Operational Landscapes, Situated futures

Designing for post-extractive futures in West Africa

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Operational Landscapes, Situated Futures
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Figure 1. *Construction worker (Boké, Guinea)*

Acknowledgements

This thesis has been a transformative experience. It confronted me with my own limits, mainly through the realisation that motivation does not always translate into just outcomes. I realised how intentions can be wholehearted and still impose adverse effects. Throwing myself into a context unfamiliar to me put me in an uncertain position, asking me to rethink what it means to practise this profession. At the end of the ride, I can say that I feel I have matured as a researcher, as a designer, and above all as a person. None of that would have been possible alone, and I would like to thank the people who made it so.

I am deeply grateful to my first mentor, Victor, for an endless flow of inspiration. To every uncertainty, every new subject, every unfamiliar context, he responded with examples, methods, references, and the names of people worth speaking to. Through him I gained access to the building blocks from which this entire project was eventually constructed.

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Finally, I want to thank my father for joining me on the fieldwork, as a sparring partner on site and as company on the journey. And my mother, who as I write this is herself finalising a second master's, has inspired me along the way. That we are graduating together is surely something worth celebrating.

Abstract

West Africa's extraction landscapes sit at the centre of a global supply chain whose costs (degraded land, polluted water, displaced communities, foreclosed futures) remain locally borne while their benefits accrue elsewhere. Dominant responses to this condition, from large-scale initiatives such as the Great Green Wall to project-level rehabilitation, remain grounded in a positivist planning paradigm that treats degradation as a technical problem and leaves the extractive relations of ecological unequal exchange intact. This thesis takes the bauxite-mining region of Boké, Guinea, as the operational landscape through which to develop a different response.

It works from the position that planning and design for such places must be situated, anchored in the specific ecological, historical, and lived realities of the territory and the designer rather than abstracted from them. Drawing on the theoretical frame of the planetary mine, and on planetary boundaries and spatial justice as the terms of evaluation, the research moves through situated analysis, scenario-based futuring and value-based assessment. Four plausible post-extractive futures are developed and compared through transparent criteria against the thesis's goal and vision, on the basis of which *Loconomy*, the scenario most aligned with a just redistribution of the commons within planetary boundaries, is selected for design.

The decisive turn in the thesis comes through situated fieldwork. By indulging in the territory rather than abstracting from it, relations between human and more-than-human actors became legible as mutually reinforcing rather than competing, opening design pathways no positivist method could have surfaced. Situated knowledge thus allowed the design to live *with* the context rather than against it.

The design proposes a regional system in which bauxite remains relevant but extraction is slowed to the pace of ecological regeneration. A preserved coast is put to productive use through fishing, salt, and oyster-based closed loops that double as living breakwaters and tidal energy infrastructure; urban cores are held within fixed limits and given distinct regional roles; the railway is repurposed for people and regional produce; and a countryside of sequential mining is interleaved with ecological preservation and staged soil regeneration. Localised production sustains a trans-regional balance rather than a single export flow. This is one possible trajectory, proposed rather than prescribed, the situated outcome of this research, the designer, and the lived realities encountered.

Backcasting from the selected scenario then translates the design into an actionable roadmap, within which a set of no-regret measures is identified: actions advantageous across all four explored futures and therefore worth enacting whichever one unfolds. The thesis argues that the most transferable contribution is not the design itself but the situated, accountable way of arriving at it: a practice that positions the urbanist as a translator of situated perspectives more than as the architect of a ready-made end-state master plans.

Keywords: situated knowledge, operational landscape, post-extractive futures, spatial justice, planetary boundaries, bauxite extraction, futuring, backcasting, West Africa, Guinea



Figure 2. *Red mangroves with their roots in the soils of the riverbank (Boké, Guinea)*



Figure 3. *Parents teaching their child the tells of a ripe coffee berry (Oromia, Ethiopia)*



Figure 4. *Getting schooled on the ins and outs of local coffee production (Oromia, Ethiopia)*

Motivation

Before beginning my Bachelor's in Delft, I took a formative year away to encounter the world beyond the context I had always known. I expected to travel and broaden my perspective, but I did not anticipate how fundamentally it would reshape the way I understand the relationship between places, people, and the systems that bind them.

I joined an internship at a foundation working to create shared value in the coffee chain by strengthening positive externalities. It was my first sustained exposure to the complexity, and the profound disconnect, between global consumption and local production. Unlike the more typical "development aid" trajectory often associated with a gap year, this environment asked something different of me. It thought me to learn, observe, and work alongside local actors. Here, I witnessed how constructive communication can bridge conventional unequal positions, and how value can be negotiated as something both individual and shared.

The most transformative experiences, however, took place while visiting production farms. I visited production landscapes operating under different jurisdictions and governance frameworks. This showed me how deeply these conditions shape what is possible, or not. Some farms were actively developing future-proof practices, investing in agroforestry, fair labour, and pricing models within a strong community that aimed to sustain both production, land and livelihoods. Others revealed the harsher counterpart: extractive systems, monocultures intensified for short-term yield, precarious working conditions, and rapid value extraction, often in service of the very international brands whose coffee I drank unquestioningly back home.

For the first time, I understood in a visceral way how decisions made in distant offices can determine realities at the point of production, and how branding narratives in consuming countries can obscure the consequences embedded in landscapes elsewhere. Friends still joke about how I returned, as if I had "seen the light." In a sense, I had. I never held a cup of coffee the same way again. I also came to recognize how little most people around me know about these implications, not out of indifference, but because our worlds are inherently disconnected from one another.

This experience was not the initial reason I began studying at the Faculty of Architecture, but it has remained a quiet driver in my ethos. Now that I am at the end of my Urbanism master track, I can feel how my education has caught up with an experience that has been shaping me for years.

What I witnessed during my time in coffee-producing regions was how easily harm can be hidden when production landscapes are far from the places where choices are made. When I look at the current rush for critical minerals I see the same logic repeating itself, with consequences that could be even more severe. This thesis is my attempt to apply what I have learned in my time in Delft to bridge that distance. Making impacts visible, challenging disconnections, and contributing, however modestly, to a more just and connected future.

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Part I. Forensics



theoretical forensics
introspection
empirical forensics
problem definition

1. Theoretical forensics

1.1 Africa and the resource paradigm

Throughout history, economic systems have been organised around particular commodities, which shift in form and significance over time as technologies, trade regimes and geopolitical relations change. Sub-Saharan Africa has long been positioned as a key source of such commodities, supplying agricultural products like coffee, a wide range of mineral resources and, at various points, coerced and enslaved labour.

Prominent within the continent is the region of West-Africa. The region underpinned early continental trade in copper and iron goods as early as 900 BCE. Afterwards, it supplied the gold that sustained Mediterranean economies between the twelfth and fifteenth centuries (UNESCO, 1984), and later provided both commodities and enslaved people for the transatlantic slave-based economies of the sixteenth to the nineteenth century. Following the colonial "scramble for Africa", many territories in the region were further integrated into agricultural and mineral export economies geared towards external markets (UNESCO, 1992), embedding West-Africa within successive global regimes of resource extraction and value appropriation.

