



THE OMNIDOX LECTURES

Paper I · NVM-WP 2026/01 · July 2026

THE PHILOSOPHY OF ABUNDANCE¹

Scarcity on Trial, the Invisible Mycelium, and the Foundations of Metanomics

The Omnidox Lectures · Three Provocations on the Study of Abundance · Paper I

Yegandi Imhotep Paul Alagidede

School of Metanomics

Nile Valley Multiversity

Pungu Telania, Navrongo, Upper East Region, Ghana

Correspondence

alagidede@gmail.com

Prepared at the Little Legon Paradise · Delivered at the University of Ghana, Legon · July 2026

¹ **Suggested citation:** Alagidede, Y.I.P. (2026) 'The Philosophy of Abundance: Scarcity on Trial, the Invisible Mycelium, and the Foundations of Metanomics', The Omnidox Lectures, Paper I, Nile Valley Multiversity Working Paper Series, NVM-WP 2026/01. Pungu Telania, Navrongo: Porthologos Press for the Nile Valley Multiversity.

Prepared at the Little Legon Paradise and delivered at the University of Ghana, Legon, in July 2026, as the first of The Omnidox Lectures, Three Provocations on the Study of Abundance. The lectures are The Philosophy of Abundance: Scarcity on Trial, the Invisible Mycelium, and the Foundations of Metanomics (Paper I, NVM-WP 2026/01); The Psychology of Abundance: The Inner Architecture of Metanomics (Paper II, NVM-WP 2026/02); and The Architecture of Abundance: The Kassena Granary and the Building of Sovereign Capital (Paper III, NVM-WP 2026/03). The applied studies that build on their premises form The Metanomics Series: The Fiscal Architecture of Abundance (Paper IV, NVM-WP 2026/04), on resource rents and domestic revenue; The Reciprocity Principle (Paper V, NVM-WP 2026/05), on external capital; The Ledger of Return (Paper VI, NVM-WP 2026/06), on the reparatory ledger; and The Architecture of Bankability (Paper VII, NVM-WP 2026/07), on the legal coding of infrastructure capital. The series continues in The Omnidox Operating System, NVM-WP 2026/08, on resource-backed money and sovereign ledgers, and Doing Business in Africa, NVM-WP 2026/09, on enterprise on the continent. Nile Valley Multiversity working papers are circulated to invite comment and are not refereed. Comments are welcome to the correspondence address above.

Licence and attribution: © 2026 Yegandi Imhotep Paul Alagidede. Published by Porthologos Press for the Nile Valley Multiversity, Pungu Telania, Navrongo, Ghana. This working paper is licensed under the Creative Commons Attribution 4.0 International Licence (CC BY 4.0). It may be shared and adapted for any purpose, including commercially, provided the work is credited as in the suggested citation above, the licence is cited, and any changes are indicated. Licence text: creativecommons.org/licenses/by/4.0. Material from third parties quoted or cited in this paper, including data drawn from the sources in the references, remains subject to its original terms and is not covered by this licence.

ABSTRACT

Economics rests on a premise it has never proved. Ever since Robbins defined it in 1932 as the science of allocating scarce means, scarcity has been treated as a law of nature rather than a choice we made. This paper puts that premise on trial and finds it fails on its own terms. In about an hour the Earth intercepts as much energy from the sun as humanity uses in a whole year; the world grows more food than the species needs, yet hundreds of millions go hungry; money is issued without physical limit and rationed only by permission. Scarcity, then, is not the condition of the world. It is an operating system imposed upon it. We name that system Monodox, and counter it with Omnidox, which begins from abundance. The discipline rebuilt on this footing we call Metanomics: abundance is the starting point, and ordinary scarcity economics becomes the special case that holds only where limits are truly imposed. This paper supplies the mechanism the philosophy had lacked. Adam Smith named an invisible hand and never formalised it; the discipline later formalised it only as the division of a fixed stock. We locate the true formalisation in the invisible mycelium, the unseen fungal network that gives structure to the visible mushroom, moves resources from surplus to need, senses deficiency and corrects it by reciprocal reward rather than decree, and creates by decomposing what others discard. This is the generative principle that feminist economics reached at its root and read as an omission; it is Omnidox as a primal formative act. We ground the argument in the Akan Adinkra and Kente symbols of wealth, Bese Saka, the bound sack that makes abundance a property of the network, and Sika Futuro, the gold dust that was money, and in the Sankofa recognition that indigenous Africa ran the wood wide web long before the world wide web: susu, stokvel, aman bre, and letsema, the communal system of production, distribution, exchange, and consumption. From the network follows a decentralised finance in which a nation's verified wealth is tokenised and routed to need without manufacturing scarcity, the Resource-Based Monetary Sovereignty and Endogenous Resource-Backed Currency developed in the companion papers. The monetary consequence is a currency anchored to a nation's own renewing wealth rather than to borrowed permission; the fiscal consequence is a new question for the state, not how much it can borrow, but how much of its own abundance it can put to work.

Keywords: Metanomics; Monodox and Omnidox; Manufactured scarcity; Abundance; The invisible mycelium; Endogenous money; Tokenisation; Resource-Based Monetary Sovereignty; Sankofa.

JEL classification: B41 · B52 · E42 · E51 · F33 · O55 · Q57

1. Introduction: The Unproven Premise

Every science is built on a foundation, and most sciences can show you where the foundation was poured. Economics cannot. It calls itself the science of scarcity, yet it has never demonstrated that scarcity is the condition of the world. It assumed it. Lionel Robbins gave the assumption its canonical form in 1932 when he defined economics as 'the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses' (Robbins, 1932, p. 15). The sentence reads like a description. It is in fact a decision. With it, scarcity ceased to be one fact among many that an economist might investigate and became the axiom from which the entire edifice is deduced. Everything the discipline has built since, its theory of price, its theory of choice, its theory of value, stands on a premise that was installed rather than proved.

It is worth stating the move precisely, because an imprecise version of it is easy to dismiss. The claim of this paper is not that nothing is ever scarce. At any given instant a particular person faces particular limits: a farmer has only so many hours of daylight, a treasury only so many trained engineers, a patient only one heart. That local fact is trivially true and nobody disputes it. The claim is narrower and far more serious. It is that economics has smuggled a small, local, often temporary truth into the place of a large, permanent, metaphysical one. It has taken the ordinary friction that any chooser meets at the margin and elevated it into the natural and governing condition of existence, a condition supposed to hold everywhere, always, and by the nature of things. The friction is real. The cosmology built on it is not.

Put that cosmology on trial, on its own terms and in the three domains where material life is most plainly at stake, and it fails. In energy, in food, and in money, the binding constraint turns out not to be the quantity nature provides but the terms on which institutions grant access. Where the discipline sees a shortage written into the world, we find a rule written by human hands. Scarcity, on inspection, is not the condition of the world. It is an operating system installed upon it.

We name that operating system Monodox, the order of the single permitted truth that there is never enough, and we set against it Omnidox, the order that begins instead from abundance. The discipline rebuilt on the abundance footing we call Metanomics. Within Metanomics the familiar scarcity economics is not abolished; it is relocated. It survives as a special case, valid and useful wherever limits are truly imposed, and silent everywhere else. From this single reordering two consequences follow, one for money and one for the state, and it is these that carry the argument out of philosophy and into the institutions treated in the third paper of this series and in the companion papers. But a reordering of premises is not yet a mechanism, and it is on the mechanism that this paper turns. The philosophy of abundance has long been able to say that abundance is real; it has struggled to say how abundance is produced and coordinated without a central hand. The answer, we will argue, was named by the founder of the discipline and never formalised, and it is found beneath our feet, in the unseen network from which the visible harvest springs.

The pages that follow make the case in full: first the history of how a working assumption hardened into a supposed law, then a fair accounting of the schools that have wrestled with it, then the trial itself, then the limit the argument must respect, then the two operating systems, then the mycelial mechanism that formalises the generative principle, the Sankofa grounding that shows indigenous Africa already held it, the tokenised architecture that builds it, the consequences, and finally the objections.

2. The Genealogy of Scarcity: How a Premise Became a Law

A premise that can be shown to have a history can be shown to be a choice, and showing that scarcity is a choice is the first task of this paper. The history has two anchors, a century apart, and the distance between them is the distance a contingent worry travelled to become an a priori law.

Thomas Malthus, writing in 1798, gave scarcity its natural face (Malthus, 1798). Population, he argued, presses against a food supply that cannot keep pace, so that want is not an accident of bad policy but the discipline a fertile species must suffer at the hands of a finite earth. The argument has a power that explains its long afterlife, but it is worth seeing what it generalised from. Malthus reasoned from a particular conjuncture in one temperate economy: an England of rapidly rising population, land already substantially enclosed and privately held, war-time grain prices, and a poor law under political attack. From that vantage the pressure of numbers on land looked like a law of nature. It was in large part the signature of a property regime and a moment. The age of circumnavigation had already encountered, and would continue to encounter, whole regions where the relation of people to land ran the other way, where the difficulty was not too many mouths for the harvest but too few hands for the abundance the land would yield. The Malthusian postulate universalised a local experience of limitation. The error was not in the arithmetic but in mistaking a window for a world.

