Village Simulation

Personal money creation, information money and ecological supply over 10 to 200 years

Full documentation: how the model works, every parameter, the computed simulations and what they show

Model version 1.1.0 · all figures in this document were computed by the simulation engine itself (seed 2026 unless stated) and can be reproduced with `node doku/daten.js`.

What this document does and does not claim. The simulation is an exploratory model with freely chosen play values. It is not a forecast and it does not prove that any economic system is optimal or would work in reality. "Works" in this document means: the model is internally consistent, its bookkeeping is exact, its results are reproducible, and its outcomes follow from stated rules rather than from built-in success.

1 What the simulation is

The simulation follows a fictional settlement month by month. The standard case is a village of 1,000 people; a city, a megacity or a county (one town with three villages) can be selected instead, and runs can cover 10, 50, 100 or 200 years (chapter 8). Every person starts with the same balance (1,000 D, which stands for one billion original coins) and has the same ongoing, debt-free, personal right to newly created money. There is one shared, self-governed currency and no exchange into euros or dollars. The village is closed: nothing is imported, so everything consumed has to be produced from local labour, land, water, energy, materials and existing facilities.

The question it explores: can such a village, with equal personal money creation, optional data-based coordination and ecological limits, build a reliable, fair and plentiful supply over decades? The answer is left open. Nothing in the model forces success; the runs in chapters 8, 9 and 11 show both stable phases and collapses.

How to use it

- Open `Dorfsimulation.html` in a browser. Everything is embedded; no server, account or internet connection is needed (only the optional AI assistant needs a connection).
- Press Start or "Run to end". The tabs show money, supply, nature, investment, comparison, checks and settings. A "User guide" tab inside the application explains every control in English, German and Spanish.
- Same seed plus same settings always gives exactly the same result.

The structure in brief

Part	What is modelled
People and households	Each person has an age, a skill type (general, technical, social/health), schooling and possibly a training in progress. Households pool money, buy goods, offer labour and do unpaid care.
Firms	19 cooperatively owned firms in 9 sectors (2–3 per sector), each with a money balance, price, capacity, facility condition and inventories.
Community fund	Two separate budgets: supply (education, health subsidy, basic support, digital infrastructure) and investment (co-financing of projects, liquidity aid).
Nature	Water stock, soil quality, land use and habitat, a simplified biodiversity indicator, wood stock, material cycle with recycling losses, greenhouse gas emissions.
Non-replaceable stocks	Technical parts and medical supplies from the initial endowment; they cannot be fully reproduced locally.
Planner (optional)	A disclosed rule set labelled "AI surrogate". It sees only delayed, noisy data up to the current month.
External AI (optional)	The user can connect their own Claude or ChatGPT key. The AI can steer by chat, search for better settings, or act as a real-time planner that decides at fixed intervals during a run.

2 Why the model can be trusted to do what it says

The model is built so that its numbers cannot drift away from its rules. Four properties carry this:

- **Exact money bookkeeping.** Money is held as whole numbers in a smallest unit of 0.001 D. Every payment has a sender and a recipient and is refused if the sender lacks cover. At the end of every month the sum of all accounts must equal start + creation − withdrawal exactly, otherwise the run stops.

- **Physical balances.** For food, materials, water, wood and the material cycle the closing stock must equal opening stock + inflows − outflows within a relative tolerance of 10^{-7}. Stocks cannot become negative.
- **Real constraints come first.** Output is the minimum of what facilities, labour, skilled labour, energy, water, materials and financing allow. Money cannot substitute for a missing physical input (check 5 in chapter 12 demonstrates this with a hundredfold start balance).
- **No hidden clamping.** If a value becomes invalid (NaN, negative account, broken balance) the run stops with a diagnosis instead of being corrected silently.

On top of that, randomness is split into separate streams (weather, demography, measurement, planner) with a fixed number of weather draws per month, so that a changed policy does not change the weather. This makes scenario comparisons fair: all scenarios see the same droughts and harvests.

What the model cannot give is empirical validity. All starting values are plausible but uncalibrated. Chapter 13 lists the simplifications that matter most.

3 The monthly sequence

One step is one month of a uniform 30.4375 days. Annual rates are converted to monthly rates. The order within a month is fixed:

Step	What happens
1 Demography	Weather and events are drawn. People age; deaths, births and moving out at 22. Balances of extinct households go to heirs, otherwise to the fund.
2 Money	Withdrawal on the start-of-month balance of every account (deleted for good), then money creation according to the chosen mode.
3 Planning	Eco budgets from measured values, planner view (if on), basic needs, labour supply, liquidity aid.
4 Labour	Maintenance and project orders; materials bought from last month's store; production plans; labour allocated (skilled first); wages paid; fund levy taken once.
5 Production	Fixed order: energy, water, digital, health, then food, materials, construction, everyday goods, housing, education. Household basic energy and water are reserved first.
6 Trade	Households order basic needs in a fixed order as far as their money reaches, then comfort goods. Two allocation rounds per good; scarce goods are shared proportionally.
7–8 Outcomes	Coverage per person, schooling and training progress; projects completed and started.
9 Wear and nature	Facility wear and maintenance effect, water, soil, biodiversity, wood, material cycle, emissions; cooperative payouts; price and wage adjustment.
10 Closing	Balances checked, key figures recorded.

4 Money

```
M_end = M_start + C − D
```

M is the sum of all accounts (households, firms, both fund budgets). C is money actually created, D money finally deleted. Wages, purchases, fund spending and inheritances are transfers and never change M.

Creation

Basic rule (mode 0): every living person receives the same amount each month.

```
q = floor(λ · M_start) / N C = N · q (remainder distributed one unit at a time, rotating start position)
```

λ defaults to 1 % per month and can be set from 0 to 2 %. Firms have no creation right. Five modes can be compared:

Mode	Rule	All needs met	Worst-off tenth	Gini end	Price index end
0	equal per person (λ · money supply ÷ inhabitants)	48 %	95 %	0.46	0.83
1	fixed amount per person	51 %	95 %	0.47	0.82
2	by basic need (children less, older people more)	52 %	95 %	0.47	0.82
3	to the community fund instead of to people	68 %	97 %	0.46	0.60
4	by last month’s labour income	49 %	95 %	0.53	0.86

Scenario B settings, 1,000 inhabitants, 10 years, seed 2026, one run per mode. Mode 0 is the equal personal right the concept is about; modes 1–4 exist for comparison.

Withdrawal and levy

- **Withdrawal** (default 0.8 % per month): floor(rate · balance) on every account. It takes more from large balances, so creation minus withdrawal is positive for poor and negative for rich households; the application shows this by tenths. It also raises the propensity to spend out of balances.
- **Fund levy** (default 25 %): taken once from each wage sum paid, split into supply and investment budgets (default 85 / 15).
- **No credit.** There are no loans and no negative accounts. Investments are paid from existing balances.
- **Adaptive controller** (optional, uncalibrated): λ is nudged by at most ±0.05 points per month in response to smoothed, delayed inflation, free production capacity and circulation. It can oscillate or mis-steer.

```
λ ← λ + clamp(−kP·(π − π*) + kU·s − kV·Δv, ±0.0005), 0 ≤ λ ≤ 0.02
```

Opening balance sheet (standard example)

Item	Amount (D)
Start coins issued to 1000 people	1,000,000
= household balances (484 households)	880,000
+ firm balances (10 % transferred by households)	100,000
+ fund balance (2 % transferred by households)	20,000
Sum of accounts	1,000,000

5 Households, demand and labour

Basic needs and comfort

Good (unit)	Children < 18	Adults 18–66	67–79	80+	Comfort wish
Food (rations)	24.4	30.4	27.4	25.9	+8.0
Water (m³)	3.0	3.0	3.0	3.0	+1.5
Energy (kWh)	84.0	120.0	132.0	144.0	+60.0
Housing (places)	1.0	1.0	1.0	1.0	+0.2
Health/care (h)	1.0	0.8	5.0	12.0	+0.8
Everyday goods (SU)	6.4	8.0	7.2	7.2	+30.0

Per person and month. Energy varies seasonally (×0.6 in summer to ×1.5 in winter). SU = service units. A ration is a model quantity without nutritional claim. Education is paid by the fund: 6 teaching hours per school child, 8 per trainee.

- **Affordable order.** Basic needs are ordered in a fixed sequence as far as the balance reaches. Unmet need = need − delivered, even if nothing could be ordered.
- **Comfort budget.** spending rate · (income − basic spending) + (wealth rate + incentive · withdrawal) · (balance − savings target). Cheaper goods raise the comfort wish (rebound elasticity).
- **Basic support.** The fund covers the gap between balance and basic basket pro rata, with at most half of its free supply budget.

Labour supply

```
share = clamp((base + aL·ln(real wage) − aV·ln(1 + buffer/6) + aN·shortage) · preference, minimum, 1)
```

buffer is the balance per person measured in monthly basic baskets. So people work less when they are financially secure and more when basic needs are unmet, but never zero and never automatically the maximum. These parameters are the most uncertain in the model.

- Unpaid care reduces paid hours: 60 h per child under 6, 25 h per child 6–13, 30 h per person aged 80+; people aged 67–79 take on up to 60 h.
- Allocation: specialists by type first, then general labour, proportional when scarce. Firms with unfilled jobs raise their wage step by step (up to +50 %) and get priority.
- Missing specialists: the affected share works at 40 % output. Training takes 36 months; schooling sets later productivity (75–100 %).