In the current Capitalocene epoch, the market has formed around ever-expanding digitalisation, as well as the global ambition for an energy transition. Dominant economies are competing in a renewed type of 'scramble'. This time for control over the minerals, metals and industrial processes required for strategic technologies.

Approximately 72% of known global cobalt production, essential for cathodes and for magnetic alloys, is located in the Democratic Republic of Congo (AMDC, 2021). Furthermore, the West-African Guinea hosts one of the world's largest Bauxite deposits (Mining Technologies, 2024), the source of aluminium and gallium which is used in the production of semi-conductors (USGS, 2017). These are but two examples, smaller deposits of other critical minerals are distributed across multiple Sub-Saharan states. Many of these countries have thereby become key producers of raw materials for the contemporary world economy. With this role they are entangled in an increasingly globalised context where production processes span across landscapes, borders and continents.

> "Society has been completely urbanised".
> - Henri Lefebvre (1970)

1.2 World economy and the opertional landscape

Lefebvre theorised in La Révolution urbaine (1970) that the world had become fully urbanised through a process he termed "implosion-explosion": concentrated (imploded) urbanised nodes are sustained by the extension (explosion) of logistical and commercial infrastructures across the globe, producing an "uneven mesh" that spans terrestrial surfaces, oceans, the atmosphere and the subterranean. These imploded centres of agglomeration and their "operational landscapes" are woven together in mutually transformative ways while being merged into a worldwide capitalist system (Brenner, 2014), now increasingly fixated on digitalisation and the energy transition.

Mineral production in Sub-Saharan Africa can therefore be understood as part of this globalised operational landscape which, through the "uneven mesh" described by Lefebvre (1970), links local and regional, and even continental economies more directly; through transnational flows of raw materials, commodities, labour and capital (Brenner, 2014). The context of critical minerals in this globalised operational landscape has been explored by Arboleda in Planetary Mine (2020) for South American contexts. In it, he describes extraction landscapes as being connected through f.e. railways, ports, pipelines, digital platforms and financial instruments which don't always serve the best interest of the situated context within the host nation; similar concerns are shared amongst both Lefebvre (1970) as Brenner (2014). Foregrounded by these insights, this thesis aims to explore the interrelations and realities between scales of this globalised urban network and it's contemporary fixation on critical minerals.

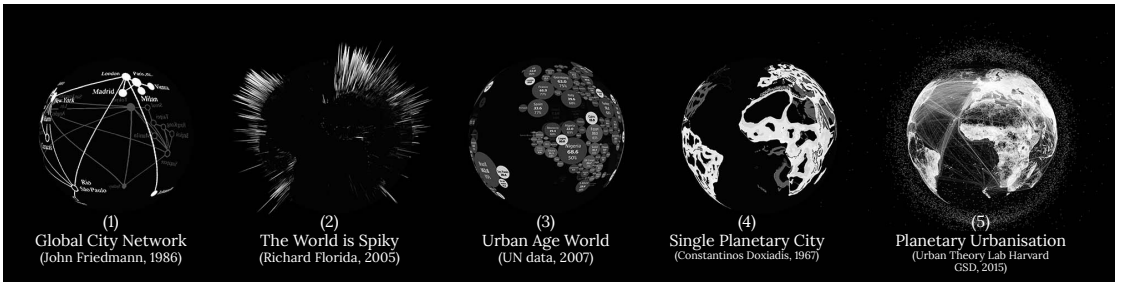

Figure 5. *Reframing the World as One City* (Urban Theory Lab Harvard GSD, 2015).

Planetary urbanisation treats the urban as a worldwide condition: agglomerations depend on dispersed operational landscapes (corridors, extraction zones, supply chains and "remote" ecologies) that are woven into a single territorial system.



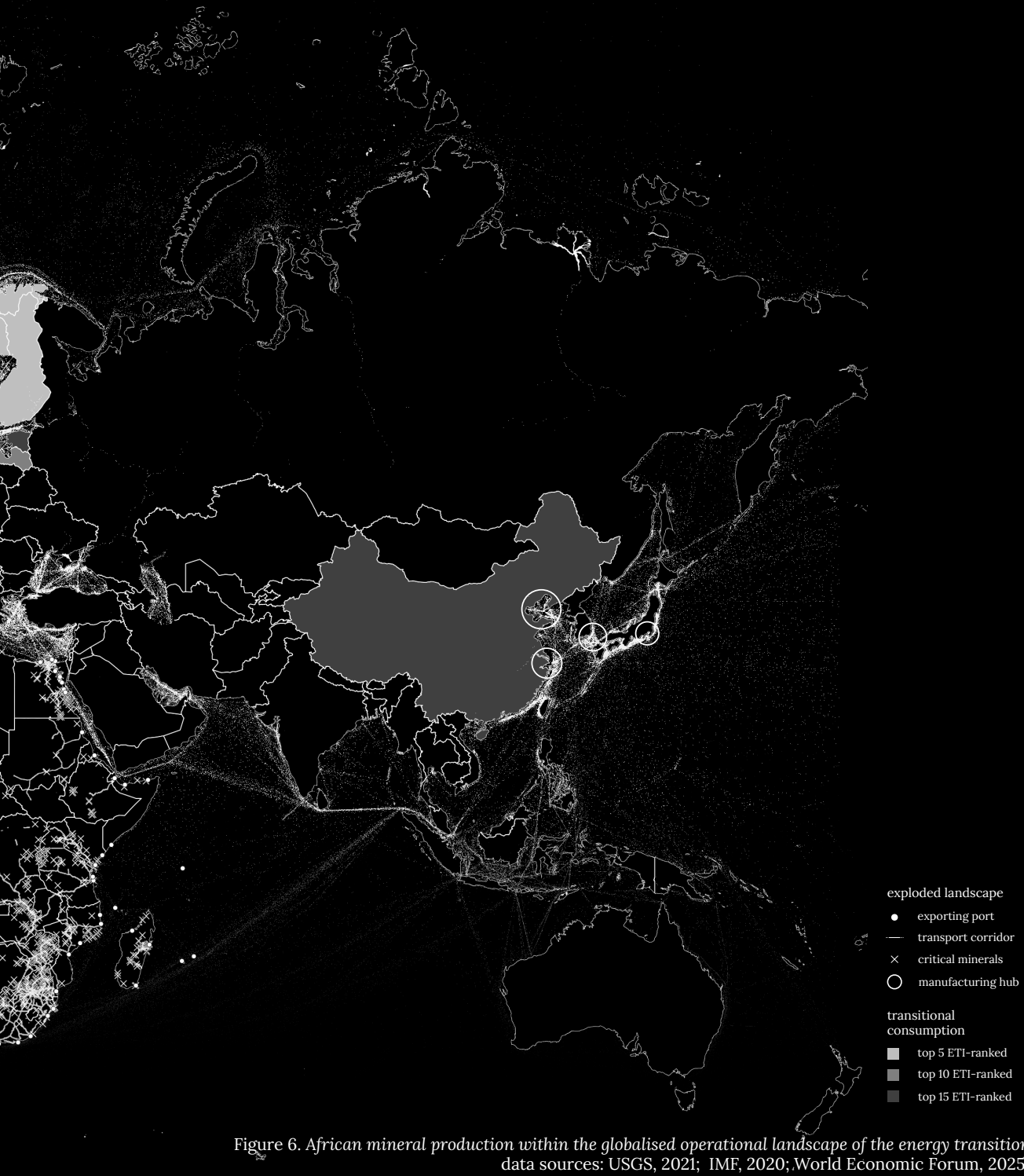

Figure 6. *African mineral production within the globalised operational landscape of the energy transition*
data sources: USGS, 2021; IMF, 2020; World Economic Forum, 2025)