More than a century later, Robbins (1932) completed the migration. His contribution was not a claim about food or population at all. It was a claim about the meaning of the word economics. By defining the subject itself as the science of allocating scarce means, he lifted scarcity out of the realm of empirical questions, where it could be tested and might be false, and lodged it in the definition of the discipline, where it could not be questioned without ceasing to do economics. Between Malthus and Robbins scarcity changed its category twice over: from a contingent empirical worry about harvests, to a structural feature of choice, to a definitional condition built into the discipline's self-understanding. Somewhere in that passage the discipline stopped asking whether the premise was true, because the premise had become the thing one assumed in order to ask anything at all. It is a striking fact, and a telling one, that the two great rival traditions of the twentieth century, the Cambridge of Marshall (1890) and Keynes (1936) and the Chicago of Knight (1921) and Friedman (1953), for all that divided them, agreed on this. Both proceed on the scarcity premise that Robbins would codify. The scarcity axiom is the rare doctrine that orthodoxy and its loudest critics hold in common.

Before the trial can begin, one distinction must be set down, because the entire argument turns on it and the discipline's central error is the failure to draw it. Scarcity is not one thing but 3. There is relative scarcity, the local fact that a given person at a given moment cannot have everything at once; it is real, it is universal, and it is trivial. There is absolute scarcity, the thermodynamic and ecological limit of a finite planet; it is real, it is not trivial, and this paper will respect it without flinching. And there is manufactured scarcity, the want produced by rules, enclosures, patents, permissions, and austerity that human institutions wrote and could rewrite; it is real, it is enormous, and it is the kind that dominates economic life. Orthodox economics collapses all three into a single undifferentiated category and then, having collapsed them, treats the manufactured kind as though it were the absolute kind. It dresses an arrangement in the authority of a law. The genealogy exposes the conflation; the taxonomy of Table 1 names it; the demonstrations that follow break it apart.

Kind of scarcity	What imposes it	Can it be rewritten?
Relative scarcity	The fact that one person at one moment cannot have everything at once; the ordinary friction of choice	No, but it is local and trivial
Absolute scarcity	The thermodynamic and ecological limit of a finite planet: entropy, throughput, carrying capacity	No, and it must be honoured
Manufactured scarcity	Rules, enclosures, patents, permissions, and austerity written by human institutions	Yes, because we wrote them

Table 1. The three kinds of scarcity.

Source: author's construction. The distinction between the absolute and the relative draws on Georgescu-Roegen (1971) and Daly (1977) for the entropic floor; the category of manufactured scarcity is the author's, and is developed against the enclosure literature discussed in Section 3.2.

3. The Monodox Schools: Orthodoxy, Heterodoxy, and the Edge of Abundance

Before scarcity is put on trial, the schools that have lived under its authority deserve a fair hearing. The argument of this paper is not a polemic against economics, and it is not the discovery of a continent the discipline never saw. It is an evolutionary step. Many of the most powerful minds in the field have stood at the edge of the abundance position, looked across, and described what they saw with insight that this paper inherits rather than discards. What follows is a map of that terrain, drawn with respect, and gathered in Table 2, ending in a single claim: that the orthodox and heterodox traditions alike, for all their quarrels, share one foundation, and that we may therefore name them together as the Monodox school, the family of doctrines organised around the single permitted premise that there is never enough.

3.1 The orthodox lineage

The orthodox tradition is the direct heir of Robbins, and its achievement is real. From the marginalist revolution of Jevons (1871), Menger (1871), and Walras (1874), through Marshall's synthesis (Marshall, 1890), to the general-equilibrium theory of the twentieth century and the Chicago positive economics of Friedman (1953) and his successors, the orthodox school built the most rigorous account of allocation any civilisation has produced. It explained how dispersed decisions coordinate through prices, how relative scarcities are signalled without a central planner, how incentives shape behaviour at the margin. These are durable insights and Metanomics keeps them. The blind spot lies where the achievement is greatest. Having built a magnificent theory of how to allocate a fixed stock, the orthodox school mistook the allocation of a fixed stock for the whole of the economic problem. It treats the size of the stock, and the rules that fix it, as given from outside, as data rather than as decisions. Money, in this tradition, is largely a veil over real exchange, and the institutional act of its creation drops from view. The orthodox economist is a superb navigator who has forgotten that someone drew the map, and that the coastline can be moved.

3.2 The heterodox families and their nearness to abundance

Against orthodoxy stand the heterodox traditions, and several of them come close to the abundance position, close enough that fairness requires naming both what they saw and where they stopped.

The Keynesian and post-Keynesian line saw furthest on money. Keynes (1936) broke the idea that the economy naturally tends to full use of its resources, and his followers, Kaldor (1985), Robinson (1956), and above all Basil Moore (1988), established that money in a modern economy is endogenous, created by the act of lending rather than dug from a fixed reserve. This is the very finding on which the third demonstration of this paper rests. Yet the post-Keynesians, having shown that the financial constraint is institutional, continued to treat the real economy through the lens of effective demand and distribution within a broadly given productive capacity. They unlocked the door to abundance on the monetary side and did not walk through it on the side of resources.

The Marxian tradition saw furthest on manufactured scarcity, though it did not use the term. Its account of enclosure, of the artificial creation of a propertyless class, of the way surplus is captured and want is administered to discipline labour, is an anatomy of scarcity as a relation of power rather than a fact of nature (Marx, 1867). The insight is permanent. But the Marxian frame remains a theory of conflict over a contested surplus, and it inherits from classical economics a labour theory of value that anchors worth to expended toil rather than to the renewing wealth of a system that understands its own design. It diagnoses administered scarcity with great force and then theorises the cure as a different administration of the same fundamentally scarce stock.

The institutionalists came nearer still in spirit. Veblen (1899) exposed consumption as a social performance rather than the satisfaction of fixed wants, and Galbraith, in *The Affluent Society* (1958), gave the abundance position one of its sharpest formulations: that a society of unprecedented productive plenty continues to manufacture private want through the very machinery that satisfies it, starving the public sphere while the shelves groan. Galbraith stood at the edge and named the paradox with great force. He did not, however, rebuild the discipline from the plenty he described. He offered a powerful critique of affluence misallocated, not a general theory in which abundance is the starting axiom.

Three further traditions deserve particular notice, for each holds a piece of the Omnidox position. The Georgist tradition, descending from Henry George (1879), located the engine of poverty in the private capture of rent from land and resources that no individual created, an analysis of manufactured scarcity through enclosure that the present argument absorbs directly; yet it remained a single-factor theory, fixed on land, and did not generalise into an operating system. The anthropology of Marshall Sahlins (1972), in his account of the original affluent society, severed the link between abundance and industrial output altogether, showing that hunter-gatherer peoples met their wants with ease and leisure because their wants were bounded; this is abundance as a relation between means and ends rather than a quantity of goods, and it is illuminating, but it is description, not a reconstructed economics. And the post-scarcity and cornucopian

writers, from Simon's insistence that the ultimate resource is human ingenuity (Simon, 1981), to Fuller's spaceship earth (Fuller, 1969), to the recent visions of automated plenty, grasped that resources are a function of knowledge rather than a fixed endowment; but they located abundance in the future, in technology yet to arrive, and so left it as a promise rather than a present condition to be claimed.

3.3 The feminist economists and the generative root

One heterodox tradition came nearer to the foundation of abundance than any other, and it must be set out on its own, for it reaches the source from which the whole argument of this paper will later be drawn. Feminist economics, from Waring's *If Women Counted* (1988) through Nelson (1996), Folbre (2001), Elson (1999), and Power's case for social provisioning as the starting point of the discipline (2004), made visible the most basic productive activity of all, the one the scarcity-and-allocation frame renders invisible: the work of care, reproduction, and provisioning that creates and renews human life itself. Waring showed that the international System of National Accounts counts the unpaid labour of women, and the generativity of nature alongside it, as nothing, literally zero, in the measure of what an economy produces. Folbre named the result the invisible heart, the vast generative economy that sustains every market and is recorded in none of them. The insight reaches to the root.

And yet the tradition, in the main, framed its discovery as a problem of mismeasurement and exclusion to be corrected, a matter of counting properly and valuing fairly within the existing accounts, rather than rebuilding the premise of the discipline from the generative source it had uncovered. It found the foundation of abundance and described it as an omission rather than a beginning. This is the one step it did not take, and it is the step this paper takes. What the accounts leave out is not a missing entry to be added to the ledger. It is the generative network itself, the unseen root that gestates and births the visible economy. To ask only that it be counted is to ask that the ledger of the fruit make room for a footnote about the roots. Omnidox asks instead that we recognise the roots as the organism. We will give this claim its mechanism in Section 7, where the generative principle the feminist economists reached, and read as absence, is shown to be a thing with a structure, a physiology, and a name.

3.4 Ecological economics and the chartalist turn

Two traditions sit closest to the institutional consequences this paper will draw, and each must be placed with care. Ecological economics, founded on Georgescu-Roegen's entropy law (1971) and carried forward by Daly (1977) and Raworth (2017), is in one sense the opposite of an abundance school: it exists to insist on limits, on throughput, on the finite carrying capacity of the biosphere. Yet it is a necessary ally, because it identifies with care the one scarcity that is not manufactured and cannot be legislated away. Metanomics does not argue against ecological economics; it agrees with it about the floor and disagrees with the orthodox school about everything above the floor. The chartalist and Modern Monetary tradition, descending from Knapp (1924) through Wray (2015) and Kelton (2020), comes closest of all on the fiscal side. It establishes that a sovereign which issues its own currency is never financially constrained in the way a household is, that the real

limit is inflation and the supply of resources rather than the supply of money, and that the deficit is the wrong thing to fear. This is the fiscal consequence of Section 9.4 stated in advance. But Modern Monetary Theory anchors the currency to nothing more than the political community and its power to tax. It removes the scarcity of money without naming what the money should stand for. The argument of this series accepts the chartalist diagnosis and supplies the missing anchor: not pure fiat resting on taxation alone, but issuance against a nation's own verified and renewing wealth.

