

Heal the System

What Portugal Reveals About Design Failure, And What
Living Systems Teach Us About the Way Out

A systemic analysis using ecological principles,
with evidence from Silitânia, Castro Marim, Algarve.

Cooperativa Integral Silitânia, CRL

Version 0.5 · June 2026 · Living artefact

syntrociety.org/research/heal-the-system

The Question

What if the problem is not human nature, but the way we design the systems people have to live in?

Portugal is one of Europe's oldest nation-states, with a working democracy, EU membership, a growing economy and a population consistently counted among the friendliest and safest in the world. By the usual measures, things are going well.

And yet the country is losing its best-educated young people to emigration. The interior is emptying, housing has become unaffordable, the soil is degrading and the water is running short. The forests burn. The population is ageing faster than almost anywhere in Europe, health gaps are widening, and the workforce is projected to shrink by 16 percent within two decades.

These are symptoms of a single underlying design flaw, one that has repeated itself for five hundred years in changing forms.

This document uses Portugal as a case for a simple question: what happens when you look at a country through an ecological lens? What do living systems know about resilience, productivity and durability that our economic and social systems have forgotten?

The answer is being tested on nine hectares in Castro Marim, in the Algarve, by a cooperative of sixteen people of five nationalities who decided to build a society the way living systems work.

Note on Method

How this analysis came about

This document grew out of a dialogue between a human and an AI. The structural analysis, the ecological parallels and the feedback loops took shape across a series of conversations between one of Sulitânia's members and Claude (Anthropic). The human brought life on the land, the history of the cooperative and the original question. The AI brought the capacity to set policy documents side by side, to order arguments and to see patterns across datasets.

Every claim has been checked against the sources named, every analogy tested for soundness.

What resulted is neither a human nor an AI document, but a collaborative artefact, made through the same kind of dialogue the cooperative practises in its governance: making a proposal, questioning it, refining it, testing it.

The analysis draws on three kinds of knowledge.

Verified data comes from international institutions: the OECD, IMF, European Commission, Eurostat, INE and IPMA. The figures appear in published reports from 2024 to 2026. Anyone wishing to cite this analysis should check each figure against its primary source.

Claims marked [*] are figures from secondary sources that have not been checked against the primary statistic. They are included because they are plausible and consistent with the other data, but they need confirmation before formal use.

Ecological parallels are functional analogies drawn from agroecology and systems science (Götsch, Ingham, FAO, Ostrom, Holling, Meadows). They describe structural resemblance, not literal likeness. A society is not a forest. But both are complex adaptive systems, and the design principles that make one resilient teach us something about the other.

Feedback loops are partly documented explicitly in the literature, partly built up by combining data from several sources. Each carries a label: [Documented], [Partly documented] or [Hypothetical].

The analysis means to open a conversation, not close one.

The Diagnosis

Sources: OECD Economic Survey 2026, IMF Article IV 2024, European Commission forecasts, OECD Country Health Profile 2025, European Environment Agency, OECD Migration Outlook 2025, Eurostat, INE, IPMA. All data 2024-2025 unless otherwise noted.

1. The Economy Grows, But the People Leave

GDP grew 1.9 percent in 2024, unemployment sits at a historic low of 6.4 percent, and public debt fell from 134 percent in 2020 to 93.6 percent in 2024. At the same time, Portugal has the highest emigration rate in Europe. Some 2.3 million citizens live abroad, roughly 30 percent of those aged 15 to 39 have left [*], and almost half of the emigrants hold a university degree [*]. The minimum wage is 910 euros a month and labour productivity sits below the OECD average. The growth is real, but the prosperity does not reach everyone.

2. The Interior Empties While the Coast Overflows

Lisbon and Porto hold 45 percent of the population on 5 percent of the territory. Castro Marim counts 7,069 inhabitants on 301 km², 23 per km² against a national average of 117, with an ageing index of 241.9 and an average monthly income of 894.50 euros [*].

3. Housing Has Become Extractive

House prices rose 16.3 percent in the first quarter of 2025, the highest on record. Wages grew forty percent in a decade, prices more than 170 [*]. The Commission estimates overvaluation at 35 percent, the highest in the EU. Social housing makes up 1.1 percent of the stock, the lowest in the OECD, and a rent in Lisbon takes about sixty percent of household income.

4. The Climate Is Shifting Faster Than Adaptation

By late 2024 more than half the territory was in drought. The fires of 2017 cost more than a hundred lives and destroyed 500,000 hectares [*], and the fire season lengthened from two months to five [*]. Road transport accounts for 96 percent of land-transport emissions, with a vehicle fleet averaging fourteen years. That 71 percent of electricity in 2024 came from renewables is a bright spot.

5. Health Inequalities Widen

Inequality by gender and income runs above the EU average. Only 26 percent of adults exercise three times a week or more, against 31 percent in the EU, and rural areas are the least served.