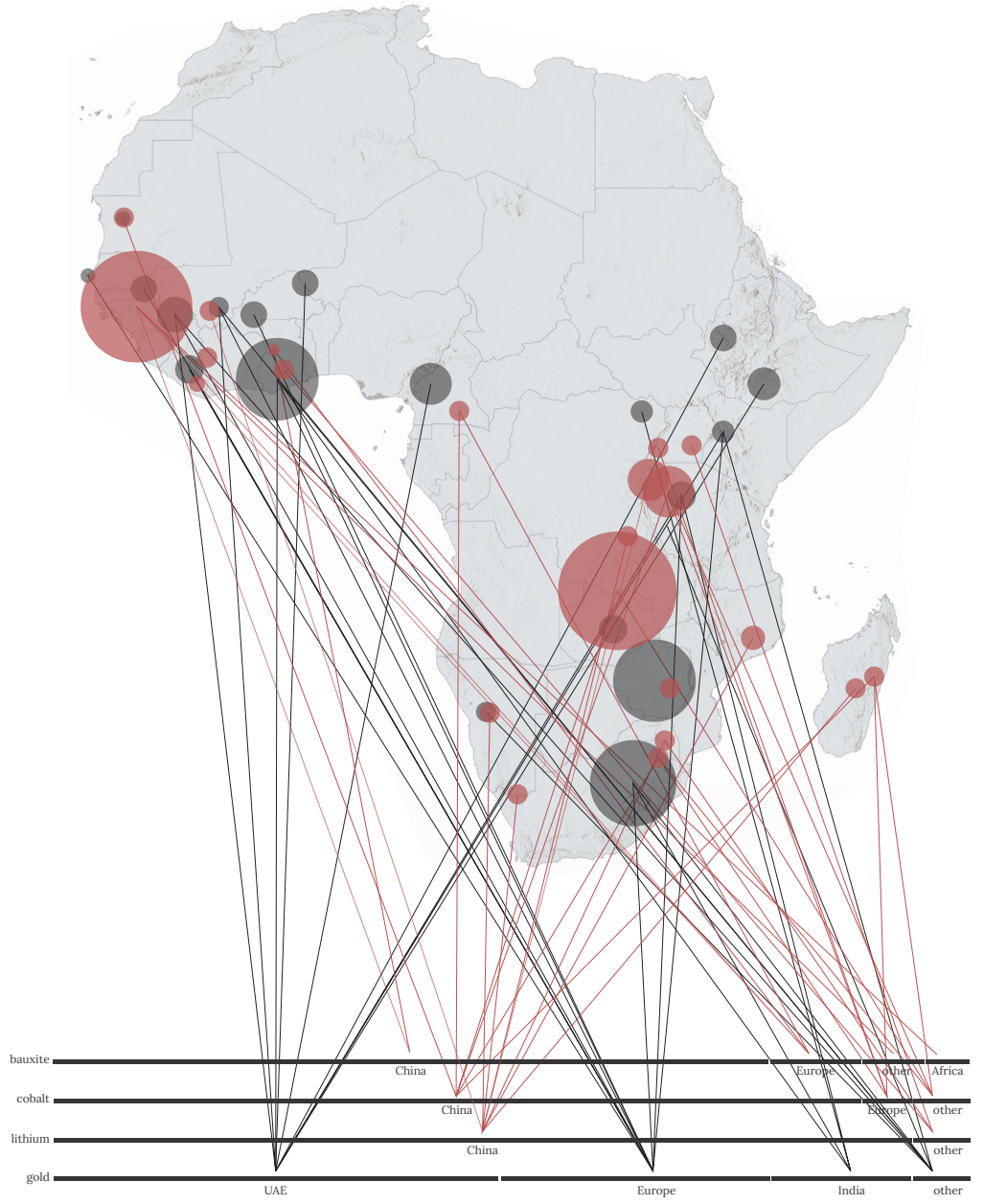

Figure 7. *Visualiser raw material destinations* (compiled of data from The Observatory of Economics, 2026)

1.3 The material issue

The globalisation of urban networks has brought notable benefits, including economic growth, international cooperation, and technological advancement through the exchange of resources and ideas. However, these developments also generate negative effects that are unevenly distributed, paving the way for environmental exploitation and increasing inequalities between scales (Xhaferraj, 2025).

This dissonance between global operational landscapes, mobilised to serve dominant economic ambitions of consumption and development, and the situated production landscapes on which these ambitions depend has long been observed across a wide range of professions and forms of knowledge production. I witnessed this firsthand during visits to coffee production sites in Ethiopia, yet one needn't look far to find readily available works of all kinds that address the issue.

It is addressed not only through policy and academic analysis but also through cultural critique: numerous African artists have foregrounded the violent and dehumanising dimensions of unequal industrial systems and the lived realities of extraction and commodity production.

1.3.1 Global extractivism

Alongside such cultural work, scientific scholarship has developed systemic interpretations of these dynamics. Within political geography, the concept of *global extractivism* conceptualises the world economy as organised around recurrent practices that draw natural and human wealth out of particular territories (Chagnon et al., 2022). These practices channel value across places and scales while externalising many of the associated social and ecological costs. This account emphasises interconnected mechanisms (global supply chains, rent-seeking finance, creditor–debtor relations and trade regimes) that structurally depress the cost of labour and materials, with historically unequal impacts on regions in the Global South.

1.3.2 Ecological unequal exchange

A parallel diagnosis is articulated in anthropological economics through theories of "unequal exchange". Emmanuel (1972) and Hickel (2018) argue that monetary exchanges between "core" and "periphery" economies can appear equivalent while concealing systematic transfers of value from poorer to richer regions. They attribute these transfers to wage differentials, unequal terms of trade, and asymmetries in control over technology and finance. Unequal exchange is debated through multiple perspectives, and a full discussion falls beyond the scope of this thesis. Instead, it focuses on the more directly observable dynamics of "ecological unequal exchange".

In environmental studies, ecological unequal exchange extends the analysis to material and energetic flows, highlighting how high-income economies secure access to resources and waste assimilation capacity in low- and middle-income countries under conditions that do not reflect their full socio-ecological costs (Hornborg, 2011). In effect, environmental burdens and risks are displaced onto extraction territories while benefits accrue elsewhere; an outcome that resonates with Lefebvre's early diagnosis of an "uneven" global urbanisation process in which distant operational landscapes provision and absorb the externalities of agglomerated centres (Lefebvre, 1970).