6 Production, prices and investment

Sector coefficients

Sector (unit)	Labour h/unit	Specialist share	Energy kWh/unit	Material t/unit	Wear/month	Maintenance h per capacity unit
Food (rations)	0.42	2 %	0.3	0	0.40 %	2
Water (m³)	0.03	50 %	0.6	0	0.40 %	0.03
Energy (kWh)	0.4	60 %	0	0	0.50 %	0.5
Housing (places)	0.6	10 %	0	0	0.15 %	1.2
Health/care (h)	1.3	75 %	1	0	0.30 %	0.15
Maintenance/construction (h)	1	30 %	0.5	0.005	0.40 %	0.05
Education (h)	1.5	70 %	0.5	0	0.20 %	0.15
Materials (t)	12	20 %	150	0	0.40 %	5
Everyday goods (SU)	1.1	2 %	0.5	0.002	0.30 %	0.02

Food: yield = area · 2,000 · soil · intensity^0.7 · weather · seasonal share · water factor (rations per ha and year), harvested mainly July–October, stored with spoilage. Energy: 65 % of solar/wind output is usable directly, the rest only through storage (15 % loss) or is curtailed; the CHP plant burns 0.25 kg wood per kWh.

Prices and the price index

```
p ← p · (1 + clamp(kC·(unit cost·(1 + mark-up)/p − 1) + kD·excess demand, ±maximum))
```

Prices react with delay and within limits to smoothed unit costs and to excess demand. A high price can push demand out without removing the need. The price index values a fixed basket per person and month: 29 rations food, 3 m³ water, 120 kWh energy, 1 places housing, 1.9 h health/care, 8 SU everyday goods. If a good has no sales, its last price is carried forward and the index is marked as restricted.

Investment projects

Project	Construction hours	Material t	Technical parts	Months
Generation +80 kW (solar/wind)	900	12	40	6
Electricity storage +250 kWh	250	4	30	4
Waterworks +1,500 m³/month	600	10	12	6
Irrigation efficiency +8 % (max 40 %)	500	5	6	6
Housing +20 places	3000	120	2	12
Farmland +10 ha (from habitat)	400	2	0	12
Soil-building programme (36 months)	600	0	0	3
Storage technology (spoilage −15 %)	500	20	2	5
Health/care +200 h	800	20	8	8
Workshop +600 h	400	8	10	4
Crafts +1,500 SU	600	15	6	6
Recycling rate +3 points (max 90 %)	500	5	10	6
Energy efficiency +3 % (max 30 %)	800	10	10	6
Restoration 5 ha farmland to habitat	300	0	0	6
Overhaul of a firm (condition +0.2)	6 months of maintenance	1 % of hours	by sector	4

Per 1,000 inhabitants. A project starts only if the technical parts are available; it progresses only when construction hours, materials and money are actually there; its effect begins after the last hour is delivered and the construction time has passed. Progress is therefore never free and is capped.

The planner ("AI surrogate")

Without the planner, firms invest when their own utilisation is high or their facilities are worn, and the fund co-finances. With the planner, proposals are ranked in a disclosed order: 1. respect protective limits, 2. improve basic supply, 3. reduce failure risks, 4. further benefit with little resource use. The planner also prioritises scarce labour and maintenance towards sectors with unmet basic needs and trains specialists ahead of foreseeable retirements. It works with data coverage (default 80 %), measurement error (5 %) and a delay (2 months), never with future information, and it does not rate people.

External AI as real-time planner

In addition to the built-in planner, an external AI can plan during a run. The user chooses an interval (every 6 months to every 10 years). The simulation computes up to each decision point, sends the AI only the data measured so far (coverage by area, limiting factors, facility condition, stocks, limits, money, labour) and waits for the answer. The AI sets at most six policy parameters per decision, including the money creation mode and the planner's priority weights; the built-in rule set then carries out investments, labour priorities and training. Every decision is stored as a change with its month, so the run stays reproducible from its export. The application shows supply over time with a vertical line per decision, the list of decisions with the AI's reasoning, and the plan currently in force. This feature needs the user's own API key and was not exercised for this document.

7 Nature, limits, population and federation

- **Water:** stock + natural inflow (seasonal, weather-dependent) − extraction − overflow.
- **Soil:** $\Delta B = r \cdot (1 - B) - r \cdot (0.3/0.7) \cdot \text{intensity}^3 \cdot B$. At intensity 1 a quality of 0.7 is stable; over-use degrades it and lowers yields.
- **Habitat and biodiversity:** the indicator slowly follows habitat share, farming intensity and water level. It is a heavily simplified indicator.
- **Wood:** logistic growth; used as CHP fuel and as new material.
- **Material cycle:** built-in material retires over 50 years, 80 % is taken back, recycling yield 75 % (up to 90 % through projects). The rest is lost for good.

- **Emissions:** farming, CHP plant, material extraction, recycling and technical parts used.

Five separate limits

Limit	Default	Reaction when limits are active
Water extraction	80 % of mean annual inflow	Pumping beyond household basic need is capped
Emissions	0.35 t CO_2e per person and year	CHP use, new material and new projects are throttled
Wood extraction	80 % of wood growth	New material is capped; fuel for household basic energy is exempt
Habitat	at least 50 % of the area	Land conversion projects are blocked
Soil protection	farming intensity ≤ 1.0	Intensity is capped

Control uses measured values with error and aims 10 % below each limit. Household basic needs for water and heating have priority and can push a limit over; that is then shown. With limits ignored (scenario D) decisions disregard the budgets but all physical consequences still apply. Limits are tracked separately and never offset against each other. The values are freely chosen local play values, not derived planetary boundaries.

Population

With demography on, people age monthly, die with age-dependent probability, have children according to the fertility rate and move out at 22. Lack of food, water and health care raises mortality visibly (excess mortality is reported). With demography off, the population is frozen. Newborns immediately get the same creation right; the start bonus only if switched on.

Federation of villages (optional)

Two to six villages run together. Each is a complete simulation with its own weather and a slightly different endowment; planned events hit one village each in turn. After every month they balance out: food and materials against payment or as a solidarity delivery (with transport loss), technical parts and medical supplies as a commons. Money only changes village, so the federation's money supply is unaffected.

Example, three villages of 1,000, 10 years: 12,587 rations and 14,876 D moved between villages; all basic needs were met for 56 % of people on average (per village: 54 %, 39 %, 75 %).

8 Settlement types, scale and long runs

The settlement type loads a set of starting values. Up to 5,000 inhabitants every person is simulated individually. For larger populations each simulated person stands for several real people (the scale): quantities, stocks and money totals are extrapolated, while per-person values such as coverage, prices, hours and the Gini coefficient are unchanged. A megacity of five million is therefore computed with 2,500 simulated people, each standing for 2,000.

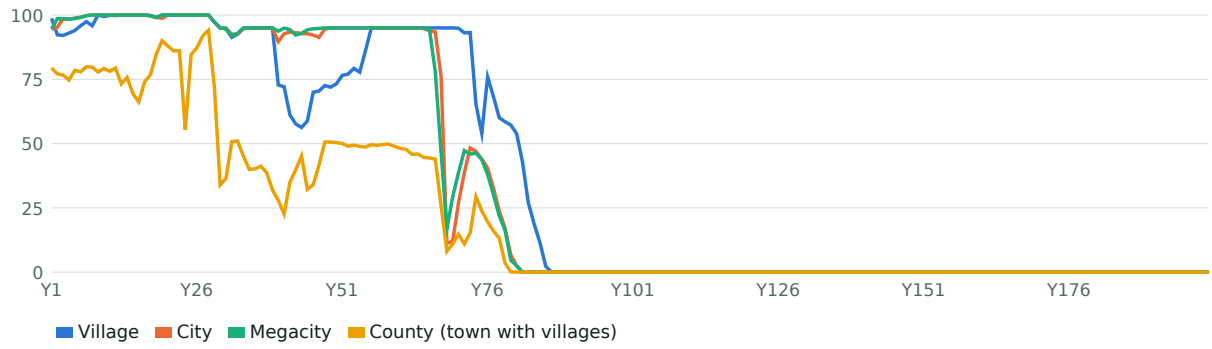
Starting value (per 1,000 simulated people)	Village	City	Megacity	County (town with villages)
Simulated people	1,000	2,000	2,500	1,000
Scale	1	50	2,000	25
Farmland ha	330	310	300	330
Habitat ha	520	300	160	520
Min. habitat share	50 %	30 %	15 %	42 %
Water inflow m³/yr	150,000	140,000	125,000	150,000
Wood stock t	80,000	33,000	17,500	80,000
Solar/wind kW	1,300	1,650	2,050	1,300
CHP kW	200	150	100	200
Storage kWh	1,500	3,200	4,800	1,500
Built-in material t	20,000	48,000	64,000	20,000

Play values. City and megacity have less farmland and nature per person but more solar power, storage and recyclable building stock. The county is a federation of four settlements: the first is a town with 35 % of the farmland, half the habitat and more services; the other three are villages with 25 % more farmland that supply the town. In the county the number of inhabitants applies per settlement.