6. The Working-Age Population Is Shrinking

The OECD foresees a 16 percent decline over twenty years. The birth rate stands at 1.4 where 2.1 is needed for replacement, and in 2024, 33 percent of babies had a foreign mother, against 16 percent in 2015.

The History

Phase 1: Colonial Extraction (15th-20th Century)

For five centuries Portugal drew value from elsewhere: gold and sugar from Brazil, spices from India, enslaved people from Africa. When the colonies gained independence in 1975, more than 500,000 retornados returned. The model broke; the mindset stayed.

Phase 2: Rural Extraction Under the Estado Novo (1930s-1970s)

Under the Estado Novo the extraction turned inward, with wheat campaigns, internal colonisation, dams and large-scale eucalyptus planting: short-term output, long-term ruin. Since the 1960s, 80 percent of the territory has lost population [*], and between 1960 and 1974 a million and a half people emigrated. In ecological terms, that is soil mining.

Phase 3: Emigration as Extraction (1960s-Present)

Then emigration itself became a form of extraction. Portugal invests public money in education and then exports the graduates, 2.3 million by now, almost half with a degree. A composting process whose compost ends up in northern Europe.

Phase 4: EU Accession and Structural Dependency (1986-2008)

EU accession modernised the surface, but the structural funds displaced small-scale agriculture, so there was no productive base left when the 2008 crisis hit. External inputs raised the visible growth while the capacity beneath it was hollowed out, the way chemical agriculture works.

Phase 5: Tourism and Housing as the New Extraction (2015-Present)

And since 2015 tourism has taken over that role, grown from ten million visitors in 2010 to more than thirty million in 2023, with housing prices rising alongside. The same architecture again: external demand draws out local value, and a diverse landscape thins to monoculture.

The Thread: The thread through all five phases: value flows from periphery to centre, the periphery grows poorer, and each phase creates the conditions for the next. Each time, the commons are enclosed.

The Feedback Loops

Loop 1: Emigration-Housing Spiral HYPOTHESISED

Brain drain leads to labour shortages, which draw immigration, which drives housing demand, which raises prices, until more Portuguese leave.

Loop 2: Eucalyptus-Fire-Depopulation Cycle DOCUMENTED

Depopulation leaves land unmanaged, where eucalyptus and scrub take hold, which feeds fire, which destroys, which drives more departure. The literature is explicit here: forest fires are directly related to depopulation.

Loop 3: Housing-Fertility Implosion PARTIALLY DOCUMENTED

Unaffordable housing delays family formation, which lowers the birth rate, which shrinks the workforce, which slows construction, which drives scarcity and so prices higher still.

Loop 4: Climate-Agriculture-Water-Tourism Cascade HYPOTHESISED

Drought makes agriculture fail, which empties the countryside further, which raises fire risk and lowers water, which threatens the tourism infrastructure that replaced the agriculture.

Loop 5: Low Wages-Productivity-Brain Drain Trap DOCUMENTED

Low productivity keeps wages low, so innovative people leave, which slows innovation, which keeps productivity low. The IMF and OECD both name this loop.

Loop 6: Ageing-Fiscal Pressure-Underinvestment Squeeze DOCUMENTED

The cost of ageing fills the fiscal room, which crowds out investment, which lowers growth, which reduces revenue and raises the pressure. The OECD warns of it explicitly.

Loop 7: Regulation-Scarcity-Price Spiral PARTIALLY DOCUMENTED

Complex permitting slows construction, which creates scarcity, which drives prices, which builds political pressure, which leads to more regulation. In 2024 only 28,000 units were permitted.

The Cascade: Together they form a cascade of degradation. The climate accelerates the housing and emigration loop, the brain drain undermines the innovation the climate demands, the ageing eats at the capacity to invest in housing. Only a redesign of the system reverses a cascade like this.

The Pattern

Extraction over circulation. Value leaves without returning.

Monoculture over diversity. Single points of failure everywhere.

Rigidity over adaptation. Regulations designed for one era block the next.

Separation over integration. Housing, agriculture, energy, health, education administered as separate domains.

Control over trust. Top-down management instead of conditions for local intelligence.

In the language of systems theory, these are the signs of a late conservation phase: high efficiency, low resilience, little capacity to adapt.

The Principles

Sources: Götsch, Ingham, FAO 10 Elements of Agroecology, Ostrom, Holling, Meadows. These are functional analogies between ecological and social systems. The parallels are instructive, not literal.

Principle 1: Diversity Is a Survival Strategy. Diverse agroforestry outperforms monoculture in soil carbon, water retention, pest resistance and long-term productivity.

Principle 2: Value Must Circulate. In a healthy ecosystem nutrients move around without cease; when that circulation stops, the system degrades.

Principle 3: Succession Creates Productivity. Syntropic systems grow more productive as they age, exactly the reverse of conventional agriculture.

Principle 4: The Soil Is the Economy. A teaspoon of healthy earth holds more microorganisms than there are people on the planet, and if that soil life is lost, the visible system collapses.