3.5 Why they are one school, and why Africa needs the next step

Set these traditions side by side, as Table 2 does, and a single pattern appears. The orthodox school takes scarcity as its axiom. The heterodox schools, where they glimpse abundance, treat it as an exception to be explained, a critique to be levelled, a generative root to be recounted, a future to be awaited, or a floor to be respected, but never as the foundation on which to rebuild. Each holds a true fragment. None assembles the fragments into an operating system that begins from sufficiency and recovers scarcity only as the special case. That is the shared horizon, and it is why orthodoxy and heterodoxy alike belong to the Monodox family: they differ on how the single permitted scarcity should be managed, not on whether scarcity is the ground beneath their feet.

Tradition	The fragment it grasped	Where it stopped short
Orthodox (marginalist, general-equilibrium, Chicago)	Coordination of allocation through prices, without a central planner	Mistook allocation of a fixed stock for the whole problem; treats the stock and its rules as given
Post-Keynesian (Keynes, Moore)	Money is endogenous, created by the act of lending	Walked through the monetary door to abundance, not the door on the side of real resources
Marxian	Scarcity as an administered relation of power (enclosure, discipline)	A theory of conflict over a contested surplus; labour theory anchors worth to toil
Institutionalist (Veblen, Galbraith)	Want is manufactured amid affluence	A critique of affluence misallocated, not a premise rebuilt from plenty
Georgist (George)	Poverty from private capture of unearned rent	A single-factor theory, fixed on land; no operating system
Anthropological (Sahlins)	Affluence as bounded wants, not industrial output	Description, not a reconstructed economics
Post-scarcity, cornucopian (Simon, Fuller)	Resources are a function of knowledge, not a fixed endowment	Located abundance in a future technology rather than a present condition
Feminist (Waring, Folbre, Power)	The invisible generative economy of care and provisioning	Read the generative root as an accounting omission, not a beginning
Ecological (Georgescu-Roegen, Daly, Raworth)	The one scarcity that is not manufactured: the entropic floor	Insists on limits; an ally on the floor, silent about the manufactured middle

Tradition	The fragment it grasped	Where it stopped short
Chartalist, MMT (Knapp, Wray, Kelton)	The currency issuer faces no household finance constraint	Removes money's scarcity without naming the anchor the money should stand for

Table 2. *The Monodox schools: the fragment each grasped and where it stopped short.*
Source: author's synthesis of the works cited in Section 3. Full bibliographic details for each work appear in the reference list. The characterisation in column 3 is the author's assessment.

This is not an adversarial conclusion. It is a developmental one. Omnidox stands to Monodox as a later stage stands to an earlier, inheriting its instruments while reconstituting its premise, the way an organism evolves into a new state rather than the way one theory is nested inside a larger one. The point bears most sharply on the African case, and this is why the step is not merely academic. African economies do not, in the main, resemble the cold, crowded, capacity-bound world that gave Malthus and Robbins their intuitions. They resemble the other case: lands of resource abundance held under conditions of manufactured capital scarcity, continents whose wealth sleeps in the ground or is pledged abroad while their people are told there is not enough. For such economies the Monodox premise is not merely incomplete; it is a description of someone else's constraints imposed upon them. The evolutionary step from Monodox to Omnidox is, for Africa, the recovery of a premise that fits the physical facts.

4. Scarcity on Trial: 3 Demonstrations

Here the argument moves from history and taxonomy to evidence. Take the three domains in which scarcity is asserted most loudly, energy, food, and money, and in each show that the binding constraint is not natural shortage but institutional permission. The structure of the demonstration is identical in all 3. State the scale of the abundance that is in fact available. Set beside it the lived experience of want. Then locate the gap between them, and find it not in nature but in the rules of access. Three times the same result, in the three areas on which material life most depends, is not a coincidence. It is a pattern, and the pattern is the finding. Table 3 sets the three demonstrations side by side.

4.1 Energy: the sun the discipline forgot to count

The Earth sits inside an energy income so large that the entire human economy is a rounding error against it. The Sun delivers to the top of the atmosphere on the order of 173,000 terawatts of power without interruption. About 30 per cent of that is reflected back to space, leaving roughly 121,000 terawatts absorbed by the Earth and its atmosphere, which is about 435 exajoules every hour, or some 3.8 million exajoules a year. Total human primary energy use in 2023, from every source combined, was 620 exajoules for the whole year (Energy Institute, 2024). The arithmetic is not subtle: measured against the flux the planet actually absorbs, the Sun supplies humanity's entire annual energy budget in about an hour and a half; measured against the flux the planet intercepts, in almost exactly one hour. The canonical statement of the point, that more energy strikes the Earth in a single hour than the species consumes in a year, comes from

Lewis and Nocera (2006), and it held, by a narrow margin (4.3 against 4.1×10^{20} joules), at the consumption levels of the early 2000s. Perez and Perez (2015) extend the comparison to the stock rather than the flow: a single year of incident sunlight exceeds all recoverable reserves of oil, coal, gas, and uranium combined. Deployed together, these figures are unanswerable in their order of magnitude.

The honest form of the thesis matters here, because energy is the domain where overstatement is easiest and most damaging. The claim is not that energy transition is costless, nor that capture and storage are solved problems, nor that the sun can be harnessed by wishing. The constraint on energy has never been the quantity arriving; it has been our capacity to capture, store, and distribute it, and the institutions that decide who may build, who may connect, and who may sell. The scarcity we price at the meter is downstream of capture and permission, not of supply. The resource is superabundant; the bottleneck is technological and, increasingly, political. To call that a scarcity of energy is to mistake a queue at one narrow gate for an empty warehouse behind it.

4.2 Food: the harvest that feeds everyone and the hunger that persists

From energy the argument moves to its most visceral case, because if abundance can be shown where life itself is at stake, the manufactured-scarcity thesis stands at its strongest. The world already grows enough to feed every person alive, with a wide margin, and has done so for decades. Global food supply now averages more than 2,900 kilocalories per person per day, against a moderate-activity requirement of roughly 2,100 (FAO food balance sheets, via Our World in Data, 2025; United States Department of Agriculture, Economic Research Service, 2024, for the requirement threshold). Production, in other words, runs well above need, not at the edge of it. And yet hunger persists on a vast scale. About 673 million people faced hunger in 2024, within a range of 638 to 720 million (since revised to about 659 million), and about 645 million in 2025; some 2.3 billion experienced moderate or severe food insecurity in 2024, and about 2.1 billion in 2025; and about 2.7 billion could not afford a healthy diet in 2025 (FAO, IFAD, UNICEF, WFP and WHO, 2025, 2026). Surplus and starvation coexist, in the same year, on the same planet, measured by the same agencies.

It follows, with the force of simple logic, that hunger cannot be explained by aggregate shortage. If the harvest exceeds the need and people still starve, the cause lies in access, in distribution, in entitlement, not in the quantity grown. This is not speculation. Amartya Sen demonstrated it for the most extreme form of hunger, the famine, and his finding generalises to the milder forms (Sen, 1981). Sen showed that major famines have occurred with no decline at all in the aggregate availability of food, that people starved not because there was too little to eat but because they had lost the entitlement to command what was there, through unemployment, collapsing wages, or rising prices. The lesson is clear and it is fatal to the orthodox frame. If scarcity is not the cause of hunger, then scarcity economics is not its cure. What Malthus posited as nature's discipline, Sen refuted as society's arrangement. The food-availability-decline hypothesis gives way to the entitlement approach, and with it the deepest intuition of the scarcity school loses its most affecting case.

4.3 Money: the ledger that needs no mine

The trial closes with the case that is hardest to see and most consequential of the 3, because money is where the manufactured nature of scarcity is most completely hidden and, once seen, most completely plain. The everyday intuition pictures money as a finite substance, dug from the ground, fixed in quantity, and rationed by its scarcity, the gold in the vault that there is only so much of. That picture is a historical artefact of the gold standard, and it is false to the modern economy. Money today is not a substance but a ledger entry. It is created at the moment of lending, by a keystroke, against a promise. When a commercial bank makes a loan it does not pass on someone else's prior savings; it writes a new deposit into existence on the spot, and that deposit is new money.

This is not a heterodox provocation but the settled account of the central banks themselves. The Bank of England's own description is the anchor (McLeay, Radia and Thomas, 2014): the majority of money in circulation is created by commercial banks making loans; whenever a bank extends a loan it simultaneously creates a matching deposit; about 97 per cent of the money people hold is bank deposits rather than physical currency; and banks are neither mere intermediaries lending out funds placed with them, nor multipliers of a fixed base of reserves. Werner's empirical work (2014) confirmed the mechanism at the level of the individual bank, showing directly that a bank creates money when it lends. The limit on money, then, is not physical but institutional: capital rules, regulation, central-bank policy, the demand for credit, the solvency of borrowers, and above all the judgement of who is deemed creditworthy. Money is rationed by permission.

The discipline of the phrasing is itself the argument's defence. The claim is not that money is costless, or that issuance has no consequences, or that a central bank may create without limit and without inflation. Those caricatures are easy to refute and are not the claim. The claim is that the limit is a decision, not a deposit of ore; that the institution issuing a currency is not digging for it but deciding; and that a constraint which is decided can be decided differently. That is both true and far harder to dismiss than the cornucopian version, and it is the form in which the monetary consequence of this paper will be drawn.