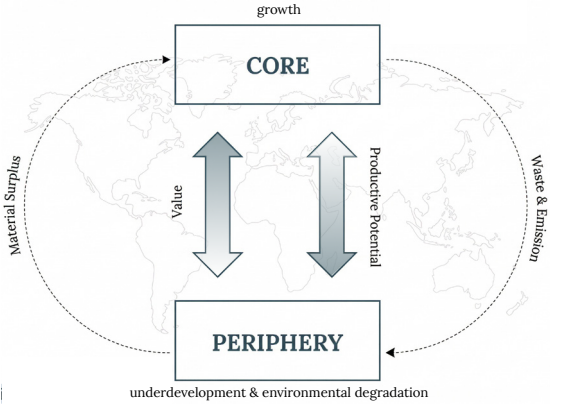

Figure 8. *Ecologically unequal exchange diagram* (Tausch, L., & Althouse, J. (2025)





INTRODUCTION
positonality

> "Scientists are very much entangled in their culture and this culture is not pristine, untouched by other cultures and practices."
> - *BRUNO LATOUR, 2011*

Engaging with the subject of post-extraction futures in West Africa, from the position of a researcher and designer largely unfamiliar with the context, raises questions about the appropriateness of one's methods.

The choice of approach is not a neutral technical decision; it carries assumptions about whose knowledge counts, what counts as evidence, and on whose terms the future of a place is imagined.

Echoing Bruno Latour's (2005) account of the social as composed of heterogeneous associations among human and non-human actants, none of which can be presumed to be passive, it becomes imperative for the designer to subject their own relation to and influence on the context to critical scrutiny.

The following mini-essay is therefore an exercise in introspection. Its aim is to interrogate the role of the urbanist within the operational extraction landscape and, in doing so, to establish the ontological, epistemological, and axiological terms that will guide the remainder of this thesis through answer the questions:

What kind of knowledge does this context demand, and what kind of researcher must one become to produce it responsibly?

Positivist urbanism and the need for situated futures

From the Berlin Conference to contemporary extraction: rethinking the role of the urbanist

Author: Valdemarr van Staveren van Dijk

Abstract:
This essay investigates whether the asymmetries of sub-Saharan Africa's operational extraction landscapes, marked by ecological unequal exchange, stem from more than the individual planning instruments deployed within them. It opens with the anecdote of Chandigarh, where Le Corbusier's universalist Modulor failed to translate into the Indian context, raising the question of whether modernist methods have aged any better than the ideals they were meant to serve. It then dissects the master plan as the visible congealment of a deeper epistemic structure: technocratic decision-making grounded in a positivist logic that treats reality as objectively measurable and the researcher as neutrally positioned. While positivism is defensible on its own terms as an emancipatory project against theological and arbitrary rule, methodological critiques from Nietzsche and Dostoevsky and political critiques from the Frankfurt School expose its central conceit - the inability to acknowledge the standpoint from which it speaks. The Berlin Conference of 1884–1885 illustrates how this blindness has historically operated, partitioning an entire continent through rational argument while excluding African representation entirely. Contemporary technocratic governance reproduces the same logic in fragmented form, where inclusionary language coincides with exclusionary outcomes through practices conceptualised as extraction/exclusion. The essay concludes that the way forward is a different epistemic posture: the urbanist as translator of situated perspectives rather than architect of end-state master plans. Drawing on the decolonial option and Haraway's situated knowledges, it establishes the ontological commitment to multiple, located realities; its epistemological commitment to diverse and transparent forms of knowing; and its axiological commitment to visible accountability over claims of neutrality.

Keywords: positivism; technocratic planning; situated knowledge; ecologically unequal exchange; sub-Saharan Africa; decolonial urbanism

Introduction

Urbanists working in contexts outside their own inherited environment will face the realisation that they are guests in a new and often different reality that cannot be fully understood on arrival, and perhaps never entirely. Few episodes illustrate this more sharply than the planning of Chandigarh, a new regional capital commissioned in postcolonial India. The project was entrusted to Le Corbusier, an architect often read as emblematic of radical utopianism, mechanised functionalism, and authoritarian urban control (Scott, 1998). For Le Corbusier, Chandigarh was to be his *magnum opus*. Tasked with designing the masterplan for a city for half a million people, he turned to his trusted Modulor, a recently patented proportional system intended to express his interpretation of the universal dimensions of the human body (O'Shea, 2009).

In a now-famous journal entry dated 28 March 1951, he recounts that, while making measurements for his urban masterplan, the proportional strip slipped from his jeep and fell into the fields that were soon to be cleared for the city. He interpreted the loss romantically, imagining the Modulor as being integrated into the soil and destined to "flower in all the measurements of the first city of the world to be organized all of a piece in accordance with the harmonious scale" (O'Shea, 2009). Yet Chandigarh is now widely read as a failed project, its rigid European modernism colliding with Indian cultural and physical realities and its imposed geometric order overriding the social fabric it was meant to house (Prakash, 2002). The magnum opus to be, in this light, did not crown a life's work so much as expose its limits.

Le Corbusier's poetic journal entry can therefore also be read against its author's intent: the Modulor did not flower in the soil of Chandigarh; it was swallowed by it, a foreign measure dissolved by a ground that refused to recognise its scale. Such a mismatch could perhaps have been anticipated by analogy with other cultural domains. In music, for instance, Western scales are absolute and constructed for harmony, whereas Indian classical scales are relative and fluid, oriented towards the evolution of melody (Wade, 1987). It cannot be assumed that features that function in one cultural reality always transfer cleanly to the other.

While the modernist ideals that shaped Chandigarh have largely dissolved a less comfortable question remains: have the methods by which those ideals were operationalised aged any better, or do they continue to travel under new names?

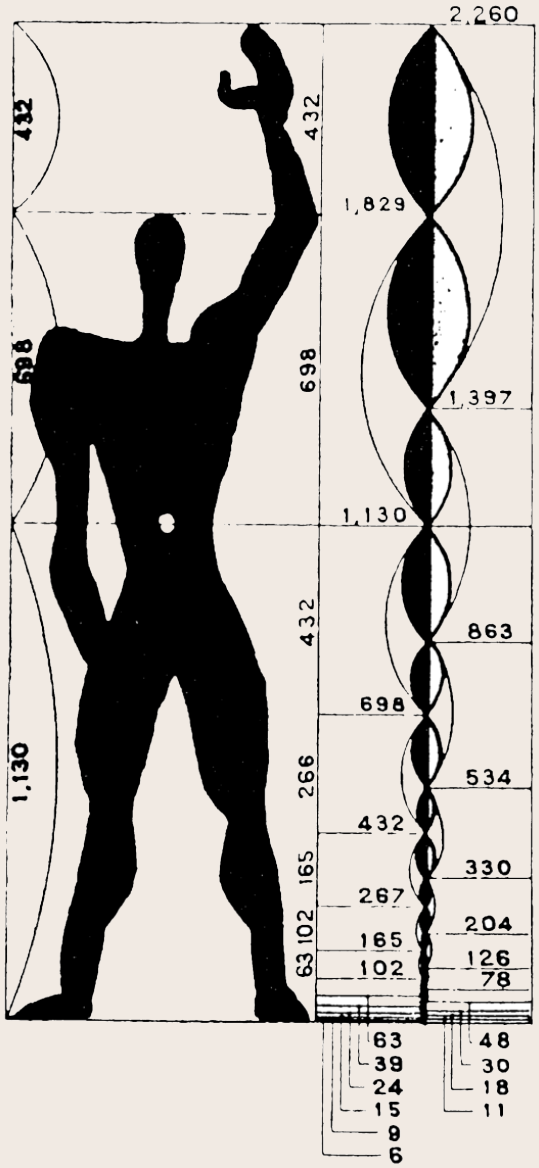

Figure 1. *Le Corbusiers modulor* (Begrenset gjenbruk, 2020).