Principle 5: Resilience Comes from Redundancy. Industrial systems optimise for efficiency, ecological ones for resilience. That is a different design logic.

Principle 6: Information Creates Coherence. A forest has no board of directors; it organises itself through feedback, and is by that more productive and more resilient than any central plan.

Note: these are functional analogies between ecological and social systems. Both are complex adaptive systems. The parallels are instructive, not literal.

The Mapping

Problem	Principle	Practice at Sulitânia
Brain drain: 50% of emigrants have degrees	Nutrient loss from degraded soil. Build holding capacity.	Affordable housing, meaningful work, community, beauty.
Interior depopulation: 80% of territory lost population	Desertification from lost ground cover. Succession needs pioneers.	16 members with five nationalities. EUR 100,000 invested. Roots in the ground.
Housing: 35% overvalued, 1.1% social stock	Monoculture housing is extractive. Nature builds light, adaptive, local.	Relocatable tiny houses. Biobased materials. Off-grid energy.
Tourism monoculture	Monocultures are fragile. Diversity equals resilience.	19 projects in 8 sections. Year-round. No single point of failure.

Problem	Principle	Practice at Sultânia
Drought: 50% territory affected	Syntropic systems retain water. Soil organic matter holds 20x its weight.	1,481 m ² food forest. Every tree is a water reservoir.
Wildfires: 500,000 ha burned 2017	Diverse moist landscapes resist fire.	Agroforestry as fire prevention. A food forest does not burn like eucalyptus.
Low productivity	In monoculture only top layer produces. In forest every layer produces.	Syntropic agroforestry: 7 layers. Yield increases over time.
Health inequality wider than EU average	Treating symptoms without root causes.	Living on land, growing food, physical work, community, purpose.
Fertility 1.4, working age -16%	System consuming its seed stock.	Intergenerational community. Cooperative protects commons across generations.
Regulatory rigidity	Rigid systems break. Living systems iterate.	Living lab: test, measure, share data, propose regulation.
7 self-reinforcing feedback loops	Degradation cascade. Only redesign reverses it.	Syntrocity: redesign the architecture, not the components.

What Sultânia shows

Sultânia works on Quinta da Fornalha in Castro Marim. The cooperative was founded in June 2025 and registered for tax in October 2025 (NIF 518771571); the place has been active since May 2023.

Ecological. Ecologically there is 1,481 m² of syntropic food forest, with more than 1,688 plants across more than 61 species, a seed bank and a 130 m² trial plot. The soil is improving, documented in September 2025. Investment: around 34,500 euros.

Energy. For energy there is 22.3 kWp of solar with 48 kWh of storage, run as community energy with internal metering. Investment: 18,300 euros.

Economic. Economically there are nineteen projects across eight cooperative sections, with a ten-percent contribution model per micro-enterprise and a support programme, Friends of Sultânia. Total member investment is approaching 100,000 euros.

Social. Socially the cooperative has sixteen members of five nationalities and governs by consent. Thirty-two meetings have been recorded. Conflicts have arisen, been recorded, and been learned from.

Policy. On policy, the work aligns with ENVI 2030, AP Portugal 2030 and Algarve 2030. An EU ORRI application has been submitted and a position paper presented to the municipality.

Syntrocity

| *A society designed the way living systems work.*

Six design rules carry it.

Diversity first. Each element serves several functions, and each function is carried by several elements.

Circulation over accumulation. The ten-percent contribution, the Friends programme, the internal market, the shared tools. When value stops moving, the system dies.

Succession, not imposition. Begin with what is possible, and build the conditions for the next phase, since each phase creates what follows.

Soil before harvest. Invest in relationships, governance, repair and trust before expecting productivity.

Feedback over control. Governance by consent, conflict as information, documentation as memory, transparency as immune system.

Scale follows rhythm. One household a year, one hectare a season. The land sets the pace.

Implications

Rural regeneration requires residents, not programmes. Regulatory accommodation for lightweight ecological housing on agricultural land.

Living labs need legal space. Pilot project status, temporary licensing, regulatory sandboxes.

Cooperatives are infrastructure. Social infrastructure for collective action, not commercial enterprises.

Ecological restoration is climate adaptation. Every euro in agroforestry is simultaneously climate, biodiversity, food security, and economic development.

Break the feedback loops, not the symptoms. Only integrated approaches addressing the architecture can reverse degradation.

Trust local intelligence. Community-led development only works if communities are trusted to lead.

Closing

Portugal's crises follow a pattern, and that pattern is recognisable to anyone who studies living systems. The solutions are known, tested and available. What is new is the willingness to apply them to society itself, and to ask what it would look like if we designed the way a forest works.

Sulitânia is one answer. Nine hectares, sixteen people, nineteen projects, three years of work and almost 100,000 euros. Mistakes have been made and lessons learned, the soil is improving, the trees

are growing. It is alive, and in a system that is losing life, that counts.

If this analysis speaks to your work, we would be glad to hear from you.

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