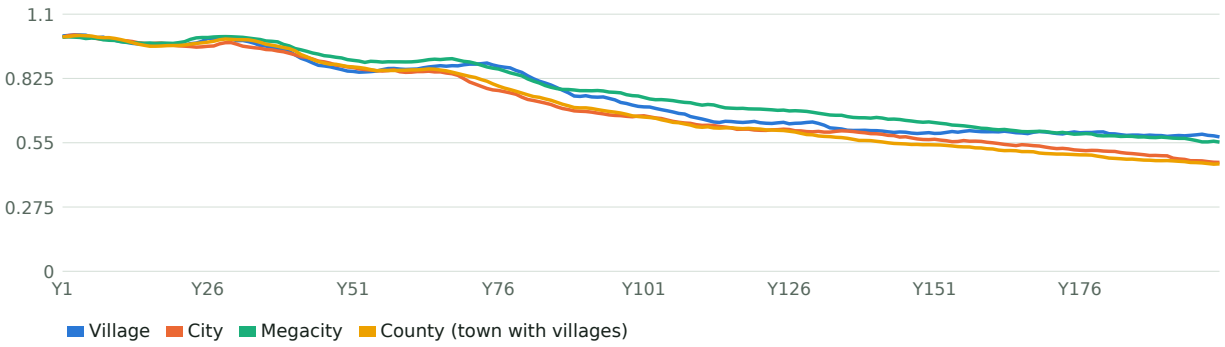
Type	People at start	After 50 y	After 200 y	Years 1–10	11–20	21–30	31–40	41–50	Crisis months
Village	1,000	856	575	57 / 96	92 / 100	84 / 99	0 / 92	0 / 66	19
City	100,050	87,200	46,500	68 / 98	92 / 100	84 / 99	0 / 94	0 / 93	0
Megacity	5,004,000	4,522,000	2,762,000	67 / 99	93 / 100	84 / 99	0 / 94	0 / 94	0
County (town with villages)	100,025	87,425	46,025	39 / 78	55 / 77	69 / 78	9 / 40	0 / 40	43

Scenario C (planner on), seed 2026, one run per type. Decade columns in per cent: people with all basic needs met / coverage of the worst-off tenth. Crisis months counted over the first 50 years.

Coverage of the worst-off tenth over 200 years (yearly mean, %)



Population over 200 years (start = 1)



- **All types work for about three decades and then decline.** Technical parts and medical supplies run out in the fourth decade in every type, because the closed settlement cannot replace them. In years 51–100 the worst-off tenth still has 54 % (village) to 20 % (county) coverage; after year 100 it is close to zero, and by year 200 the population has fallen to roughly half.
- **City and megacity do slightly better than the village in these presets** because recycled building material and solar power replace wood. A first preset with only less nature per person failed from the first year; the result depends on these play values.
- **The county is the weakest.** The town cannot feed itself and depends on deliveries from the villages, which costs transport losses and leaves it exposed when the villages have a poor harvest.
- **Run time and number range.** 200 years take about 14 to 43 seconds depending on the type. With money creation but no withdrawal the money supply can exceed the exact number range in very long runs; the run then stops with a diagnosis instead of continuing with rounding errors.

Energy scenarios E and F

Scenario	Years 1–10	11–20	21–30	31–40	41–50	Crisis months	Comfort	Parts gone (year)	Energy cond.
C with planner	57 / 96	92 / 100	84 / 99	0 / 92	0 / 66	19	89 %	37	0.62
E Solar houses	66 / 98	92 / 100	87 / 99	0 / 94	0 / 92	0	93 %	31	0.43
F Hypothetical free energy	72 / 99	92 / 100	85 / 99	0 / 94	0 / 92	0	94 %	41	0.66

Village, 50 years; decade columns in per cent as above; energy condition is the facility condition (0–1) at the end. E: double solar area on roofs and walls with double storage; solar heating and cooling at the house cover up to half of household energy demand (less in winter). F: an assumed fuel-free, weather-independent source of 600 kW per 1,000 inhabitants.

- **E, decentralised solar houses,** removes the winter energy bottleneck and the crisis months. The price is faster use of technical parts: they run out about six years earlier, and the energy facilities end in worse condition.
- **F, hypothetical free energy.** No device that delivers more energy than it takes in is known to physics; this scenario is a thought experiment and not a technology option. It shows that even with energy removed as a constraint the settlement still runs out of medical supplies and technical parts, so abundant energy alone does not make the closed settlement sustainable.

9 Scenario G: information money after Hörmann

Three levels are kept apart in this chapter. (1) What the sources describe: model ideas and theses by Franz Hörmann. (2) What we added to make them executable: assumptions S1–S10, which are ours and not a specification by the author. (3) What the simulation computed. The reconstruction is not complete and has not been confirmed by the author. Variant H (the early EURO-WEG/Gelt approach of 2011 with equal counter-bookings and negative accounts) is not implemented.

9.1 Settlement rules compared

Scenario G is a separate settlement type, not a sixth money creation mode. The physical core (people, facilities, stocks, weather, limits, planner, labour-supply function) is the same as in scenario C; only bookkeeping, production financing and allocation under scarcity differ.

Rule	Transfer models A–F	Information money G
Accounts	household accounts, firm accounts, two fund budgets	one account per person, also within a household; no firm or fund accounts
How balances arise	equal creation per person: $q = \lambda \cdot M \div N$ (or a comparison mode)	contribution credit for recognised work and care; need credit for basic needs actually delivered
Consumption	payment to the supplier; the money stays in circulation	deletion on one's own account; there is no recipient
Transfer between accounts	yes: wages, purchases, levies, inheritances	no; at death the account is closed and any remainder deleted
Firms	need money for wages and inputs	produce from allocated real resources; money is no barrier
Investment	from firm balances and the fund's investment budget	limited by construction hours, materials, technical parts, eco budgets and construction time
Prices	market prices, delayed response to costs and excess demand	fixed contract tariffs; abundant goods without deletion
Scarcity	price rises, demand without money drops out	basic needs first, remainder by a disclosed allocation rule
Money supply, price index, Gini	meaningful key figures	technical log quantities; not directly comparable
Not applicable	–	λ controller, money withdrawal, fund levy, liquidity aid, payouts, basic support from the fund

9.2 Register: source / added assumption / testable effect

Source and location	Executable assumption added by us	Testable effect
Q1 informationsgeld.info "Informationsgeld"; Vienna slides 5 July 2016, nos. 7–9, 13, 26: personal credit, deletion on consumption	S2: for every person closing balance = opening + contribution, need and other credits − consumption and other deletions. Every credit has a unique event ID.	Checks IG1, IG2, IG3, IG6; booking log
Q2 "Gesellschaftsvertrag": personal, non-comparable figure; individual tariffs	S1/S7: own account unit per person; allocation and behaviour compute in a reference unit. One contract template for all, which acts differently by age, need and skill.	IG7 scale invariance; open point: no editor per individual
Q2/Q5 slide 29: shared means of production, cooperation instead of payments between firms	S4: firms have no money account; inputs, maintenance and projects are allocated in real terms. Labour for basic needs is filled first (can be switched off).	IG5; sensitivity "without basic-needs-first labour" in IG9
Q3 "Preissetzung": abundant goods without a consumption booking, scarce goods with a price and possible non-allocation	S5: abundance when monthly supply exceeds all wishes by the threshold, for food the reserve also suffices, and no environmental limit is exceeded. Scarcity: basic needs first, remainder in proportion to normalised offers or equally.	IG4; key figure "value of deliveries without deletion"
Q4 FAQ: basic provision, remuneration of community work, more incentive for unpleasant work	S3: need credit only for basic needs actually delivered; no negative accounts. Care is remunerated at an adjustable share; the factor for unpleasant work acts through the same labour-supply function as in A–F.	Key figures need credits, working hours; parameters in the contract editor

Source and location	Executable assumption added by us	Testable effect
Q1 thesis: without circulation no inflation or deflation	S8: not assumed. Fixed tariffs give a constant index; missing quantities and waiting times are shown next to it and the index is then marked as restricted.	IG8; key figures waiting time, critical person-months, balance per head
Q5 slides 27–29; Q7 manifesto pp. 4–7: cooperation networks, disclosure of assumptions	S6/17.3: coordination costs time per working-age person; recognition errors reduce credits; the planner remains a rule set with delayed, noisy data.	Sensitivity to coordination time and recognition errors in IG9 and in the report
Q6 book “Das Ende des Geldes”, pp. 110–115: early EURO-WEG/Gelt approach with equal counter-bookings and negative accounts	Not part of G. Planned as a separate variant H, not implemented here.	open point
Q8 newsletter index and GAIA article part IX	Context only; they provide no executable rule and no production data.	–
All sources	S7: C and G start with the same people, facilities, stocks and random sequences. Opening balance in G = balance per head in C after the initial transfers (880 D).	C/G comparison; legacy check A–F

9.3 The booking rules as implemented

```
B_end = B_start + G_contribution + G_need + G_other − L_consumption − L_other (checked for every person, every month)
```

- **Contribution credit:** effective hours × tariff × factor for unpleasant work × (1 − recognition error) + care hours × tariff × recognition share. Each credit carries a unique event ID (month:person:type); a repeated ID creates nothing.
- **Consumption deletion:** quantity actually delivered × personal tariff, deleted on the consumer's own account. There is no recipient. For goods meeting the abundance condition the deletion is zero.
- **Need credit:** only when basic needs actually delivered exceed the balance. It never replaces a missing delivery. Accounts cannot become negative.
- **Firms** hold no money. Inputs, maintenance and projects are limited by labour, energy, water, materials, technical parts, eco budgets and construction time. Labour serving basic needs is filled first (a disclosed rule that can be switched off).
- **Personal units:** each account has its own unit scale; all decisions and allocation compute in a reference unit, so a larger raw number buys no priority.
- **Death:** the account is closed and any remainder deleted; nothing is inherited. Newborns get their own contract with a balance of zero.
- **Opening balance:** 880 D per person, the same balance per head as in scenario C after its initial transfers to firms and fund, so that the opening basket is equally accessible.
- **Costs of cooperation:** 2 hours per working-age person and month for contracts and coordination; 2 % of contributions go unrecognised. Both are adjustable.