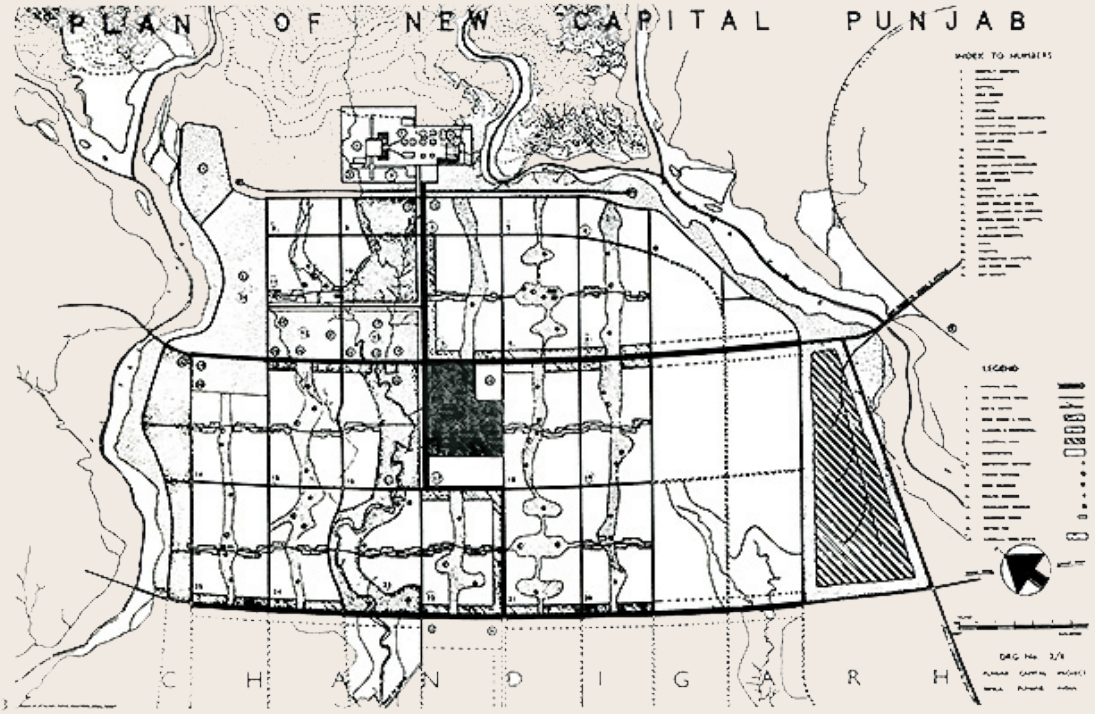

Figure 2. *The early master plan of Chandigarh by Le Corbusier* (Mapin, 1999).

Dissecting the masterplan

The hypothesis of this essay departs from the statement that the ontological, epistemological, and axiological structures behind decisions such as those that shaped Chandigarh have not been retired but continue to inform urbanist practice today, producing the asymmetries of ecological unequal exchange identified in the operational extraction landscape of Sub-Saharan Africa. The master plan offers a useful entry point, since it is an instrument through which such structures visibly congeal. Dissected, it may reveal a l*ongue durée* of systemic decision-making that has shaped sub-Saharan Africa across centuries.

This essay's definition of a master plan is a long-term spatial plan that maps a strategic vision for the physical, economic, and social development of a defined area (Albrechts, 2004). It has been characterised as privileging a society made cleanly readable and manageable from above, over situated and practical knowledge (Scott, 1998). By this the master plan is itself an expression of a broader mode of governance: technocratic decision-making, in which choices are entrusted to specialised experts and justified by data and efficiency rather than by public deliberation (Pacchi, 2018). Technocracy, in turn, rests on a distinctive philosophical convention. Positivism is a paradigm grounded in the ontological position that reality is measurable and consists only of what can be directly observed; axiologically, it holds that research can and should be conducted without value judgments, foregrounding the objectivity of the researcher and designer rather than the perspectives of situated actors (Shannon-Baker, 2023). This stack - positivism as substrate, technocracy as mode, master plan as instrument - is what the following sections will interrogate on the working hypothesis.

In defence of positivism

Before turning a critical eye to positivism, it is worth recognising that as a philosophical movement it is not inherently regressive. On the contrary, its origins lie in a deliberate rejection of arbitrary authoritarian power. Founded in the early nineteenth century by Auguste Comte, positivism sought to replace theological explanation and metaphysical speculation with knowledge grounded in observation, measurement, and verifiable evidence. Its ambition was, in its own terms, emancipatory: to free societies from what its proponents saw as the tyranny of irrationality, blind faith, and arbitrary royal authority (Bourdeau, 2018).

Against this inheritance, Comte's proposition was radical: that society itself could be studied, understood, and improved using the same methods of observation and experimentation that had transformed physics and chemistry. The positivist project, in other words, was animated by a recognisably modern conviction that knowledge grounded in evidence rather than authority was a precondition for human progress. Read in this light, positivism is a serious attempt to build a science of society in the service of social emancipation.

The methodological critique

Nevertheless, critiques of positivism's foundational claims emerged almost as soon as the movement itself took shape. To name a few; Nietzsche (1887/2006) dismantled the premise of a detached vantage point, arguing that there are no independent facts, only interpretations made from particular standpoints. A position he called perspectivism. Dostoevsky (1880/2003) advanced a complementary critique through the figure of Ivan Karamazov, whose "*Euclidean reason*" cannot account for the depths of the human condition. Together, both arguments puncture the central positivist conceit: if there is no neutral standpoint and no rational regularity adequate to its object, the programme is structurally compromised before it begins.

These early warnings did little to slow the institutionalisation of positivist methods, and it wasn't until the mid-20th century when the philosophical position collapsed under sustained critique. Its claim to value-free objectivity was charged with producing what Levin (2000) and



Figure 3. *Francisco Goya, The Sleep of Reason Produces Monsters* 1799 (William Rockhill Nelson Trust, n.d.)

others have characterised as a tyranny of reason: a framework that, in suppressing ethics and politics from legitimate knowledge, became an apparatus of social conformism and a justification for technocratic control. The movement that had sought to free societies from theological dogma had produced a different dogma wearing the same costume of method.

A second, political critique extends this claim. Horkheimer and Adorno (1947/2002) argued that the reason positivism championed was *instrumental*: adept at calculating means, silent on ends, and therefore disposed to domination rather than emancipation. Together, the methodological and political critiques compose a single charge: positivism does not acknowledge the standpoint from which it speaks, and its inability to do so is not an oversight but an exploitable feature.