4.4 The synthesis

Draw the three threads into one finding, as in Table 3. In energy, the resource is superabundant and the scarcity is a matter of capture and permission. In food, the harvest exceeds the need and the hunger is a matter of entitlement. In money, the quantity is unbounded in principle and the limit is a matter of institutional judgement. Three domains, three forms of want, one cause: in each, the governing constraint is not the quantity nature provides but the terms on which institutions grant access. Scarcity is real at the margin and manufactured at the core. The discipline built its house on the margin and called the margin the world.

Domain	The abundance available	The want that persists	The true binding constraint
Energy	About 435 EJ of sunlight absorbed each hour; 620 EJ is all of humanity's primary energy for the whole of 2023	Energy poverty; billions under-served or unconnected	Capture, storage, distribution, and the permission to build, connect, and sell, not supply
Food	More than 2,900 kcal per person per day produced, against about 2,100 required	About 645 million hungry in 2025; about 2.1 bn food-insecure; about 2.7 bn cannot afford a healthy diet	Entitlement and distribution, not the aggregate harvest (Sen, 1981)
Money	Issuance unbounded in principle; a loan creates a matching deposit by keystroke	Credit-starved firms, households, and nations, especially in the South	The institutional judgement of creditworthiness; permission, not a deposit of ore

Table 3. Scarcity on trial: the abundance, the want, and the true binding constraint.

Sources: Energy Institute (2024); Lewis and Nocera (2006); Perez and Perez (2015); FAO, IFAD, UNICEF, WFP and WHO (2025, 2026); Our World in Data (2025); Sen (1981); McLeay, Radia and Thomas (2014); Werner (2014). Figures are as published by the cited sources; the identification of the binding constraint in column 4 is the author's.

5. The Honest Limit: Where Scarcity Is Real

An abundance philosophy that denied all limits would be a fantasy, and it would deserve to lose. So the strongest objection must be raised here, by the argument itself, before any critic can raise it. There is one scarcity that is not manufactured, that no statute can repeal, and that no monetary arrangement can wish away: the thermodynamic one. Energy degrades as it is used. Matter disperses. The entropy of a closed system rises and does not fall of its own accord. Nicholas Georgescu-Roegen (1971) made this law the foundation of an economics that takes physical limits seriously, and the ecological economists who followed, Daly (1977) with his steady-state and throughput, Raworth (2017) with her social foundation and ecological ceiling, translated the law into the working language of carrying capacity and planetary boundaries. This floor is real. The argument of this paper does not touch it and does not wish to.

With the floor conceded, the position can be stated in the precise form that raises it above a slogan. Abundance philosophy does not deny the entropic floor or the ecological ceiling. It claims something narrower and, because narrower, stronger: that the overwhelming majority of the scarcity human beings experience sits far above that floor, manufactured by rules of access rather than imposed by physics. The hungry are not short of a planet's food; they are short of entitlement to it. The energy-poor are not short of sun; they are short of capture and the permission to capture. The capital-starved nation is not short of wealth; it is short of the authority to monetise the wealth it already holds. Between the entropic floor far below and the lived experience of want lies a vast manufactured middle, and it is in that middle that economic life is conducted. Metanomics is therefore not the claim that limits do not exist. It is the claim that we have mistaken the rules we wrote for

the limits we were given, and have organised an entire science around the confusion. Conceding the floor is not a retreat. It is what makes the rest of the argument serious, and it is the passage that a sceptical referee should read as the signal that this is an economics, not an enthusiasm. It is also, we will find, the discipline the generative network itself observes: the mycelium does not repeal the entropy law; it works with exquisite economy inside it, wasting nothing and regenerating what it can.

6. Monodox and Omnidox: 2 Operating Systems

The two systems can now be named and made concrete. An operating system, in the sense intended here, is not a theory within economics but the deeper layer beneath the theories, the set of assumptions about what the economic problem fundamentally is, on which all the particular models are then written. Monodox is the operating system of scarcity. It assumes that there is never enough, that allocation of a fixed stock is therefore the whole of the economic problem, and that competition for a fixed pie is the natural and inevitable form of economic life. Omnidox is the operating system of abundance. It assumes that sufficiency is the normal condition of a living system that understands its own architecture, and that the central problem is not the rationing of a fixed stock but the design of the rules and relationships through which a renewing wealth is created, circulated, and shared. Table 4 sets the two systems against each other across the dimensions that matter.

MONODOX

The operating system of scarcity: the doctrine that there is never enough, under which economic life is organised as competition for the allocation of a fixed stock, and want is taken to be the natural and governing condition of the world.

Yegandi Alagidede

OMNIDOX

The operating system of abundance: the order that begins from sufficiency as the natural condition of a living system that understands its own architecture, under which the central economic task is not the rationing of a fixed stock but the design of the relationships through which renewing wealth is created, circulated, and shared. What a society discards is the substrate of its next abundance; the difference is never the quantity of resources, but the relationships through which they move.

Yegandi Alagidede

Dimension	Monodox (scarcity)	Omnidox (abundance)
First premise	There is never enough	Sufficiency is the natural condition of a network that understands its own architecture
The economic problem	Allocation of a fixed stock	Design of the relationships through which renewing wealth is created and moved
Coordinating image	The invisible hand dividing a stock	The invisible mycelium generating, routing, and renewing it
Default motion	Accumulation and competition	Circulation and reciprocity
Money	Borrowed permission, rationed	A claim on verified, renewing wealth
Waste	A cost to be minimised	The substrate of the next abundance
Governance	A central allocator	A polycentric network with no central key
Status of scarcity	The governing law of the world	A special case, holding only where limits truly bind

Table 4. Two operating systems: Monodox and Omnidox.

Source: author's construction.

What converts this philosophical contrast into an indictment is the evidence that scarcity is frequently produced on purpose. Manufactured scarcity is not a metaphor or a figure of speech. It is the deliberate restriction of supply to sustain price and power, and its instances are everywhere once the eye is trained to them. The diamond is held back from the market to keep the stone precious. The patent fences knowledge that costs nothing to copy and turns a public good into a private toll. Planned obsolescence shortens a product's life so that the sale may be made again. The enclosure turns a commons into a rent. The austerity programme withholds money that a sovereign issuer could create, and calls the withholding a necessity. In each case the abundance is real and the scarcity is administered. Monodox, examined closely, is not a description of nature at all. It is a description of these arrangements, mistaken for nature and taught as law.

This brings the argument to its theoretical spine, the move that makes Metanomics a contribution to economics rather than a mood about it. A precedent is worth naming, and then setting aside. In the General Theory, Keynes (1936) argued that the classical economics of his day described only a special case, the case of full employment, and mistook that special case for the general condition of the economy in which people live and work. His courage in relativising a reigning theory is a spirit this paper shares. But the move made here is not Keynes's move, and the distinction matters. Keynes built a wider theory of the same kind and showed the classical account to be a smaller province within it; he did not change the state of the discipline's foundations. Metanomics is not a larger general theory that holds scarcity economics as one province among many. It is the evolution of economics into a new state, a reconstitution of the operating system on which all the models are written. The relation is closer to a change of phase than to a change of map. As water passes from ice to flowing liquid when the binding conditions are released,

the discipline passes from scarcity economics to Metanomics when the premise of permanent want is lifted. Within the new state the older science is not a neighbouring region of the same country but an earlier phase, recovered wherever, and only wherever, real constraint still binds.

METANOMICS

The science of abundance: the discipline that takes sufficiency as its starting point and treats ordinary scarcity economics as the special case obtaining only where limits are truly imposed; concerned with the inner, often unseen forces from which abundance springs, and with how those forces take form in physical reality, in individuals, in societies, and in nations.

Yegandi Alagidede

7. The Invisible Mycelium: Formalising the Generative Principle

The trial has shown scarcity to be an operating system, and the two operating systems have been named. What remains is to give Omnidox a mechanism, for a philosophy of abundance that cannot say how abundance is produced and coordinated, without a central hand and without manufacturing want, is only half an argument. The mechanism has stood in front of the discipline for 2 and a half centuries, gestured at by its founder and never formalised, and it is found, of all places, beneath our feet.

7.1 The invisible hand that was never formalised

Adam Smith invoked the invisible hand three times across his entire corpus, and formalised it not once. It appears in *The Theory of Moral Sentiments* (1759), where the rich are led by it to distribute the necessities of life as if the earth had been divided into equal portions; in *The Wealth of Nations* (1776, Book IV, Chapter 2), where the merchant who intends only his own gain is led by it to promote an end that was no part of his intention; and, in the earliest of the 3 to be composed, in the essay on the history of astronomy published posthumously in 1795, where it is the invisible hand of Jupiter. Three passing invocations of a metaphor for an unseen coordination by which the self-regarding acts of many resolve into an order that none of them intended. Smith saw the phenomenon with a poet's clarity and left it a figure of speech.

The discipline waited nearly two centuries for the formalisation, and when it came, in the general-equilibrium proof of Arrow and Debreu (1954) and the welfare theorems that followed, it formalised the hand inside the scarcity frame. What the mathematics captured was the coordination of a fixed endowment, among self-interested agents, through the prices that scarcity generates. The invisible hand of orthodoxy is, when formalised, a scarcity hand. It allocates what already exists; it does not make more; it presupposes the endowment and asks only how a market divides it. Formalised, the metaphor became the mathematics of Monodox, the most rigorous account ever written of how to share out a pie whose size is taken as given.

Yet Smith's metaphor always pointed at something the scarcity formalisation could not hold. An unseen network that does not merely divide a stock but generates the order itself; that coordinates without a coordinator and produces without a producer; that senses where the necessities are wanted and moves them there. That is not a market clearing a fixed supply. That is a living network, and it exists, literally, as one of the oldest and most widely distributed coordinating architectures on Earth. The invisible hand was never a hand. It was a root.