9.4 R1: C against G, same endowment, seed 2026

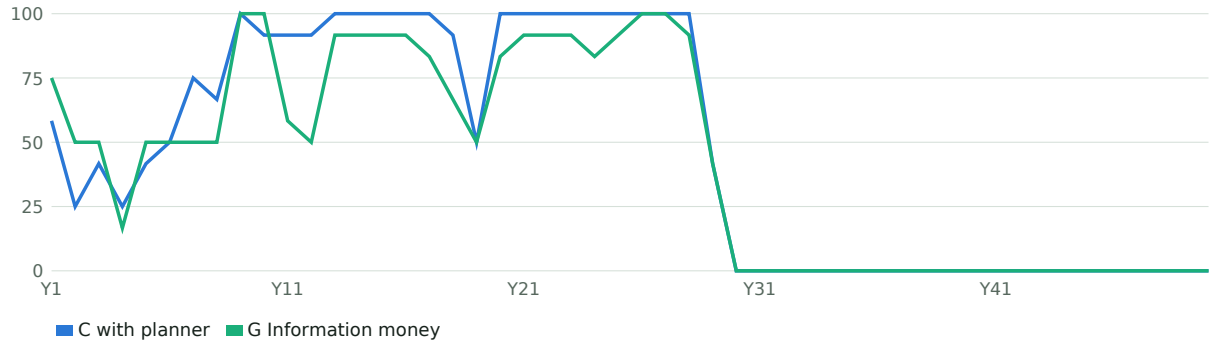
Scenario	All needs met	Worst-off tenth	Problem months	Critical person-months	Mean waiting (months)	Comfort fulfilled	Paid work h/month	Limit exceedances W/E/Wd/H/S
C with planner	57 %	96 %	47	24,193	1.4	60 %	80	0 / 0 / 0 / 0 / 0
G Information money	59 %	97 %	41	14,105	1.6	31 %	75	0 / 0 / 1 / 0 / 0

Ten years, 1,000 inhabitants. Critical person-months: people in a household with at least one basic need covered below 50 %, summed over months. Price index, money supply and Gini are not shown for G because they are technical quantities there.

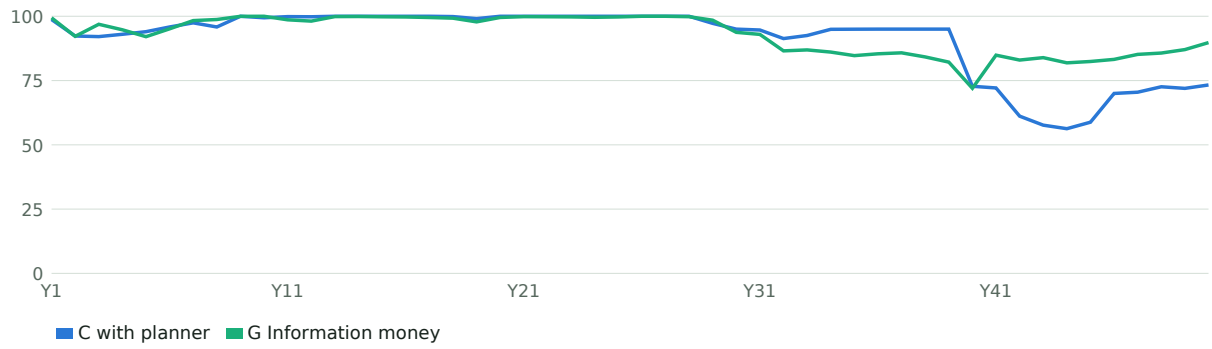
Scenario	Measure	Years 1–10	11–20	21–30	31–40	41–50	Crisis months	Inhabitants end	Cumulative unmet need
C with planner	All needs met	57 %	92 %	84 %	0 %	0 %	19	856	25,966
	Worst-off tenth	96 %	100 %	99 %	92 %	66 %			
G Information money	All needs met	59 %	76 %	78 %	0 %	0 %	60	837	39,283
	Worst-off tenth	97 %	99 %	99 %	85 %	85 %			

Fifty years. Cumulative unmet need in person-months since the start; deaths do not reduce it retroactively. Health coverage by decade, C: 99 %, 100 %, 95 %, 69 %, 56 %; G: 100 %, 100 %, 97 %, 70 %, 70 %. After medical supplies run out, health services are 70 % effective in both, which alone sets "all needs met" to zero.

People with all basic needs met (yearly mean, %)



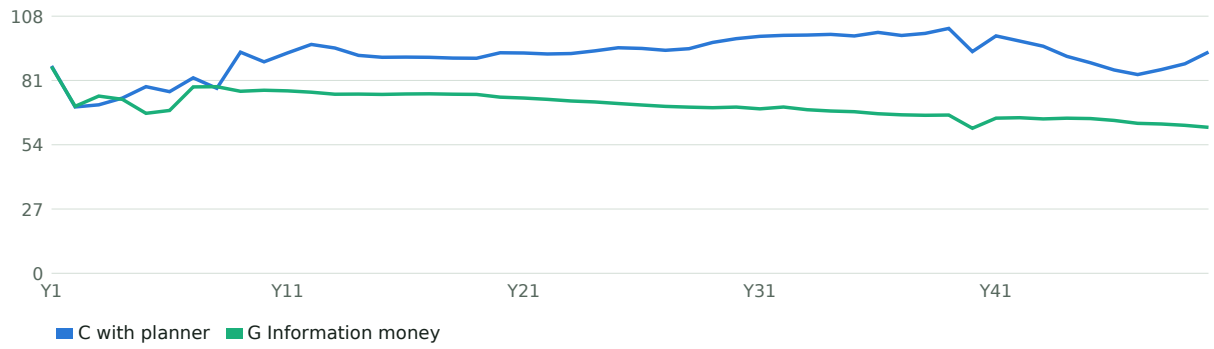
Coverage of the worst-off tenth (yearly mean, %)



Balance per head in D (in G a technical figure)



Paid work per working-age person (hours per month)



9.5 R2: ten paired seeds, 10 years

Key figure	Median C	Range C	Median G	Range G	G higher in … of 10
All needs met	57 %	43 % – 68 %	57 %	49 % – 76 %	7
Worst-off tenth	96 %	82 % – 97 %	96 %	96 % – 97 %	9
Problem months of 120	46	36 – 94	46	24 – 55	2
Critical person-months	26,257	22,519 – 35,604	17,852	15,932 – 27,830	0
Mean waiting (months)	1.3	0.6 – 21.3	1.5	0.6 – 2.2	4
Paid work h/month	81	78 – 83	76	74 – 78	0
Comfort fulfilled	62 %	56 % – 63 %	33 %	29 % – 40 %	0

Seeds 2027–2036; each pair sees the same weather and events. "Higher" is good for coverage and bad for problem months, critical person-months and waiting.

9.6 R3: sensitivity to replaceable technical parts and medicine, 50 years

Assumption	C years 31–40	C years 41–50	C crisis months	G years 31–40	G years 41–50	G crisis months
teileSubst 0.70, medLokal 0.70 (standard)	0 % / 92 %	0 % / 66 %	19	0 % / 85 %	0 % / 85 %	60
teileSubst 0.90, medLokal 0.90	50 % / 88 %	75 % / 85 %	4	7 % / 87 %	9 % / 79 %	90
teileSubst 1.00, medLokal 1.00 (full local replacement, an extra assumption)	50 % / 88 %	75 % / 85 %	4	7 % / 87 %	9 % / 79 %	90

All needs met / worst-off tenth. Higher local replacement is an additional assumption about technology, not something money creation or bookkeeping produces. Values of 0.90 and 1.00 give the same result here because at 0.90 the stocks already last beyond 50 years.

9.7 R4: sensitivity to labour supply, coordination and allocation, 10 years

Variant	C: all met / worst tenth	C paid work h	G: all met / worst tenth	G paid work h	G comfort fulfilled
Standard	57 % / 96 %	80	59 % / 97 %	75	31 %
Labour supply: double decline with security	42 % / 95 %	76	12 % / 86 %	55	11 %
Labour supply: base willingness −15 points	28 % / 94 %	75	17 % / 87 %	63	18 %
G: coordination time 10 h per month	–	–	54 % / 96 %	73	27 %
G: recognition errors 20 %	–	–	57 % / 96 %	77	36 %
G: unpleasant work paid threefold	–	–	57 % / 97 %	73	27 %
G: care fully recognised	–	–	57 % / 96 %	73	27 %

Variant	C: all met / worst tenth	C paid work h	G: all met / worst tenth	G paid work h	G comfort fulfilled
G: remainder shared equally	–	–	62 % / 96 %	74	29 %
G: without basic-needs-first labour	–	–	24 % / 94 %	74	31 %

9.8 R5: energy as a separate axis

Energy	C 10 y	G 10 y	C 50 y: crisis months / worst tenth	G 50 y: crisis months / worst tenth
Normal energy	57 % / 96 %	59 % / 97 %	19 / 91 %	60 / 93 %
Solar-house preset (solar ×2, solar heat 50 %)	66 % / 98 %	65 % / 98 %	0 / 97 %	71 / 93 %

The hypothetical free-energy profile (scenario F) is not part of this comparison and is switched off in G.