Empirical illustration: Berlin conference

Few episodes illustrate this structural blindness more starkly than the Berlin Conference of 1884–1885. Convened by German Chancellor Otto von Bismarck, the conference brought together representatives from fourteen states to establish the legal guidelines for European colonisation and trade in Africa, laying the groundwork for what would become the Scramble for Africa (EBSCO, 2020). Its argument was framed in recognisably positivist terms. After decades of profit from the transatlantic slave trade, the Western powers had only just dissolved their slaving practices. This was not the case in Africa and this enabled them to reach for humanitarian and legal rhetoric to justify partition.

The resulting General Act bound European rule as a mandate to advance the "moral and material well-being" of indigenous populations, while also pre-empting trade disputes between the colonising powers themselves (Craven, 2015). What was presented as an objective and disinterested observation of African conditions was used to legitimise the division of an entirer continent among foreign states. Following Dostoevsky's rhetoric, this can be read as a strictly rational argument deployed to enforce a profoundly irrational decision.

The legal instrument that enabled this was *terra nullius*, which roughly translates into nobody's land, a doctrine that allowed European powers to declare territories legally unowned if their inhabitants were judged too "primitive" to hold sovereign rights (Craven, 2015). Most telling of all, not a single African representative was invited to the conference. The structural feature identified in the previous section is made explicit here: positivism's inability to recognise the standpoint from which it speaks, or what Nietzsche would describe as a lack of perspectivism. The Scramble for Africa can therefore be read as one of the earliest technocratic master plans; a select expert body deploying positivist argumentation, codified in legal form, to enforce a single empirical perspective on a territory whose situated and practical knowledge were excluded from its construction.

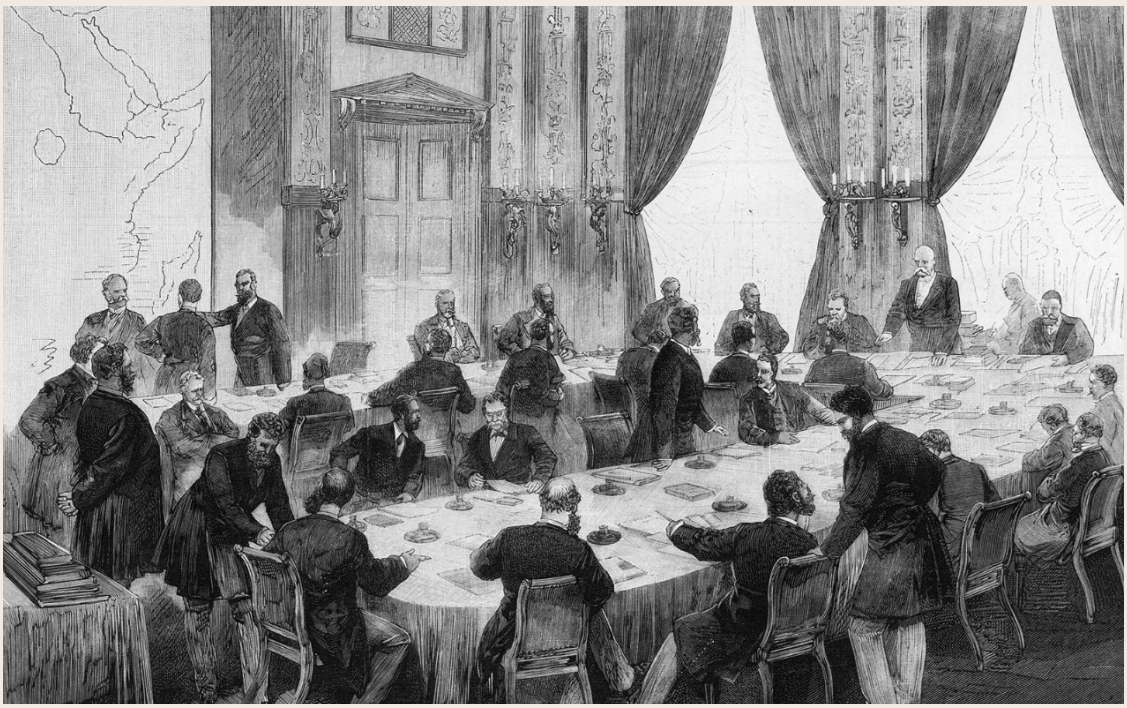

Figure 4. *Scramble for Africa: a scene from the Berlin Conference* 1884–85; *also called the Berlin West Africa Conference* (Chronicle /Alamy, 2026)

Legacy

Although technocratic masterplanning has long been challenged, positivism retains considerable influence in contemporary practice (Davoudi, 2012). Most notably, this is visible in Africa, where masterplanning practices have continued to expand, even after the colonial era. (Harrison, 2022). Participatory methods are widely adopted in it's contemporary form, but still local livelihoods and ecologies remain structurally neglected. The extraction industry is a clear example. Work by Postar et al. (2023) shows that more inclusionary language in resource-frontier decision-making coincides with increased exclusionary outcomes on the ground.

This dynamic is conceptualised as e*xtraction/exclusion*: the proposition that resource frontiers are organised through intersecting practices of access and denial (Postar et al., 2023). Extraction, on this account, is not merely a technical or economic process. It depends on exclusions: exclusions from land, decision-making and benefits; exclusions of certain knowledges from official narratives; and exclusions of alternative development pathways. The pattern bears uncomfortable resemblance to the decision-making logic of the Berlin Conference, albeit redistributed across a more fragmented and less visible architecture. Where Bismarck convened fourteen states around a single table, today's equivalents are dispersed across technocratic bodies who curate who partakes in decision-making and who is left out. One thing is the same: most situated perspectives are rendered invisible. After the tyranny of theological dogma and the tyranny of reason, this raises the question of whether positivism is now being appropriated into a third iteration of the same *longue durée*, wherein old structures are disguised by inclusionary facades.