7.2 The mycelium: the unseen architecture of the visible harvest

Consider two things, one visible and one not. The mushroom is the fruiting body, the sporocarp, the brief reproductive flush that breaks the surface, is picked, and changes hands. The mycelium is the vast web of hyphae from which the mushroom springs, threaded through soil and wood, almost entirely unseen, and it is the mycelium that does the actual work: decomposing, foraging, acquiring nutrients and distributing them, binding a whole ecosystem into exchange (Stamets, 2005; Sheldrake, 2020). Attend only to the fruit and you will misunderstand where it came from. Attend to the network beneath and you learn how abundance is actually made.

The economic translation writes itself. Prices, transactions, the visible market, the goods that change hands: these are the fruiting body, real but derivative, transient, the surface expression of something deeper. The generative network beneath, the relationships, the knowledge, the cooperative exchange, the trust, the circulation through which value is actually produced and moved: that is the mycelium. Orthodox economics is the science of the fruiting body. It studies the mushroom with great precision and calls the mushroom the organism. Metanomics is the science of the mycelium: of the inner, often unseen forces from which abundance springs, and of how those forces take form in the visible world.

The network is not metaphor alone; it is measured fact. Simard and colleagues (1997) showed, in the field, carbon passing between trees of different species through their shared fungal network, moving on balance toward the shaded Douglas-fir seedlings, though how general such transfer is remains contested (Karst, Jones and Hoeksema, 2023). Kiers and colleagues (2011) showed that the mycorrhizal symbiosis runs as a biological market: plants detect and reward the fungal partners that deliver, fungi channel more phosphorus to the roots that supply more carbon, and reciprocal reward, not central command, stabilises the cooperation. Whiteside and colleagues (2019), tagging phosphorus with fluorescent quantum dots, watched arbuscular fungi move the nutrient across their networks from where it was abundant to where it was scarce, hoarding, relocating, and trading in response to inequality of supply. The unseen network under the forest does precisely what a generative economics requires: it shifts resources from high concentration to low, it distributes what is needed to where it is needed, and it senses deficiency and answers it.

Honesty requires the counterweight, and it strengthens rather than weakens the case. The popular image of a sentient, altruistic forest has run ahead of the evidence in places, in the wider reception of Simard (2021) and Sheldrake (2020), and in the citing scientific literature as well; Karst, Jones and Hoeksema (2023) show that several widely repeated

claims about common mycorrhizal networks in forests rest on citation bias and overinterpretation. The argument here does not need the romance and does not make it. It rests on the established core, that fungal networks acquire, decompose, and redistribute resources, and that at the level of the symbiosis this redistribution follows a logic of reciprocal reward rather than central plan, and it takes the mycelium as a model of generative coordination, not as a claim that the forest is a mind. What the science licenses is exactly what Omnidox requires: a decentralised architecture that produces and moves abundance without a central allocator, and without the manufactured scarcities a central allocator is forever tempted to impose. Table 5 maps the correspondences in full.

7.3 The generative principle the ledger could not see

Return now to the root uncovered in Section 3.3, and let the mycelium make it literal. Feminist economics reached the generative source. Waring (1988) showed the national accounts recording the unpaid work of care, and the generativity of nature with it, as zero; Folbre (2001) named the invisible heart, the vast productive economy that sustains every market and appears in none. This was true seeing, and Metanomics inherits it in full. But what the accounts leave out is not a missing entry, to be corrected by better counting. It is the mycelium. It is the generative network that gestates and births the visible economy, standing to the market as the unseen web stands to the mushroom. This is the superabundant, generative principle that the measured ledger could not see, precisely because the ledger is a record of the fruit and the principle lives in the roots. To ask that it be counted is to ask the fruiting body's accounts to make room for a footnote about what produced them. Omnidox asks something else: that we recognise the roots as the organism and the fruit as its expression, and begin the discipline not from the harvest but from the network that gestates it.

This is why the deepest root of Metanomics is generative, and in the old grammar of the traditions, feminine. Abundance, fertility, and the unbounded belong to the generative pole of existence: the seed that returns more than was sown, the mycelium that makes food from what was discarded, the womb of the visible in the unseen. Monodox begins from the bounded, the contested, the already-fruited, and asks how to divide it. Omnidox begins from the generative network and asks how to tend it. The mushroom teaches the lesson in a single fact: it creates by decomposing. It does not draw down a fixed stock; it turns what others discard, the sawdust, the straw, the spent residue of last season, into protein, medicine, and money. What a society discards is the substrate of its next abundance. The generative principle does not allocate a pie. It bakes, from the crumbs of the last one, a larger one.

7.4 Omnidox as primal formative act

Gather the strands and Omnidox can be stated as a mechanism and not only as a mood. It is the primal formative act: the unseen network of patterns and relationships that, prior to any price, gestates the visible economy and then keeps it whole and in balance. Four properties define it, each with a mycelial correlate, and each already visible in the science.

First, it redistributes from surplus to need. Resources move down the gradient, from high concentration to low, as phosphorus crosses the fungal net from rich patch to poor (Whiteside et al., 2019). The network's default is circulation, not accumulation; hoarding is a pathology, not a strategy.

Second, it distributes efficiently and keeps the whole in balance. Energy and nutrients are routed to where they do most good for the system, sustaining the many rather than maximising the one; the health of the network is the unit of account, in the spirit of Bese Saka, whose fullness is a property of the bound sack and never of the single seed.

Third, it senses deficiency and answers it with right action, without distorting incentives. The mycelial market rewards the partner that delivers and withholds from the one that does not (Kiers et al., 2011); it corrects shortfall not by decree but by reciprocity, so that the amelioration of need and the alignment of incentive are one and the same motion. This is the decisive contrast with manufactured scarcity, which corrects nothing and distorts everything, restricting supply precisely where it is most abundant in order to sustain a price.

Fourth, it regenerates rather than depletes. It creates by decomposing; it leaves the substrate richer than it found it. Where the extractive economy runs down the stock it draws upon, the generative network builds the stock it feeds upon, so that use and renewal are the same act.

These four properties are the formalisation that Smith's metaphor awaited and that the scarcity mathematics could not supply. The invisible hand of Monodox divides a fixed stock through the prices that scarcity generates. The invisible mycelium of Omnidox generates the stock, moves it to need, senses and heals deficiency, and renews its own ground, all without a central allocator and all without manufacturing want. The one is the coordination of scarcity. The other is the architecture of abundance. From this architecture, and not from sentiment, follows the decentralised financial system in which resources are made readily available to meet the many desires of a people without the creation of artificial scarcities, developed in Section 9. First, though, the architecture must be shown to be older than its rediscovery, for indigenous Africa ran it for centuries.

Mycelial feature (evidence)	Economic and financial correlate
Fruiting body: the visible, transient sporocarp that is picked	Prices, transactions, the market: the visible, derivative harvest
Mycelium: the unseen hyphal network that does the work	The generative economy: relationships, knowledge, trust, circulation
Carbon and nutrient transfer between partners (Simard et al., 1997)	Redistribution of resources from surplus toward need
Reciprocal reward; better partners fed more (Kiers et al., 2011)	Incentive-compatible correction; a market without central command
Phosphorus moved from rich to poor patches (Whiteside et al., 2019)	Counter-cyclical routing; source-to-sink discipline, so that good seasons pay more

Mycelial feature (evidence)	Economic and financial correlate
Creation by decomposition; saprotrophy (Stamets, 2005)	Regeneration: waste becomes the next input; the circular loop
No central brain, yet the network decides	The Decentralised Autonomous Organisation: governance without a central key
Spores and portable, bound nutrient packets	Tokenisation: MeBits as provenance-bearing claims that carry value across the network

Table 5. *The mycelial architecture and its metanomic correlate.*

Source: author's construction. Column 1 records findings from the cited primary literature; column 2 is the author's translation into economic and financial terms and is offered as a structural analogy, not as a claim of biological identity.

8. The Wood Wide Web Before the World Wide Web: Bese Saka, Sika Futuro, and the Sankofa Principle

The formative principle just named will sound, to a discipline schooled in scarcity, like a novelty imported from the biology of the North. The reverse is the case. The mycelial architecture of abundance is not a discovery awaiting the West's forests; it is a memory awaiting Africa's recovery. Sankofa, the bird that turns its head to take the egg from its own back, teaches that it is no error to go back and fetch what was left behind. What must be fetched here is a whole mode of economic life that African and other indigenous peoples ran for centuries: the wood wide web before the world wide web, the communal and interconnected system of production, distribution, exchange, and consumption that the mycelium models and the market forgot. Two symbols from the Akan Adinkra and Kente traditions carry the recovery. They originate among the Akan of West Africa, yet the cosmology they express, of wealth as something plural, shared, and renewing, runs through many African cultures, and it is in that wider African sense that they are read here.

8.1 *Bese Saka: abundance as a property of the network*

Bese Saka, the full sack of cola nuts, is the sign of wealth that is plural by its very nature. Its meaning does not reside in the single seed but in the many bound together, in plenty gathered and held in common, in the abundance and unity that come from the gathering rather than from the grain. It is an image of affluence as a cooperative and communal fact, of riches that exist because they are shared and increase because they are pooled. One hand, the proverb reminds us, cannot tie a bundle. Bese Saka is the mycelial principle rendered in a single figure: abundance is a property of the network, never of the isolated unit. It names what the orthodox frame cannot see, that wealth is, at its root, a relation among people and not a quantity of goods. The same wisdom is carried in the counsel that if you wish to go fast you go alone, but if you wish to go far you go together: the far horizon, the durable plenty, is reached only in common.