9.9 Reading the comparison

- **First decade: about equal.** With seed 2026, G reaches 59 % / 97 % (all needs met / worst-off tenth) against 57 % / 96 % for C. Across ten paired seeds the medians are the same; G had the better worst-off tenth in 9 of 10 seeds and fewer critical person-months in 10 of 10.
- **Comfort wishes are served far less in G** (31 % against 60 %). Without prices, people with balances order what they wish and supply is rationed; the unmet part shows up as waiting rather than as a higher price.
- **Balances pile up in G.** Credits exceed deletions whenever goods are missing, so the balance per head grows from 880 D to 13,173 D after 50 years. Under the shared labour-supply function, financial security lowers paid work (75 against 80 hours per month in the first decade), which weakens supply in the long run. Whether people would really work less is one of the open questions.
- **Over 50 years the result is mixed.** G has more crisis months (60 against 19) and more cumulative unmet need (39,283 against 25,966 person-months), but its worst-off tenth is better supplied in the last decade (85 % against 66 %), because need credits keep basic deliveries accessible to everyone as long as the goods exist.
- **The thesis "no inflation without circulation" is neither confirmed nor refuted by a constant tariff index.** The index stays at 1.00 by construction. Scarcity appears instead as non-allocation, waiting and growing unusable balances; the application marks the index as restricted in those months.
- **The allocation rule matters more than the bookkeeping.** Without the basic-needs-first rule for labour, G falls to 24 % / 94 %; with it, G matches C. The bookkeeping alone does not secure supply.
- **The long-run decline is not evidence for or against either system.** In both, technical parts and medical supplies run out. With higher local replacement (R3) C recovers in the late decades while G does not, again because of the labour-supply effect of accumulated balances.
- **C and G differ in several rules at once** (bookkeeping, production financing, prices, basic provision, labour priority, coordination time). A difference in results cannot be attributed to a single cause.

9.10 Open points of the reconstruction

- Contracts are one shared template; an editor per individual, processing backlog and appeal procedures for contract changes are not modelled.
- Variant H (EURO-WEG/Gelt 2011 with equal counter-bookings and negative accounts) is not implemented.
- Contributions are remunerated by hours and qualification; quality and usefulness of single contributions are not measured.
- The abundance condition is a simple monthly rule without forecasting.

- How people actually work when supply is largely secured is open; the model uses the same uncertain behaviour function as A–F.
- An owner’s pension and the transition from an existing ownership order (slide 29) are not represented; C and G both start cooperatively.
- The reconstruction has not been confirmed by the author.

10 All parameters

Every assumption is adjustable in the "Settings" tab. "Restart" means the change only takes effect after a restart; all others take effect from the current month and are stored with their month. Values marked "per 1,000" scale with the number of inhabitants.

Basics

Parameter	Default	Range	Unit	Change	Key
Seed (random start value)	2026	1 – 999999		restart	seed
Inhabitants at start	1000	100 – 5000	people	restart	einwohner
Time horizon	10	10 – 200	years	restart	jahre
Settlement type	0	0 – 3		restart	siedlung
Scale: real people per simulated person (extrapolation)	1	1 – 10000	×	restart	massstab
Demography: ageing, births, deaths (off = population frozen)	on			restart	demografie
Start balance per person (1,000 D = 1 billion coins)	1000	1 – 100000	D	restart	startgeld
Initial transfer to cooperative working capital	10 %	0 % – 50 %		restart	anteilBetrieb
Initial transfer to the community fund	2 %	0 % – 30 %		restart	anteilFonds
Ownership concentration (0 = cooperative per person, 1 = everything with 10% of households)	0 %	0 % – 100 %		restart	eigentumKonz
Initial wage (only sets the starting price level)	2	0.1 – 100	D/h	restart	startLohn

Federation

Parameter	Default	Range	Unit	Change	Key
Federation: several villages run together and share surpluses	off			restart	foederation
Number of villages (inhabitants apply per village)	3	2 – 6	villages	restart	doerfer
Solidarity delivery: help even when the receiving village cannot pay	on			live	foedSolidar
Transport loss on deliveries between villages	5 %	0 % – 50 %		live	foedVerlust

Information money

Parameter	Default	Range	Unit	Change	Key
Settlement type	0	0 – 1		restart	abrechnung
Personal opening balance (same computed access as in the transfer model after the initial transfers)	880	0 – 100000	D	restart	igStart
Remuneration factor for unpleasant work (harvest, construction, material extraction)	1	1 – 5	×	live	igUnangenehm
Recognition of unpaid care (share of the labour tariff)	50 %	0 % – 100 %		live	igPflege
Abundance threshold: supply exceeds all wishes by at least this much	15 %	0 % – 200 %		live	igReserve
Extra consumption of abundant goods without deletion	20 %	0 % – 200 %		live	igNullMehr
Allocation of scarce comfort goods	0	0 – 1		live	igZuteilung
Labour is allocated to basic needs first, then to comfort	on			live	igGrundArbeit

Parameter	Default	Range	Unit	Change	Key
Time per working-age person and month for contracts, need reports and coordination	2	0 – 40	h	live	igKoordH
Recognition error: share of contributions without credit	2 %	0 % – 50 %		live	igAnerkFehler

Money

Parameter	Default	Range	Unit	Change	Key
Personal creation λ per month (share of money supply)	1 %	0 % – 2 %		live	lambda
Money creation mode	0	0 – 4		live	geldModus
Fixed creation amount per person and month (mode “fixed amount” only)	10	0 – 200	D	live	geldFix
Money withdrawal per month (reduction of all balances)	0.8 %	0 % – 3 %		live	ruecknahme
Start bonus for newborns as well	off			live	bonusNeu
Adaptive money controller for λ (uncalibrated heuristic)	off			live	regler
Controller: target inflation per year	2 %	-5 % – 20 %		live	reglerZiel
Controller: weight of price deviation kP	0.01	0 – 0.1		live	reglerKP
Controller: weight of free production capacity kU	0.002	0 – 0.02		live	reglerKU
Controller: weight of circulation change kV	0.001	0 – 0.02		live	reglerKV

Community fund

Parameter	Default	Range	Unit	Change	Key
Fund levy on paid labour income	25 %	0 % – 60 %		live	abgabe
Share of the levy for the investment budget	15 %	0 % – 100 %		live	fondsInvAnteil
Fund share of investment costs	60 %	0 % – 100 %		live	fondsKofin
Basic support: grant when basic needs are unaffordable	on			live	grundsicherung
Liquidity aid to firms with less than one month of cost cover (transfer from the fund, not a loan)	on			live	liqHilfe
Fund subsidy for health/care (basic need)	50 %	0 % – 100 %		live	gesZuschuss

Households

Parameter	Default	Range	Unit	Change	Key
Savings target: reserve in monthly basic baskets (mean)	4	0 – 36	months	live	sparMonate
Comfort spending out of free income	90 %	0 % – 100 %		live	konsumEink
Comfort spending out of balances above the savings target, per month	8 %	0 % – 50 %		live	konsumVerm
Extra buying incentive per percentage point of withdrawal	3	0 – 20	×	live	kaufanreiz
Extent of comfort wishes (1 = standard)	1	0 – 3	×	live	komfort
Extra demand when supply gets cheaper (rebound elasticity)	0.5	0 – 2		live	rebound
Price sensitivity when choosing a supplier	3	0 – 10		live	preisSens
Basic needs are served before comfort orders	on			live	grundVorrang

Labour

Parameter	Default	Range	Unit	Change	Key
Base willingness to do paid work (share of available time)	80 %	10 % – 100 %		live	arbeitBasis
Response to the real wage	0.15	0 – 1		live	arbeitLohnEl
Decline of labour supply with financial security	0.12	0 – 1		live	arbeitVermEl
Extra work when basic needs are unmet	0.2	0 – 1		live	arbeitNot
Lower bound of labour supply	30 %	0 % – 100 %		live	arbeitMin
Maximum paid hours per person and month	160	60 – 220	h	live	stundenMax

Prices

Parameter	Default	Range	Unit	Change	Key
Maximum price change per month	3 %	0 % – 20 %		live	preisMax
Price response to costs	0.3	0 – 1		live	preisKosten
Price response to excess demand	0.15	0 – 1		live	preisNachfr
Cost mark-up of firms	12 %	0 % – 100 %		live	aufschlag
Payout of surplus firm funds per month	30 %	0 % – 100 %		live	ausschuettung

Supply

Parameter	Default	Range	Unit	Change	Key
Food reserve beyond the crop year	2	0 – 12	months	live	reserveMonate
Spoilage of the food store per month	3 %	0 % – 30 %		live	verderb
Upper limit of achievable energy efficiency (through investment only)	30 %	0 % – 60 %		live	effizienzMax

Energy

Parameter	Default	Range	Unit	Change	Key
Solar expansion on roofs and walls (factor for solar/wind plants and storage)	1	1 – 4	×	restart	solarAusbau
Share of household energy need covered by solar heating and cooling at the house (less effective in winter)	0 %	0 % – 80 %		live	solarWaerme
Hypothetical free energy source (“overunity”), fuel-free and weather-independent – not known to physics (per 1,000)	0	0 – 5000	kW	live	freiEnergie

Ecology

Parameter	Default	Range	Unit	Change	Key
Ecological limits active (off = budgets are ignored)	on			live	oekoAktiv
Water extraction limit (share of mean annual inflow)	80 %	10 % – 150 %		live	wasserBudget
Emission limit	0.35	0.05 – 3	t CO_2e/person/year	live	emisBudget
Material extraction limit (share of wood growth)	80 %	10 % – 200 %		live	holzBudget
Minimum share of habitat area	50 %	0 % – 90 %		live	habitatMin
Safety margin of control below the limits	10 %	0 % – 50 %		live	sicherheit