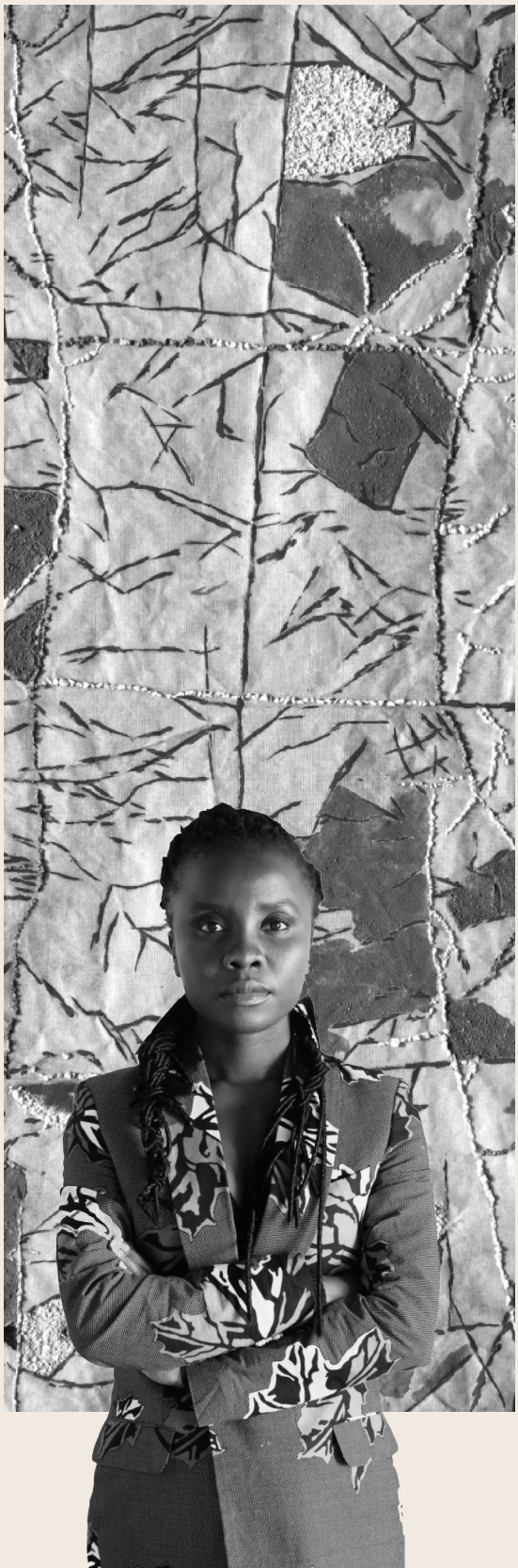

Figure 5. *Cerveau 1 - malachite, white gravel, acrylic and coffee on hard cotton* (Hadassa Ngamba, 2017).

Ngamba is a Congolese artist whose work explores how colonial cartography and resource mapping enabled Congo's exploitation within imperial and capitalist systems. By using ground minerals and commodities, such as malachite and coffee, she addresses continued external control over Congo's wealth and the social and environmental harms of extraction.

The way forward: Situated futures

This essay examined whether the asymmetries of sub-Saharan Africa's operational landscapes, and the ecologically unequal exchange they sustain, stem from more than individual planning instruments. It argued that the master plan reflects a deeper epistemic structure: technocratic decision-making grounded in a positivist logic that persists across changing tools and institutions. While positivism can be defended as a project of social emancipation, its claim to objectivity is both methodologically and politically compromised, and from the Berlin Conference to contemporary fragmented governance, this logic has continued to marginalise situated perspectives and exclude those most affected from decision-making.

For this thesis, the implication is not abstract. To engage with post-extraction futures as an urbanist from a European institution is to participate in the structures these sections have critiqued. The route forward cannot be a more refined positivism but a different epistemic posture altogether: the urbanist is better understood as a translator of situated perspectives than as the architect of a ready-made end-state master plan. Had Le Corbusier listened to Indian classical music before drafting Chandigarh, he might have recognised that the harmony he sought to impose was already present in a register his Modulor could not measure.

Two bodies of work guide this method. The decolonial option (Mignolo & Escobar, 2011) calls for *delinking* from the Eurocentric knowledge systems that have structured colonial and contemporary asymmetries, in favour of *pluriversality*: the coexistence of multiple worlds, epistemologies, and realities. Haraway's (1988) situated knowledges provide the methodological counterpart. Against the "god trick" of a universal, disembodied viewpoint, she argues that all knowledge is partial, embodied, and socially located — and that genuine objectivity is achieved not by escaping one's standpoint but by acknowledging it.

These commitments translate into concrete demands. Ontologically, this thesis rejects the idea of a single objective urban reality awaiting expert description: extraction contexts are produced through situated histories, ecologies, and lived practices. Epistemologically, it works with diverse forms of knowledge - qualitative, quantitative, ethnographic, and interactive in the bottom-up tradition of Jacobs (1961/1993) - while making its interpretive position explicit. Axiologically, it treats the researcher's values not as contaminants to be filtered out but as constitutive features of the inquiry, requiring visible accountability rather than claims of neutrality. If positivist urbanism has produced the operational landscape by speaking from nowhere and to no one in particular, situated design begins from the opposite premise: that meaningful intervention in post-extraction futures must proceed from a partial, located, and accountable understanding of the worlds it seeks to engage.

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2. Empirical forensics

2.1 West Africa's Ecological Crisis: Deforestation, desertification, and water Stress

In Sub-Saharan Africa, the uneven distribution of environmental burdens and economic benefits is clearly visible. This is especially evident in West Africa, where desertification pressures are rising and rainforest is being lost at an alarming rate. More than 80% of the forest cover present in 1900 has already disappeared, and this trend continues (Hepner et al., 2025).

The loss of forest cover in West Africa is also fuelling a water crisis, increasing the vulnerability of productive lands in dry and semi-arid zones and placing 122 million people at risk (WaterAid, 2025).