8.2 Sika Futuro: wealth that moves under its own authority

Sika Futuro, the gold dust, carries the monetary half of the argument, and it carries it with the weight of history rather than metaphor. Among the Akan and across much of West Africa, gold dust was not a symbol for money or a poetic stand-in for it. It was money. For centuries before colonial coinage was imposed, gold dust served as the working medium of exchange and the store of value, measured with finely made spoons and with the brass weights of the abrammuo system, a functioning indigenous monetary order in its own right (Garrard, 1980). Sika Futuro therefore stands for wealth in motion: value that circulates and works, value that moves under the authority of the people who hold it, rather than value hoarded in a vault or pledged to a creditor across the sea. The historical fact is the load-bearing point and it should be stated plainly: African societies ran their own money, anchored to a wealth they themselves possessed and measured, before that sovereignty was displaced. To anchor a currency to a nation's own verified wealth is not an untried novelty. It is a return.

8.3 The human mycelia: susu, stokvel, aman bre, letsema

Long before packet-switching, indigenous economies were networks, not markets of isolated maximisers, and the four properties of the mycelium set out in Section 7.4 are legible in their institutions. West African susu and Southern African stokvels pooled savings and shared risk through webs of mutual obligation, mechanisms of collective finance that circulated resources from those in surplus this month to those in need, outside the purview of any central authority (Ardener, 1964; Bortei-Doku and Aryeetey, 1995; Alagidede, 2025b). The Akan aman bre, the deliberation of common affairs in open assembly, settled matters of the commons by discussion among all whom they touched, which is coordination without a central allocator. The Tswana letsema turned communal labour to the season's demands, more hands where more were wanted, the source-to-sink routing of effort itself. The Zulu maxim umuntu ngumuntu ngabantu, a person is a person through other persons, states the relational ontology plainly: the unit is the network, not the node. These are human mycelia. They circulate resources from surplus to need, sense deficiency and answer it, regenerate the ground of the next season's plenty, and coordinate without a central key, the four properties of the generative network enacted in social institutions centuries before a laboratory measured them under the soil.

And the money moved the same way. Gold dust and the cowrie ran as media of exchange embedded in social trust and communal oversight, their supply moderated not by a distant central bank but by the network's own institutions, chiefs, guilds, and cultural norms that sanctioned misuse and restrained over-circulation (Alagidede, 2025b). This was money as a claim on a wealth the community held and measured, circulated through relationships, and not money as borrowed permission pledged abroad. The precolonial monetary order was mycelial: decentralised, resource-anchored, communally governed. What the colonial currency boards imposed in its place, a sterling-backed issue that prohibited domestic credit creation and drained value outward, was the amputation of the network and its replacement by a single artery running north (Alagidede, 2025b). The tragedy of the modern African monetary predicament, traced in the companion paper, is

the tragedy of a rich mycelium cut back to one vessel and told the resulting hunger was its own fault.

Sankofa, then, is not nostalgia; it is the retrieval of a working architecture. The claim is not that the past was paradise but that the past held the pattern, and the pattern is the one the mycelium confirms and the one Omnidox formalises. To build an economics of abundance in Africa is to fetch what was set down under duress and carry it forward with instruments the ancestors lacked. Those instruments are the subject of the section that follows.

9. From Network to Architecture: Tokenisation and the Decentralised Finance of Abundance

A pattern retrieved is not yet an institution. The mycelial architecture must be built in the materials of the present, and the present has, for the first time, the materials to build it. What the fungal network does with hyphae and spores, a human economy can now do with ledgers and tokens. The decentralised finance of nature has a decentralised finance of code as its answer, and the two share a design. This section draws that architecture from the mycelial principle and connects it to the Resource-Based Monetary Sovereignty and Endogenous Resource-Backed Currency developed at length in the companion papers (Alagidede, 2025a, 2025b), of which the present paper supplies the philosophical foundation.

9.1 *The mycelium as decentralised finance; MetaFi as the built network*

Strip the mycelial network to its logic and it is already a decentralised financial system: peer to peer, without a central intermediary, moving value from where it is held to where it is needed, pricing by reciprocal reward, and settling in a medium, nutrient and carbon, that stands for real work done. This is the architecture of MetaFi, the metanomic finance system set out in the companion papers. MetaFi disintermediates the creditor cartels that sit, like a single central artery, between a resource-rich economy and its own wealth, and replaces them with a polycentric network in which resources route directly to need. The Decentralised Autonomous Organisation that governs it, in which no single key can move funds and decisions are taken by the many whom they touch, is the aman bre and the fungal network at once: coordination without a central allocator. Where the mycelium has no brain and yet decides, the Decentralised Autonomous Organisation has no sovereign key and yet governs. The legal characterisation of such arrangements, and the regulatory perimeter they must sit within, remain unsettled and are treated seriously rather than waved away (Zetsche, Arner and Buckley, 2020).

The routing is the point. The programmable treasury of the Metanomics debt model (Alagidede, 2025a) splits every verified inflow by a state-contingent rule, so that debt service flexes with the season, more in good years and less in hard ones. This is the source-to-sink discipline of the fungal net, the principle that good seasons pay more and hard seasons breathe, embedded in the instrument rather than renegotiated in every

downturn. The convertibility corridor that bounds issuance to measured collateral is the network's own prudence: the mycelium does not mint a nutrient it has not made, and MetaFi does not issue a claim the resource base cannot honour. The vicious circle of the debt economy, borrow, depreciate, default, renegotiate, is the extractive organism that runs down its host; the virtuous flywheel of Metanomics, produce, verify, route, develop (Alagidede, 2025a), is the saprotroph that leaves the substrate richer than it found it.

9.2 Tokenisation: the spores of the network

The mycelium moves resources as discrete, portable packets, nutrients bound and carried across the net, and it disperses the whole from a fragment through the spore. Tokenisation is that mechanism in the built network. In the Resource-Based Monetary Sovereignty model (Alagidede, 2025b), a nation's verified wealth, its gold, cocoa, energy, and certified inventories, is rendered into MeBits, programmable claims redeemable into an audited share of a resource basket, that circulate transparently across MetaFi. The MeBit is the nutrient packet of the human mycelium: a fragment of the whole that can travel, be exchanged, and reconstitute value wherever it lands, carrying its provenance with it, as Table 5 records. Because the token is a claim on measured, generative capacity and not on borrowed permission, its circulation widens the network rather than draining it; issuance rises as verified capacity rises, and the corridor tightens automatically under stress (Alagidede, 2025a, 2025b).

This is the decentralised finance that the formative principle implies: a system in which resources are made readily available to meet the many and legitimate desires of a people, without the manufacture of artificial scarcities, because the anchor is the network's real and renewing wealth rather than a rationed permission granted from outside. Here the philosophical spine of the present paper meets the institutional body of the framework. The philosophy of abundance supplies the premise; the mycelium supplies the mechanism; Resource-Based Monetary Sovereignty and the Endogenous Resource-Backed Currency supply the institution. Tokenisation is where the unseen network becomes a payable claim, where the roots, at last, are made to fruit on the nation's own terms.

9.3 The monetary consequence: a currency anchored to verified wealth

If money is created by permission rather than dug from a mine, as the third demonstration established, then the decisive question about a currency is no longer how much of it exists but what it is anchored to. Every currency stands on something. A nation may anchor its money to borrowed permission, to foreign reserves it must earn or borrow and to external debt denominated in a currency it cannot issue, and in doing so it imports the scarcity and the dependence that follow. Or it may anchor its money to its own verified wealth, the resources and productive capacity it can demonstrably account for, and issue at home against that. This is the Endogenous Resource-Backed Currency, and it rests on the principle of Resource-Based Monetary Sovereignty. The endogenous-money finding (McLeay, Radia and Thomas, 2014; Werner, 2014) is what makes the proposal coherent rather than utopian: issuance is already an institutional act in every economy on Earth, performed by a keystroke against a judgement of worth. The only questions ever at stake

are whose wealth stands behind the issuance and whose permission is required for it. The resource-backed anchor answers both in favour of the nation that holds the wealth, and the mycelial network shows why the answer is not inflationary licence but disciplined circulation: the corridor mints no claim the substrate cannot honour.

9.4 The fiscal consequence: a new question for the state

The same reordering rewrites the central question of public finance. The Monodox state asks how much it can borrow, and treats the availability of finance as the binding limit on what it may build, heal, or teach. The Omnidox state asks a different question entirely: how much of its own wealth can it put to work. For a sovereign that issues its own currency, the true constraint was never the supply of finance, which it can create, but the supply of real resources, labour, materials, energy, and capacity, and the inflation that follows if that real supply is exceeded. The modern monetary literature has pressed this point with rigour (Knapp, 1924; Wray, 2015; Kelton, 2020), and the abundance frame absorbs it and extends it: where chartalism removes the financial constraint and stops, Metanomics removes it and then names the anchor that should replace it. The African case sharpens the consequence into a paradox that ought to be intolerable. Here is a continent rich in resources and poor in capital, its mineral wealth, its land, its sun, and its people's capacity left sleeping in the ground or pledged abroad as collateral for money borrowed from others, while its treasuries are told there is not enough. The philosophy of abundance reframes that paradox as a choice that was made and can be undone. The wealth is present; the permission to monetise it at home is what has been withheld. The third paper of this series builds the institution that makes the other choice possible, and it carries the framings of sleeping wealth and wealth put to work forward into the architecture of the Kassena granary.