Parameter	Default	Range	Unit	Change	Key
Measurement error of environmental data (standard deviation)	5 %	0 % – 50 %		live	messfehlerOeko
Soil regeneration per month	0.003	0 – 0.02		live	bodenRegen
Wood growth rate per year (logistic)	4 %	0 % – 15 %		live	holzWachstum
Natural water inflow (factor)	1	0.2 – 2	×	live	zuflussFaktor

Self-sufficiency

Parameter	Default	Range	Unit	Change	Key
Locally replaceable share of technical parts	70 %	0 % – 100 %		live	teileSubst
Locally producible share of medical needs	70 %	0 % – 100 %		live	medLokal

Planner

Parameter	Default	Range	Unit	Change	Key
AI surrogate: rule-based planner	off			live	planer
Data coverage	80 %	5 % – 100 %		live	datenAbdeckung
Measurement error of planner data	5 %	0 % – 50 %		live	messfehler
Reaction delay	2	0 – 12	months	live	verzoegerung
Weight food	1	0 – 2		live	gwNAH
Weight water	1	0 – 2		live	gwWAS
Weight energy	0.8	0 – 2		live	gwENE
Weight housing	0.7	0 – 2		live	gwWOH
Weight health/care	0.9	0 – 2		live	gwGES
Weight education	0.6	0 – 2		live	gwBIL
Weight everyday goods	0.3	0 – 2		live	gwALL

Demography

Parameter	Default	Range	Unit	Change	Key
Children per couple (fertility rate)	1.9	0 – 4		live	tfr
Excess mortality from lack of food, water, health care	1	0 – 3	×	live	uebersterb

Initial endowment

Parameter	Default	Range	Unit	Change	Key
Farmland (per 1,000)	330	50 – 900	ha	restart	ackerHa
Habitat area (forest, meadows) (per 1,000)	520	0 – 2000	ha	restart	habitatHa
Settlement and infrastructure area (per 1,000)	150	10 – 500	ha	restart	siedlungHa
Soil quality (0–1)	0.7	0.1 – 1		restart	bodenStart
Water stock (per 1,000)	400000	0 – 2e+06	m³	restart	wasserStart
Storage capacity of the water stock (per 1,000)	600000	50000 – 3e+06	m³	restart	wasserKap
Mean natural inflow (per 1,000)	150000	10000 – 1e+06	m³/year	restart	zuflussJahr
Wood/biomass stock (per 1,000)	80000	0 – 300000	t	restart	holzStart
Solar/wind plants (per 1,000)	1300	0 – 10000	kW	restart	kapVar
Wood-fired CHP plant (per 1,000)	200	0 – 2000	kW	restart	kapChp
Electricity storage (per 1,000)	1500	0 – 20000	kWh	restart	batterie
Waterworks (per 1,000)	16000	1000 – 100000	m³/month	restart	kapWasser

Parameter	Default	Range	Unit	Change	Key
Housing places (per 1,000)	1030	500 – 2000	places	restart	kapWohn
Health/care (per 1,000)	2600	500 – 10000	h/month	restart	kapGes
Workshops maintenance/construction (per 1,000)	9000	1000 – 40000	h/month	restart	kapBau
School/training (per 1,000)	1700	200 – 10000	h/month	restart	kapBil
Material extraction/recycling (per 1,000)	100	5 – 500	t/month	restart	kapMat
Crafts/everyday goods (per 1,000)	30000	2000 – 100000	SU/month	restart	kapAll
Food stock	4	0 – 12	months of basic need	restart	nahVorratMon
Material store (per 1,000)	150	0 – 2000	t	restart	matLager
Material built into buildings and products (per 1,000)	20000	0 – 200000	t	restart	verbaut
Technical parts (not locally producible) (per 1,000)	4000	0 – 50000	pieces	restart	teileStart
Medical supplies (per 1,000)	5000	0 – 50000	units	restart	medStart
Facility condition (0–1)	0.85	0.3 – 1		restart	zustandStart

Scenarios and standard events

Scenario	Description	Settings that differ
A · One-off start money	No ongoing creation, no withdrawal, limits active	λ 0 %, withdrawal 0 %, planner off, limits active
B · Creation + withdrawal	Personal creation, money withdrawal, decentralised without planner	λ 1 %, withdrawal 0.8 %, planner off, limits active
C · with planner	Like B, plus data-based coordination	λ 1 %, withdrawal 0.8 %, planner on, limits active
D · limits ignored	Like C, ecological budgets are disregarded	λ 1 %, withdrawal 0.8 %, planner on, limits ignored
E · Decentralised solar houses	Like C, double the solar area on roofs and walls with storage, solar heating and cooling at the house	λ 1 %, withdrawal 0.8 %, planner on, limits active, solar ×2, solar heat 50 %
F · Hypothetical: free energy	Like C, plus an assumed fuel-free energy source (“overunity”); no such device is known to physics	λ 1 %, withdrawal 0.8 %, planner on, limits active, free source 600 kW
G · Information money (after Hörmann)	Reconstruction: personal, non-transferable accounts; credit and consumption deletion separate; production without firm money; planner and limits as in C	λ 1 %, withdrawal 0.8 %, planner on, limits active; settlement: information money (λ and withdrawal not applicable)

Event	Start month	Duration (months)	Strength
Drought	42	6	50 %
Illness wave	70	3	25 %
Energy plant outage	100	4	40 %
Crop failure	210	6	40 %
Drought	330	8	60 %
Delayed investments	400	12	100 %
Illness wave	470	4	30 %

Drought lowers inflow and harvest and raises irrigation need; crop failure lowers the harvest; energy outage lowers solar/wind generation; an illness wave lowers working time and raises health need; delayed investments pause running projects.

11 The computed simulations (transfer models A–D)

All runs in this chapter: village of 1,000 inhabitants, seed 2026, standard events, same initial endowment and same weather for every scenario. "All needs met" is the share of people for whom food, water, energy, housing, health and everyday goods are each covered to at least 95 %. "Worst-off tenth" is the mean coverage of the worst-supplied 10 %. Single runs carry no statistical certainty.

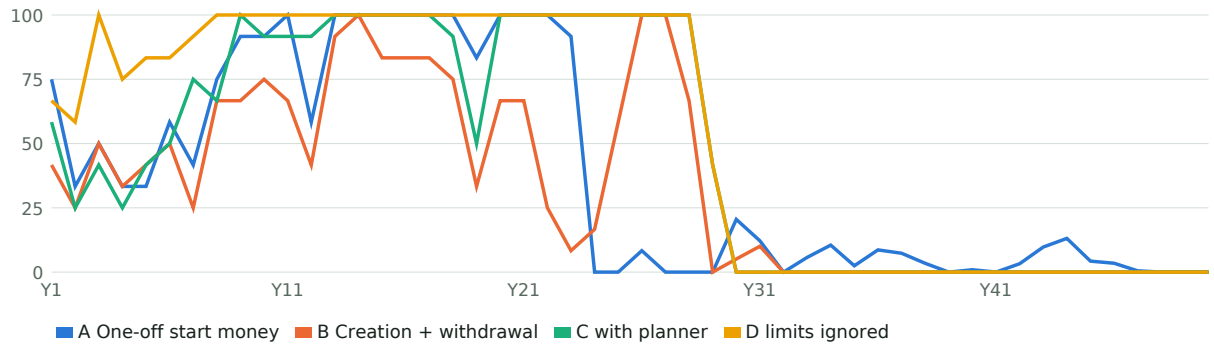
Ten years

Scenario	All needs met	Worst-off tenth	Problem months	Gini end	Paid work h/month	Limit exceedances (months): water / emissions / wood / habitat / soil
A One-off start money	58 %	96 %	42	0.52	79	0 / 0 / 0 / 0 / 0
B Creation + withdrawal	48 %	95 %	52	0.46	78	0 / 0 / 0 / 0 / 0
C with planner	57 %	96 %	47	0.53	80	0 / 0 / 0 / 0 / 0
D limits ignored	86 %	100 %	9	0.48	94	0 / 0 / 108 / 99 / 42

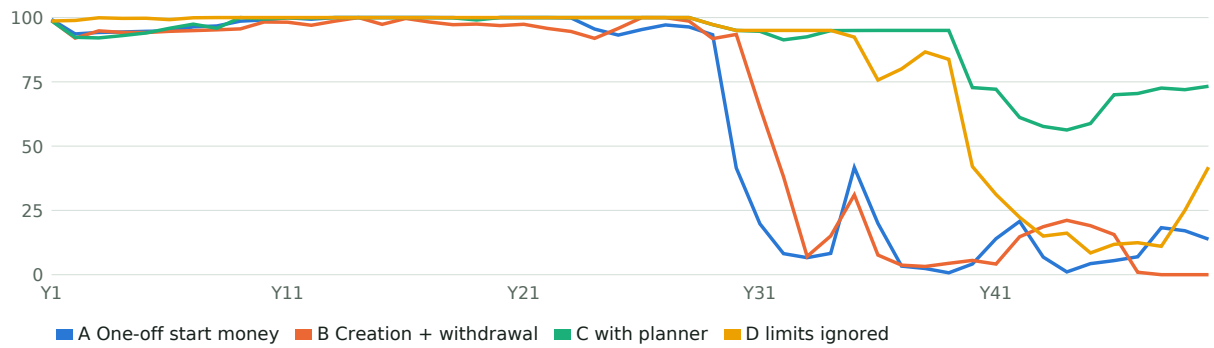
Fifty years, by decade

Scenario	Measure	Years 1–10	11–20	21–30	31–40	41–50	Crisis months	Inhabitants end
A One-off start money	All needs met	58 %	94 %	32 %	5 %	3 %	226	761
	Worst-off tenth	96 %	100 %	91 %	12 %	11 %		
B Creation + withdrawal	All needs met	48 %	72 %	45 %	1 %	0 %	224	795
	Worst-off tenth	95 %	98 %	96 %	18 %	9 %		
C with planner	All needs met	57 %	92 %	84 %	0 %	0 %	19	856
	Worst-off tenth	96 %	100 %	99 %	92 %	66 %		
D limits ignored	All needs met	86 %	100 %	84 %	0 %	0 %	104	803
	Worst-off tenth	100 %	100 %	99 %	84 %	20 %		

