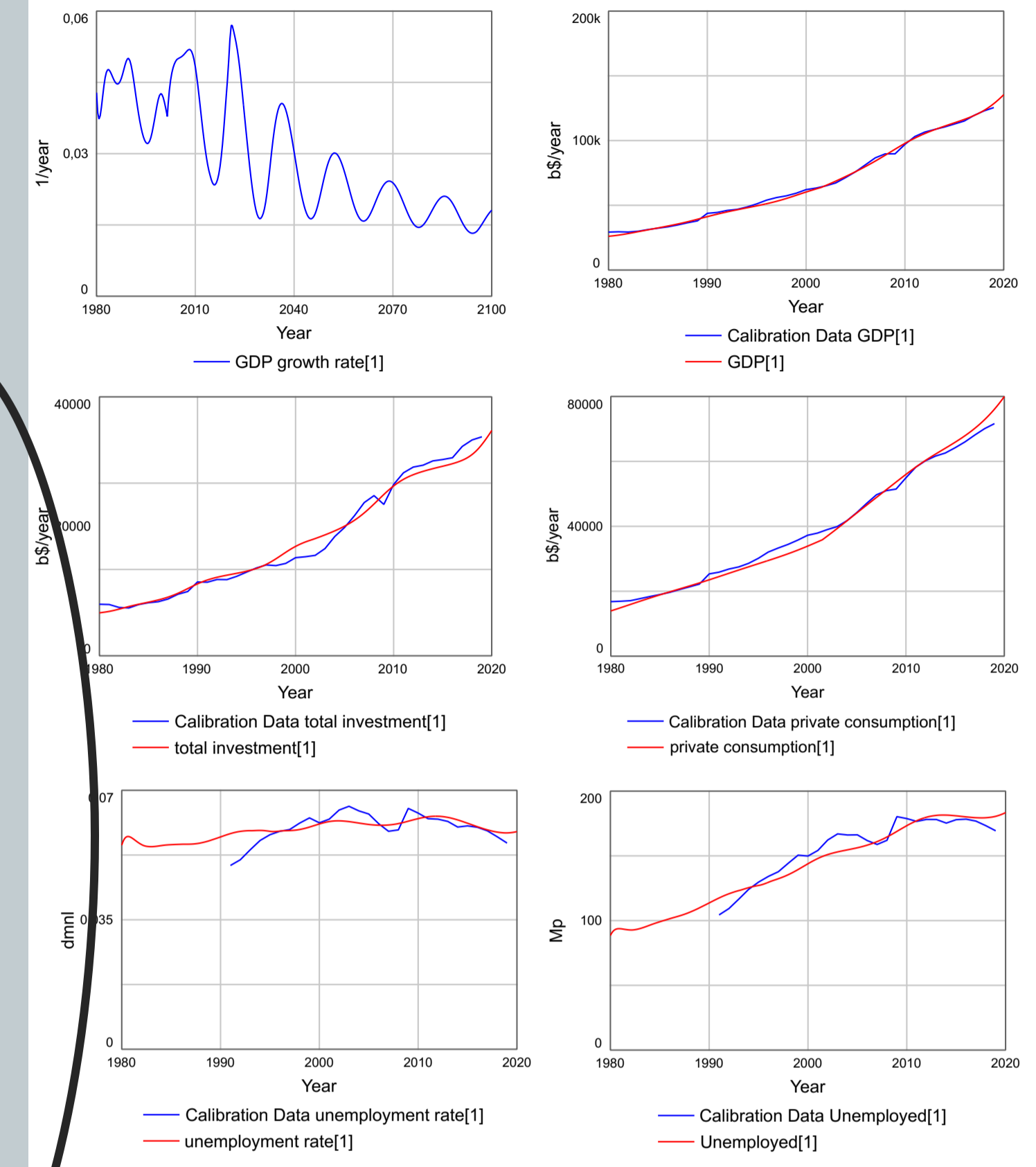
Frida is a new type of socioecological (or world-Earth) model capturing the two-way causal connections between people and the planet. Commissioned by the Horizon Europe, FRIDA is a main output of the WorldTrans project.

Its purpose is to inform sustainable climate action in a way that is transparent to experts, decision-makers, and other stakeholders alike. This requires low computational demands, a high level of aggregation, and explicit representation of variables, feedbacks, and delays.

In other words, it requires **System Dynamics**.



Results



What sets us apart?

- The three components of GDP are endogenously generated by their individual subsectors
- The model emphasises finance-mediated credit provision as a central driver of growth
- Money is endogenously created, and stocks and flows are consistently accounted for
- The model produces oscillations for the right reasons! Such as credit, and business cycles sensitive to climate conditions and dynamics elsewhere in FRIDA.

Big picture

Why care about GDP, and what is it?
FRIDA’s economic structure centres around GDP, but in a novel way!
GDP is used in FRIDA to track economic output. It’s relevant for calculating: fertility, energy demand, food demand, water usage, certain categories of emissions, indications of wellbeing, resources available for green policies, etc. GDP is the monetary value of final good and services produced in a country over a period. It includes good and services produces for sale in the market, and some “nonmarket” production, such as education and health care provided by government.

Most IAM’s: Aggregate Production Function
“GDP = TFP * Capital^a * Labour^b” is the Solovian approach used in most IAM’s. “TFP” is anything and everything that’s not capital or labour, making the model a **black box**. We don’t know what goes into it exactly, so we must rely on data, and **not mechanisms**. Since it is data driven, and climate impacts have been modest in the past, the function will produce modest impacts in the future. This is what we had in FRIDA V0.1, but **not anymore**. Furthermore, this function excludes the **financial instability hypothesis** by Hyman Minsky, where economic stability leads to increased risk-taking which can tilt the economy from growth to recession.

WorldTrans: So, how do we do it?
We model consumption, investment, and government spending. Then we add them up! That gives us a more fragile economy realistically sensitive to environmental conditions.
Our model is still a work in progress, however. We still need to capture more of the real economy, like wealth and equity. And we are currently implementing in/deflation.
What we have is a foundation complete enough to represent the **diversity of scenarios** FRIDA can generate. It is a **novel approach to IAMs**, that **improves the state of the art** by including fragility and economic cycles by considering the role of money and finance.