10. Anticipating the Objections

An argument that overturns a founding premise will draw fire, and it should. Six objections are the ones a serious critic will raise, and the argument is stronger for meeting them directly rather than waiting to be ambushed.

This is merely Modern Monetary Theory in African dress.

It is not, though it owes the chartalists a real debt and says so. Modern Monetary Theory establishes that a currency-issuing sovereign faces no financial constraint of the household kind, and the present argument accepts that finding entirely. The divergence is at the anchor. Modern Monetary Theory rests the currency on the political community and its power to tax, and names nothing that the money should stand for beyond that power. Metanomics supplies the missing anchor: issuance against a nation's own verified and renewing wealth, not pure fiat resting on taxation alone. To accept a diagnosis and complete it is not to repeat it.

A resource-backed currency is the road to Zimbabwe and Venezuela.

This objection mistakes the claim, and the mistake is instructive. Nothing here proposes issuance without limit. The honest limit of Section 5 is conceded so that the real constraint can be named: the supply of actual resources and the inflation that follows if issuance outruns the real capacity it mobilises. The hyperinflations cited are not failures of domestic issuance as such; they are failures of real productive capacity, collapsing in the face of political breakdown, war, or the destruction of the very wealth a currency must stand on. The discipline of the Endogenous Resource-Backed Currency, like the discipline of the mycelium, is that issuance be matched to verified wealth put to work, not to wealth imagined. The anchor is the safeguard, not the hazard.

Wealth in the ground is not money; who values the sleeping asset?

Rightly pressed, and the answer is that the argument never claims a mineral becomes money by being named. It claims that the anchor of a currency is a choice, and that a nation may choose to anchor its issuance to wealth it can demonstrably account for and bring into productive use, rather than to reserves it must borrow abroad. Verification, measurement, and the institutional machinery of accounting are the substance of the matter, and they are the subject of the third paper, not a hand-wave in this one. The Akan and their neighbours measured gold dust with finely calibrated weights before they spent it; verified wealth, not vague potential, is the standard the principle requires.

Without scarcity there are no prices, and the price system is how an economy coordinates.

The price system survives Omnidox intact, because Omnidox does not abolish relative scarcity. At the margin, one person still cannot have everything at once, and that ordinary friction generates the relative prices through which dispersed decisions coordinate, just as the orthodox school describes. What the argument denies is that manufactured scarcity should be priced as though it were absolute, and that the allocation of a fixed stock is the whole of the economic problem. The mycelial market itself makes the point: it prices by reciprocal reward and still coordinates, without a single administered price and without an artificial fence. Prices for truly scarce things remain essential; pricing the artificially fenced as though it were naturally finite is the error, and removing that error leaves the coordinating function of prices untouched.

This romanticises a pre-colonial past.

The charge would bite if the grounding rested on nostalgia, but it rests on record. That gold dust functioned as a working West African currency for centuries before colonial coinage is a historical fact, documented in the weights and the trade (Garrard, 1980), not a sentiment, and the claim built upon it is correspondingly modest: that anchoring a currency to a nation's own measured wealth, and organising exchange as a communal network, has been done, on this soil, and is therefore a recovery rather than an experiment. Sankofa asks only what the past in fact demonstrated. The argument respects the indigenous past as evidence, not as paradise.

The mycelium is a charming analogy, not an argument; forests are not economies.

Fair, and the paper does not claim they are. The mycelium is used at two disciplined levels. As established science (Simard et al., 1997; Kiers et al., 2011; Whiteside et al., 2019), it is an existence proof: a decentralised network can acquire, redistribute, and reciprocally price resources without a central allocator, which shows the coordination Omnidox requires to be physically real and not utopian. As model, it supplies the formal properties a generative economics must satisfy, redistribution to need, systemic balance, incentive-compatible correction, and regeneration. Where the popular literature has overreached, the paper follows Karst, Jones and Hoeksema (2023) in declining the romance. The analogy earns its place not by poetry but by furnishing the mechanism the invisible hand was always missing.

11. Conclusion: The Roots and the Harvest

The argument of this paper can be stated without hedging. Economics took a local and often temporary friction, the fact that a chooser at the margin cannot have everything at once, and installed it as the permanent and governing condition of the world. That installation, traced from Malthus's window on one enclosed and war-taxed economy to Robbins's definition of the whole discipline, produced Monodox, the operating system of scarcity, under which orthodoxy and its heterodox critics alike have laboured, differing on how the single permitted scarcity should be managed and agreeing that scarcity is the ground. Put on trial in the three domains where material life is most at stake, the premise failed. The sun delivers in an hour what the species burns in a year; the harvest exceeds the need while hundreds of millions go hungry; money is issued by a keystroke and rationed by permission. In each, the binding constraint was not the quantity nature provides but the terms on which institutions grant access. The entropic floor was conceded in full, for it is real and an argument that ignored it would deserve to fail; but above that floor lies the vast manufactured middle in which economic life is actually conducted, and it is written by human hands.

What this paper adds is the mechanism the philosophy required. The invisible hand that Smith named and never formalised, and that the discipline eventually formalised only as the division of a fixed stock, finds its true formalisation in the invisible mycelium: the generative network that does not divide a stock but makes one, moves it from surplus to need, senses deficiency and heals it by reciprocal reward rather than decree, and renews the very ground it feeds upon. That is the primal formative act we have called Omnidox, the roots from which the visible harvest springs. It is what feminist economics glimpsed at the source and read as an omission; it is what the mushroom demonstrates when it turns discarded matter into protein; and it is what indigenous Africa practised for centuries in susu and stokvel, in aman bre and letsema, and in gold dust governed by the community that measured it, the wood wide web that ran long before the world wide web. Sankofa is the instruction to fetch it, and the instruments to carry it forward are, for the first time, in hand.

The consequence is not sentiment but architecture. A generative network can be built in the materials of the present, and its logic is the logic of decentralised finance: a MetaFi that routes resources to need without a central artery; a treasury that pays more in good seasons and breathes in hard ones; a convertibility corridor that mints no claim the resource base cannot honour; and a tokenisation that carries a nation's verified wealth across the network as the mycelium carries its nutrient, in portable, provenance-bearing packets that widen the network rather than drain it. Resource-Based Monetary Sovereignty and its Endogenous Resource-Backed Currency are that architecture stated in the grammar of the state: a currency anchored to a nation's own renewing wealth rather than to borrowed permission, and a treasury that asks not how much it may borrow but how much of its own abundance it can put to work.

There the trilogy turns. This paper has cleared the ground and named the roots. The philosophy establishes that the report of scarcity was a rule we wrote, mistook for a law, and are free to write again. The mind schooled in that rule must be reschooled before it can see the wealth it already holds, and that is the psychology of abundance, the second paper. The recovered wealth must then be built into an institution that can hold it as sovereign and issue against it without asking leave, and that is the architecture of abundance, the third, carried into the granary of the Kassena and the ledger of the nation. The mushroom breaks the surface only because the network beneath it has done the unseen work of years. So it is with a people's wealth. Attend to the harvest alone and you will keep mistaking the fruit for the organism, and the fence around it for a law of nature. Attend to the roots, the unseen network of relationships through which resources actually move, and abundance ceases to be a thing that is found or awaited and becomes a thing that is built, from what we already have, with what others discard, by those willing to see the roots.

Unseen roots. Abundant harvest.

Evidence Dossier: Verified Figures and Findings

The figures and findings below are drawn from authoritative sources and stated as they appear in the argument above. Each is cited to its primary source. Table 6 consolidates them.

Claim	Verified figure or finding	Source
Solar income	About 173,000 TW intercepted at the top of the atmosphere; about 121,000 TW absorbed after reflection, equal to about 435 EJ each hour and about 3.8 million EJ a year; a single year of sunlight exceeds all recoverable fossil and uranium reserves combined	Lewis and Nocera (2006); Perez and Perez (2015)
Human energy use	620 EJ of total primary energy in 2023, a rise of 2.0 per cent on 2022; the Sun delivers this in about 1 to 1.5 hours	Energy Institute (2024)
Food available	More than 2,900 kcal per person per day on average, against a moderate-activity requirement of about 2,100	FAO food balance sheets via Our World in Data (2025); USDA Economic Research Service (2024)
Hunger amid surplus	About 673 million hungry in 2024 (range 638 to 720 million, 8.2 per cent of the world) and about 645 million in 2025; about 2.1 billion food-insecure; about 2.7 billion unable to afford a healthy diet	FAO, IFAD, UNICEF, WFP and WHO (2025, 2026)
Famine without shortage	Major famines have occurred with no decline in aggregate food availability; the cause is entitlement failure	Sen (1981)
Money creation	Most money is created by banks making loans; a loan creates a matching deposit; about 97 per cent of money is bank deposits; money is not reserve-multiplied	McLeay, Radia and Thomas (2014); Werner (2014)
Carbon transfer between trees	Carbon passes between tree species through shared fungal networks, moving on balance toward the seedling in greater need	Simard et al. (1997)
Reciprocal reward	Plants and fungi reward cooperative partners, so that reciprocal reward, not central command, stabilises the exchange	Kiers et al. (2011)
Resource redistribution	Mycorrhizal fungi move phosphorus across their networks from resource-rich to resource-poor patches in response to inequality	Whiteside et al. (2019)
Scientific caution	Several popular claims about forest-wide mycorrhizal sharing rest on citation bias and overinterpretation and are not well supported	Karst, Jones and Hoeksema (2023)

Claim	Verified figure or finding	Source
Regeneration from waste	Saprotrophic fungi create food, medicine, and value by decomposing discarded lignocellulose, requiring no arable soil and fruiting in weeks	Stamets (2005)

Table 6. Evidence dossier: verified figures and findings.