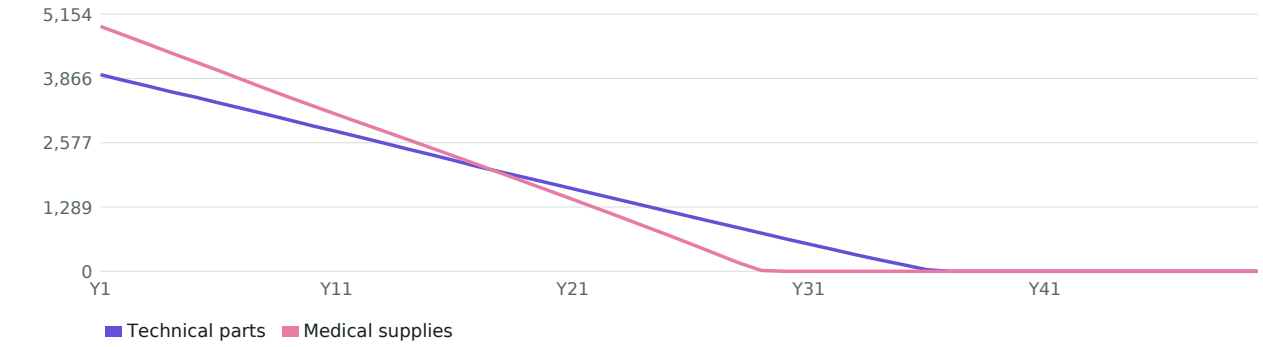
People with all basic needs met (yearly mean, %)



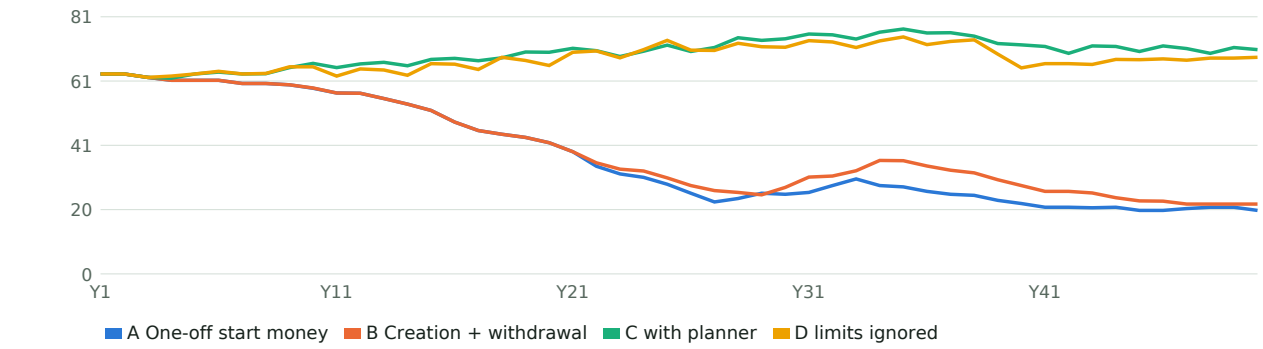
Coverage of the worst-off tenth (yearly mean, %)



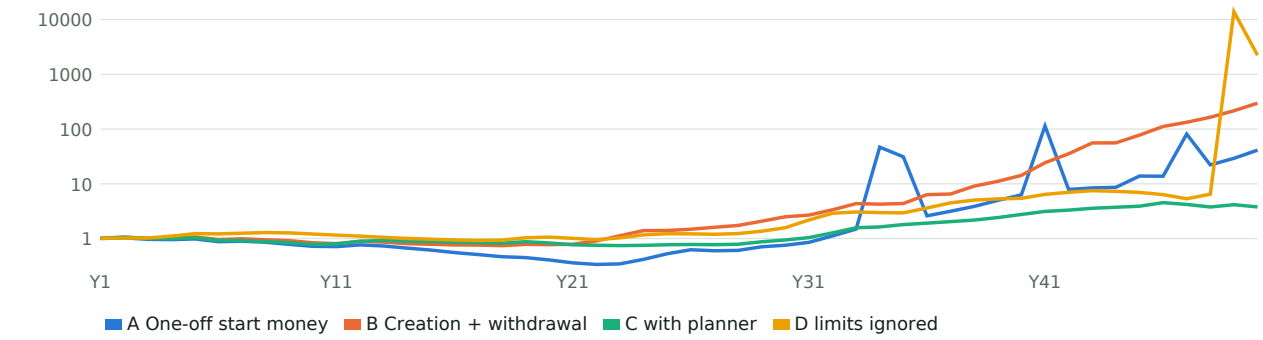
Non-replaceable stocks in scenario C



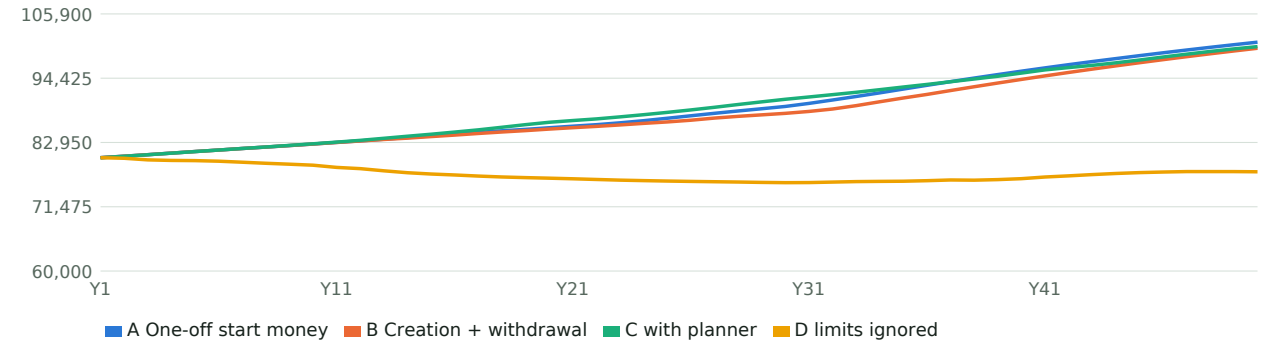
Social/health specialists (people)



Price index (start = 1, logarithmic)



Wood stock (t)



Spread across ten other seeds (scenario B, 10 years)

Key figure	Minimum	10 % quantile	Median	90 % quantile	Maximum
All needs met	41 %	42 %	48 %	61 %	62 %
Worst-off tenth	81 %	82 %	95 %	96 %	96 %
Problem months of 120	38	42	56	96	96
Gini at the end	0.45	0.46	0.51	0.66	0.68
Paid work h/month	76	76	78	79	81

Runs with a severe crisis month: 2 of 10. Runs with at least one limit exceeded: 6 of 10.

Reading the results: why the runs look the way they do

- **The first two decades work.** The endowment is sized so that labour, land, water and energy can just cover basic needs. After a rough first decade (the first harvest is short, firms start with thin working capital, prices and wages still adjust) supply stabilises; in the second decade 94 % (A) to 100 % (D) of people have all basic needs met.
- **Money creation alone changes little.** Scenario B (ongoing creation) differs only slightly from A (one-off start money). One per cent of the money supply per month is about 10 D per person, a small part of the basic basket. Money is a unit of account here; it does not create goods.
- **The long-run decline is physical.** Technical parts run out around year 36–39 and medical supplies around year 30–32. From then on health services are only 70 % effective, so the figure "all needs met" falls to zero in every scenario, and technical facilities decay faster. This follows from the closed-village assumption, not from the money rules.
- **Foresight decides what else survives.** Without the planner (A, B) the number of social/health specialists falls from 63 to about 25 by year 30, because training only reacts once a shortage exists and training itself needs teachers. Care and education shrink, firms run dry, prices explode (price index 345 in B) and the worst-off tenth ends at 9 % coverage. With the planner (C) specialists are trained ahead of retirements, the worst-off tenth still has 66 % coverage in the last decade and prices stay moderate.
- **Ignoring limits buys short-term supply.** Scenario D supplies better in the first decades, but exceeds the wood limit in 478 and the habitat limit in 579 of 600 months, and its biodiversity indicator falls to 0.58 (C: 0.80).
- **Seasonal bottlenecks are real in the model.** Household heating has priority over production, so in tight winter months education and everyday goods can drop for a month. Harvest peaks compete with other sectors for labour.

These conclusions depend strongly on uncertain assumptions: the labour-supply behaviour, the regeneration rates, the locally replaceable share of technical parts and medicine, and the price rules. The application's sensitivity analysis and multi-seed runs exist to test them.

12 Verification: the model checks

The application runs these checks on request ("Assumptions and checks" tab); they compute their own small runs in the same engine. Checks 1–10 cover the transfer models, checks 11–19 the information money (IG1–IG9), and check 20 the protection of existing scenarios. This protocol was produced on 2026-11-16 with model version 1.1.0: 20 of 20 passed. The findings below are the actual output of that run.