Note: all figures are reproduced as published by the cited source. Where an institution has revised an estimate, the most recent published version is used and the prior year is retained for comparison. Arithmetic performed by the author, including the conversion of solar power to exajoules per hour and the ratio of annual human energy use to hourly solar income, is the author's own.

References

- Alagidede, Y.I.P. (2025a) 'Metanomics and the obsolescence of debt: a resource-backed alternative to the global financial order', *Journal of African Political Economy and Development*, 10, pp. 1-19.
- Alagidede, Y.I.P. (2025b) 'From cowries to crypto: the long arc of monetary policy in Africa', *African Review of Economics and Finance*, 17(2), pp. 1-37.
- Ardener, S. (1964) 'The comparative study of rotating credit associations', *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, 94(2), pp. 201-229.
- Arrow, K.J. and Debreu, G. (1954) 'Existence of an equilibrium for a competitive economy', *Econometrica*, 22(3), pp. 265-290.
- Bortei-Doku, E. and Aryeetey, E. (1995) 'Mobilizing cash for business: women in rotating susu clubs in Ghana', in Ardener, S. and Burman, S. (eds.) *Money-Go-Rounds: The Importance of Rotating Savings and Credit Associations for Women*. Oxford: Berg.
- Daly, H.E. (1977) *Steady-State Economics*. San Francisco: W.H. Freeman.
- Elson, D. (1999) 'Labor markets as gendered institutions: equality, efficiency and empowerment issues', *World Development*, 27(3), pp. 611-627.
- Energy Institute (2024) *Statistical Review of World Energy 2024*. 73rd edn. London: Energy Institute.
- FAO, IFAD, UNICEF, WFP and WHO (2025) *The State of Food Security and Nutrition in the World 2025: Addressing High Food Price Inflation for Food Security and Nutrition*. Rome: FAO.
- FAO, IFAD, UNICEF, WFP and WHO (2026) *The State of Food Security and Nutrition in the World 2026: Understanding and Addressing the High Cost of a Healthy Diet*. Rome: FAO.
- Folbre, N. (2001) *The Invisible Heart: Economics and Family Values*. New York: New Press.
- Friedman, M. (1953) *Essays in Positive Economics*. Chicago: University of Chicago Press.
- Fuller, R.B. (1969) *Operating Manual for Spaceship Earth*. Carbondale: Southern Illinois University Press.
- Galbraith, J.K. (1958) *The Affluent Society*. Boston: Houghton Mifflin.
- Garrard, T.F. (1980) *Akan Weights and the Gold Trade*. London: Longman.
- George, H. (1879) *Progress and Poverty*. San Francisco: W.M. Hinton.
- Georgescu-Roegen, N. (1971) *The Entropy Law and the Economic Process*. Cambridge, MA: Harvard University Press.
- Jevons, W.S. (1871) *The Theory of Political Economy*. London: Macmillan.
- Kaldor, N. (1985) *Economics Without Equilibrium*. Armonk, NY: M.E. Sharpe.
- Karst, J., Jones, M.D. and Hoeksema, J.D. (2023) 'Positive citation bias and overinterpreted results lead to misinformation on common mycorrhizal networks in forests', *Nature Ecology and Evolution*, 7, pp. 501-511.
- Kelton, S. (2020) *The Deficit Myth: Modern Monetary Theory and the Birth of the People's Economy*. New York: PublicAffairs.
- Keynes, J.M. (1936) *The General Theory of Employment, Interest and Money*. London: Macmillan.
- Kiers, E.T., Duhamel, M., Beesetty, Y., Mensah, J.A., Franken, O., Verbruggen, E., Fellbaum, C.R., Kowalchuk, G.A., Hart, M.M., Bago, A., Palmer, T.M., West, S.A., Vandenkoornhuyse, P., Jansa, J. and Bücking, H. (2011) 'Reciprocal rewards stabilize cooperation in the mycorrhizal symbiosis', *Science*, 333(6044), pp. 880-882.
- Knapp, G.F. (1924) *The State Theory of Money*. Translated by H.M. Lucas and J. Bonar. London: Macmillan for the Royal Economic Society.
- Knight, F.H. (1921) *Risk, Uncertainty and Profit*. Boston: Houghton Mifflin.

-
- Lewis, N.S. and Nocera, D.G. (2006) 'Powering the planet: chemical challenges in solar energy utilization', *Proceedings of the National Academy of Sciences*, 103(43), pp. 15729-15735.
- Malthus, T.R. (1798) *An Essay on the Principle of Population*. London: J. Johnson.
- Marshall, A. (1890) *Principles of Economics*. London: Macmillan.
- Marx, K. (1867) *Capital: A Critique of Political Economy*, Volume I. Translated by B. Fowkes, 1976. London: Penguin.
- McLeay, M., Radia, A. and Thomas, R. (2014) 'Money creation in the modern economy', *Bank of England Quarterly Bulletin*, 2014 Q1, pp. 14-27.
- Menger, C. (1871) *Principles of Economics*. Translated by J. Dingwall and B.F. Hoselitz, 1950. Glencoe, IL: Free Press.
- Moore, B.J. (1988) *Horizontalists and Verticalists: The Macroeconomics of Credit Money*. Cambridge: Cambridge University Press.
- Nelson, J.A. (1996) *Feminism, Objectivity and Economics*. London: Routledge.
- Our World in Data (2025) *Food Supply: Daily Caloric Supply per Person*. Oxford: Global Change Data Lab, based on FAO Food Balance Sheets.
- Perez, R. and Perez, M. (2015) 'A fundamental look at supply-side energy reserves for the planet', *International Energy Agency Solar Heating and Cooling Programme, Solar Update*, 62, pp. 4-6.
- Power, M. (2004) 'Social provisioning as a starting point for feminist economics', *Feminist Economics*, 10(3), pp. 3-19.
- Raworth, K. (2017) *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist*. London: Random House.
- Robbins, L. (1932) *An Essay on the Nature and Significance of Economic Science*. London: Macmillan.
- Robinson, J. (1956) *The Accumulation of Capital*. London: Macmillan.
- Sahlins, M. (1972) *Stone Age Economics*. Chicago: Aldine-Atherton.
- Sen, A. (1981) *Poverty and Famines: An Essay on Entitlement and Deprivation*. Oxford: Clarendon Press.
- Sheldrake, M. (2020) *Entangled Life: How Fungi Make Our Worlds, Change Our Minds and Shape Our Futures*. London: Bodley Head.
- Simard, S.W., Perry, D.A., Jones, M.D., Myrold, D.D., Durall, D.M. and Molina, R. (1997) 'Net transfer of carbon between ectomycorrhizal tree species in the field', *Nature*, 388, pp. 579-582.
- Simard, S.W. (2021) *Finding the Mother Tree: Discovering the Wisdom of the Forest*. New York: Alfred A. Knopf.
- Simon, J.L. (1981) *The Ultimate Resource*. Princeton: Princeton University Press.
- Smith, A. (1759) *The Theory of Moral Sentiments*. London: A. Millar.
- Smith, A. (1776) *An Inquiry into the Nature and Causes of the Wealth of Nations*. London: W. Strahan and T. Cadell.
- Smith, A. (1795) 'The principles which lead and direct philosophical enquiries, illustrated by the history of astronomy', in *Essays on Philosophical Subjects*. London: T. Cadell Jr and W. Davies.
- Stamets, P. (2005) *Mycelium Running: How Mushrooms Can Help Save the World*. Berkeley: Ten Speed Press.
- United States Department of Agriculture, Economic Research Service (2024) *International Food Security Assessment, 2024–34*. GFA-35. Washington DC: USDA ERS.
- Veblen, T. (1899) *The Theory of the Leisure Class*. New York: Macmillan.
- Walras, L. (1874) *Elements of Pure Economics*. Translated by W. Jaffé, 1954. London: Allen and Unwin.
- Waring, M. (1988) *If Women Counted: A New Feminist Economics*. San Francisco: Harper and Row.

-
- Werner, R.A. (2014) 'Can banks individually create money out of nothing? The theories and the empirical evidence', *International Review of Financial Analysis*, 36, pp. 1-19.
- Whiteside, M.D., Werner, G.D.A., Caldas, V.E.A., van 't Padje, A., Dupin, S.E., Elbers, B., Bakker, M., Wyatt, G.A.K., Klein, M., Hink, M.A., Postma, M., Vaitla, B., Noë, R., Shimizu, T.S., West, S.A. and Kiers, E.T. (2019) 'Mycorrhizal fungi respond to resource inequality by moving phosphorus from rich to poor patches across networks', *Current Biology*, 29(12), pp. 2043-2050.
- Wray, L.R. (2015) *Modern Money Theory: A Primer on Macroeconomics for Sovereign Monetary Systems*. 2nd edn. London: Palgrave Macmillan.
- Zetzsche, D.A., Arner, D.W. and Buckley, R.P. (2020) 'Decentralized finance', *Journal of Financial Regulation*, 6(2), pp. 172-203.

II-m-htp

Nile Valley Multiversity Working Paper Series

Pungu Telania, Navrongo, Upper East Region, Ghana · NVM-WP 2026/01 · July 2026

Porthologos Press

© 2026 Yegandi Imhotep Paul Alagidede · Creative Commons Attribution 4.0 International (CC BY 4.0)