No.	Check	Result	Finding
1	Money balance	passed	48 months, 200 inhabitants: sum of all accounts 220,133.4 D = start money 200,000 + creation 100,654.13 − withdrawal 80,520.73 D. Largest monthly deviation: 0 internal units. Wages, purchases, fund spending and inheritances are pure transfers.
2	Solvency	passed	Run with scarce working capital (2%): smallest account at the end 35.206 D, no payment without cover (every booking is checked before execution, otherwise the run stops). Remainder distribution: 1,000,003 units to 5 recipients add up to exactly 1,000,003.
3	Unit invariance	passed	Display in D or coins: monthly data bit-identical. In addition, switching the internal unit of account from 1,000 coins to 1 coin: largest relative deviation of real quantities (supply, labour, harvest, price index, Gini) in 24 months 1.0e-4 (rounding only).
4	Quantity balances	passed	48 months with drought: largest relative deviation of the balances for food, materials, water, wood and material cycle 4.4e-16 (tolerance 1e-7); smallest physical stock 0 ≥ 0. Recycled material arises only from existing scrap (yield 75%).
5	Limits from real factors	passed	Without labour (100% absence): production 0; without energy: water/health/education/everyday goods 0; without materials: construction/everyday goods/materials 0. With a hundredfold start balance: 0 / 0 / 0. More coins do not lift the limit.
6	Financing and delay	passed	Fund without income and without start funds (levy 0%, no inheritances): fund spending in 24 months 0 D. Test investment “Generation +80 kW”, begun in month 3 (construction time 6 months): capacity unchanged until month 8, effective from month 9 – only after paid construction hours, materials and construction time.
7	Zero issuance	passed	λ = 0, withdrawal = 0, no entry bonus: money supply constant for 60 months at 200,000 D, despite purchases of 1,157,120 D, 6 births and 5 deaths (balances are inherited).
8	Reproducibility	passed	Same seed, same parameters: checksums 5662a8620113ab2a = 5662a8620113ab2a. The first 120 months of the 50-year run (0dc4abefc7a44241) match the 10-year run (0dc4abefc7a44241).
9	Shocks and ecology	passed	Drought (months 4–9, strength 60%): inflow 3,477 instead of 8,691 m³, harvest 28,308 instead of 47,321 rations. Water limit set to 10% for the test: exceeded in 21 of 24 months with limits ignored and in 20 months with active control (basic needs take priority) – both are reported.
10	Data hygiene	passed	Injected NaN value in the water stock: run stopped with “Quantity balance violated (month 5)”. Injected negative account: run stopped with “Money balance violated (month 5)”. Values are not silently corrected.
11	IG1 No transfer	passed	36 months of scenario G: firm and fund accounts stay at 0 D in every month, so no deletion has a recipient. Contribution credits 668,821 D and consumption deletions 711,163 D are booked separately and do not match. Every person’s closing balance is checked each month against their own credits and deletions.
12	IG2 Asymmetry (worked example)	passed	A starts with 100, B with 50. B’s recognised contribution creates 20 new units for B; A’s consumption deletes 12 units for A. Result: A = 88, B = 70, technical sum 158 (150 + 20 − 12). Nothing was transferred between A and B.
13	IG3 No double remuneration	passed	The same event ID was submitted a second time in month 6: 1 rejected, additional credit 0 D; credits and production of all 12 months are identical to the run without the repeat.
14	IG4 Zero price under abundance	passed	Month 0: Water met the abundance condition; 960 units were delivered with 0 D deleted, and the quantity balances still hold. With no labour (nothing produced), deliveries of energy, health and everyday goods were 0 even though a zero price would apply.
15	IG5 Production without firm money	passed	Firm balances are 0 D throughout, yet 213,860 units of food and everyday goods were produced in 24 months. Without labour production is 0; without materials construction, everyday goods and materials are 0. The hypothetical free energy source is off (0 kWh).

No.	Check	Result	Finding
16	IG6 Individual balance	passed	60 months, 201 personal accounts at the end, 6 births (new contracts) and 5 deaths: every closing balance equalled opening balance + own credits − own deletions in every month (otherwise the run stops). Closed accounts deleted 2,049.01 D; nothing was inherited. Sum of personal balances 417,489.5 D equals the booked technical total. The first 120 months of a 600-month G run match the 120-month run.
17	IG7 Scale invariance	passed	One person’s account, tariffs, credits and thresholds were multiplied by 100 (unit scale 100). All monthly results over 36 months are bit-identical (checksum af4a131f5a329fb7); the larger raw number buys no priority because allocation uses the reference unit.
18	IG8 Fixed tariffs are not a welfare measure	passed	Illness wave in months 8–13: the tariff index stays between 0.998 and 1 (suppliers’ fixed tariffs differ slightly) while the lowest sector coverage falls to 0%. In all 11 months with coverage below 90% the index is marked as restricted (11 of 11); unmet need stays visible.
19	IG9 No prescribed winner	passed	Share with all needs met / worst-off tenth in per cent, 300 inhabitants, 10 years, same seed: C 41 / 84; G standard 70 / 98; G without basic-needs-first labour 22 / 94; G with 20 h coordination and 20% recognition errors 52 / 98. The ranking follows from the assumptions; the result logic contains no fixed order.
20	Legacy protection A–F, old exports, federation G	passed	Presets A–F are unchanged (E = solar houses, F = hypothetical energy; all with transferable coins). A configuration without a settlement type loads as the transfer model. Federation of three information-money villages over 24 months: 0 units of goods were moved between villages, payments between villages 0 D.

Regression of scenarios A–F

Before scenario G was added, checksums of 36-month runs of A–F and of a federation run were stored. After the change the same runs were recomputed (new record fields excluded): OK A dadf0285717a4a05; OK B d5fd884a29032d20; OK C 38803ee470cf0f14; OK D 607a4db7245af957; OK E da088181d081e4d7; OK F 252244315f3d7c8d; OK Foed ec77e9ee14083254; A–F und Föderation unverändert.

In addition, every month of every run checks the money identity, the cover of each payment, the quantity balances and the validity of all recorded values.

13 Simplifications and open questions

- **Closed village.** No imports and no external trade. There is no pharmaceutical, chip or industrial supply chain; technical parts and medical supplies are finite and only partly replaceable locally (defaults 70 % and 70 %). This single assumption determines the long-term outcome.
- **Uncalibrated values.** All starting values and coefficients are plausible play values without empirical calibration.
- **Few, uniform firms.** Two or three firms per sector, uniform goods, no quality differences, cooperative ownership by default.
- **Simple behaviour rules.** Labour supply, saving, price and wage adjustment are transparent heuristics. Prices drift down in the first years because wages fall while labour is under-used.
- **Coarse time and agriculture.** A labour shortage reduces only that month's harvest; energy is spent on service provided rather than service sold; biogenic CO_2 is tracked through the wood stock.
- **Information money.** Scenario G is a reconstruction with our own executable assumptions; see chapter 9.10 for its open points. Variant H is not implemented.
- **Federation and county.** Sharing rules are simple thresholds; aggregated figures are sums or population-weighted means.
- **Scale.** Large settlements are extrapolated from a sample of at most a few thousand simulated people; effects that only appear at real city scale (congestion, land prices, specialised industry) are not modelled.
- **Free energy scenario.** Scenario F assumes a device that physics does not know. It is a what-if, not a forecast of available technology.

- **Search results.** The automatic search and the AI search return the best setting found in a small sample over 10 years and check it on a few further seeds. That is not a proven optimum.

Open modelling questions

- How do people actually respond to equal creation and to withdrawal (work, saving, acceptance of the currency)?
- Progressive withdrawal; credit with separate booking of claim and debt; trade with neighbouring villages.
- Empirical calibration of production and environmental parameters; a finer model of health and care.

14 Technical notes

- **Files.** `Dorfsimulation.html` is the complete application. The engine is in `src/core-a.js` (parameters), `core-b.js` (monthly step), `core-d.js` (federation) and `core-c.js` (key figures, checks, job control); the interface is in `src/ui.js`.
- **Computation.** Runs in a web worker created from the embedded source, with a main-thread fallback. Ten years take about one second, fifty years a few seconds for 1,000 inhabitants.
- **Number range.** With 5,000 inhabitants, $\lambda = 2$ % without withdrawal and 600 months the money supply stays near $7 \cdot 10^{14}$ internal units, below the safe integer limit of 2^{53}.
- **Export.** JSON holds settings, seed, model version, initial state, event plan, changes and all monthly data; an imported run is recomputed and compared by checksum. CSV gives a monthly overview.
- **AI assistant.** Optional. The user enters their own API key for Claude (Anthropic) or ChatGPT (OpenAI). The key stays in page memory; requests go from the browser straight to the provider and contain the settings, key figures and the user's messages. The AI only proposes steps; all computing stays in the browser.
- **Languages and appearance.** English (default), German and Spanish; dark appearance by default, light or automatic selectable.
- **Long runs.** Periods of 10, 50, 100 and 200 years. Money is kept as whole numbers below 2^{53}; a run that would exceed this stops with a diagnosis.

Conceptual orientation (not evidence for the model)

Money creation and bookkeeping: Bank of England, Quarterly Bulletin 2014 Q1. Equal personal money creation: duniter.org. Circular economy: UNEP. Planetary boundaries: Stockholm Resilience Centre. Rebound effects: Umweltbundesamt.