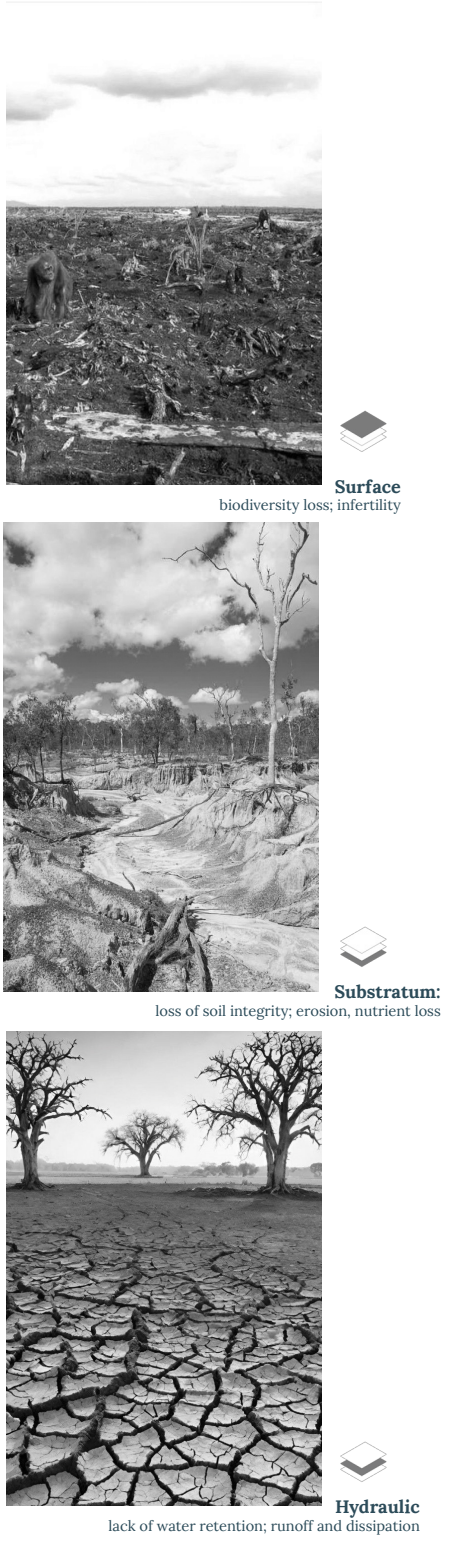


Figure 9. *The ecological effects of deforestation*

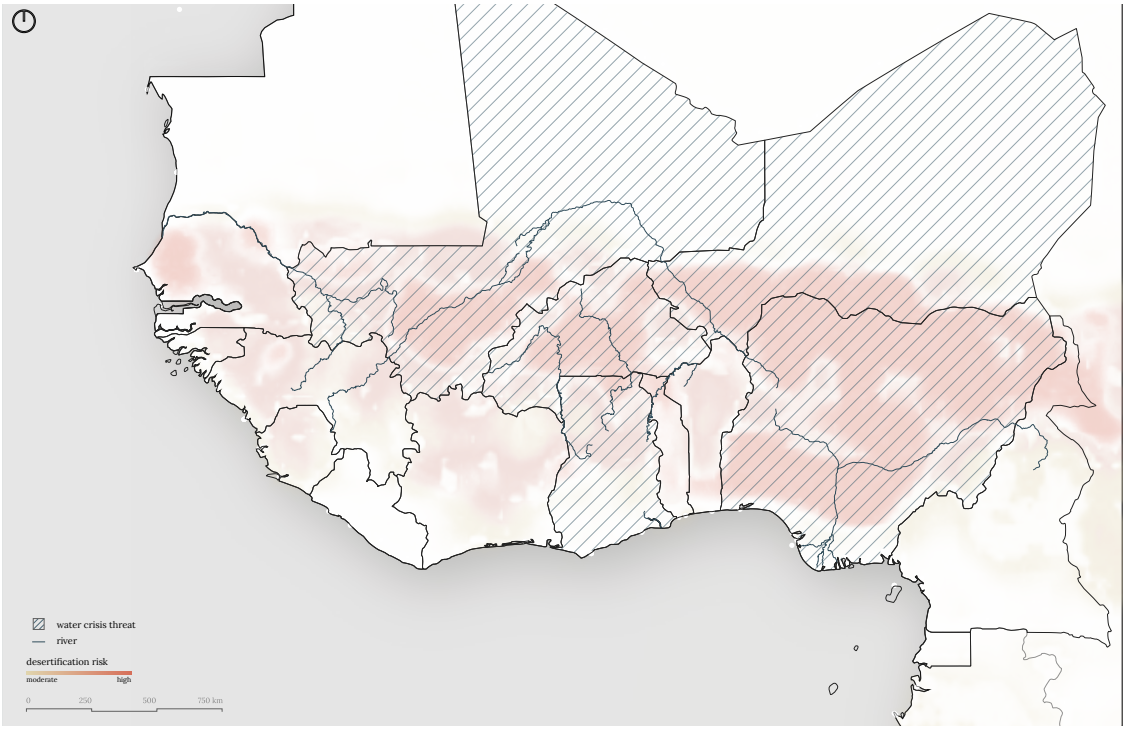


Figure 10. *Desertification risk and the water stress in West-Africa*
Data source: Belgian Science Policy Office

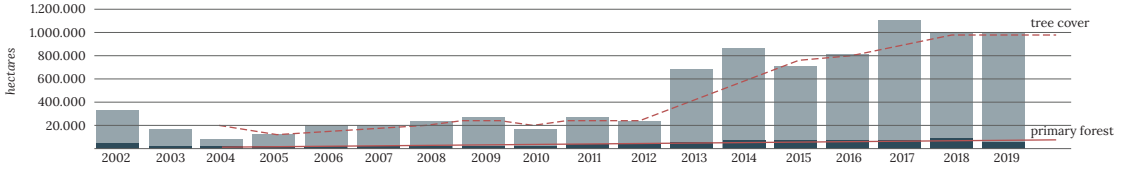


Figure 11. *Primary forest loss and tree cover loss in the Guinean Forest of West-Africa*
data source: Hansen / WRI, 2020

2.2 The great green wall: a positivist response

In response to desertification, the African Union launched the Great Green Wall initiative, which aims to restore degraded landscapes and improve livelihoods in the Sahel through large-scale tree planting across the continent (African Union, 2007).

The project aims to utilize both traditional and modern techniques to restore degraded land and support agricultural productivity. These methods include planting native, drought-resistant species, such as acacia and moringa, as well as building stone bunds to capture rainwater. Together, these approaches should help improve soil fertility, conserve water, and increase crop yields (United Nations Convention to Combat Desertification t, n.d.).

The initiative's ambition is to restore 100 million hectares of currently degraded land, sequester 250 million tons of carbon, and create 10 million green jobs by 2030. By doing so, it will help communities living along the Wall to grow and thrive, while signalling what they call an African-led dream (United Nations Convention to Combat Desertification t, n.d.).

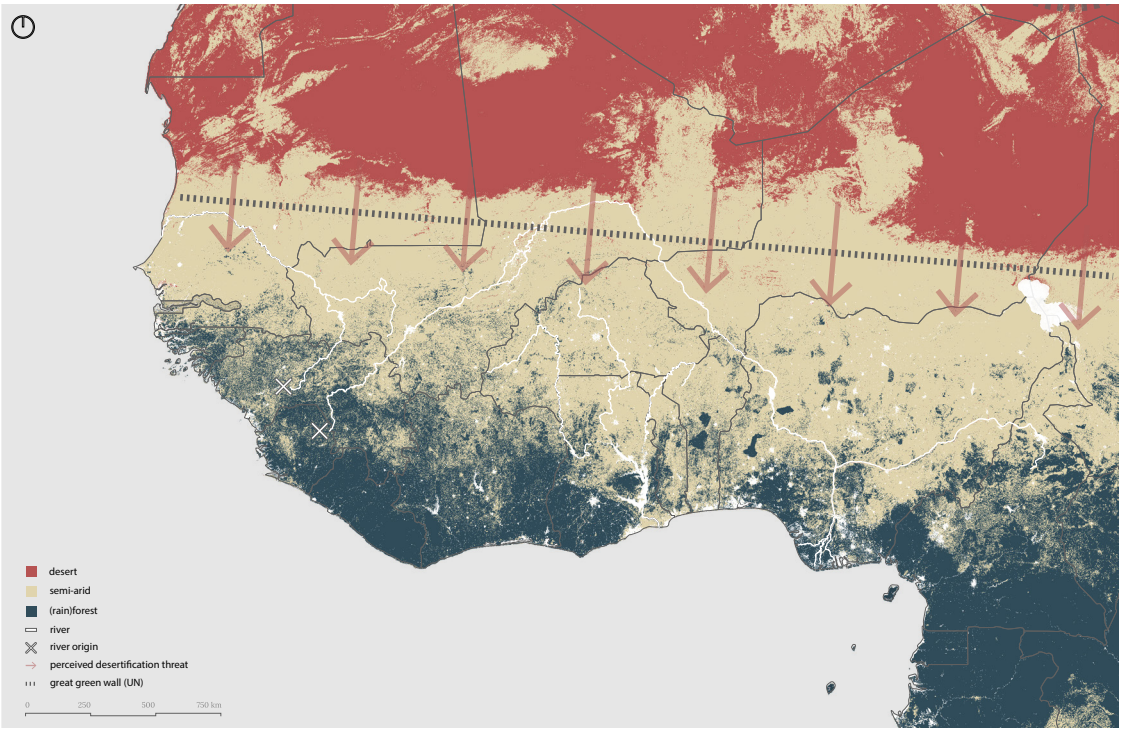
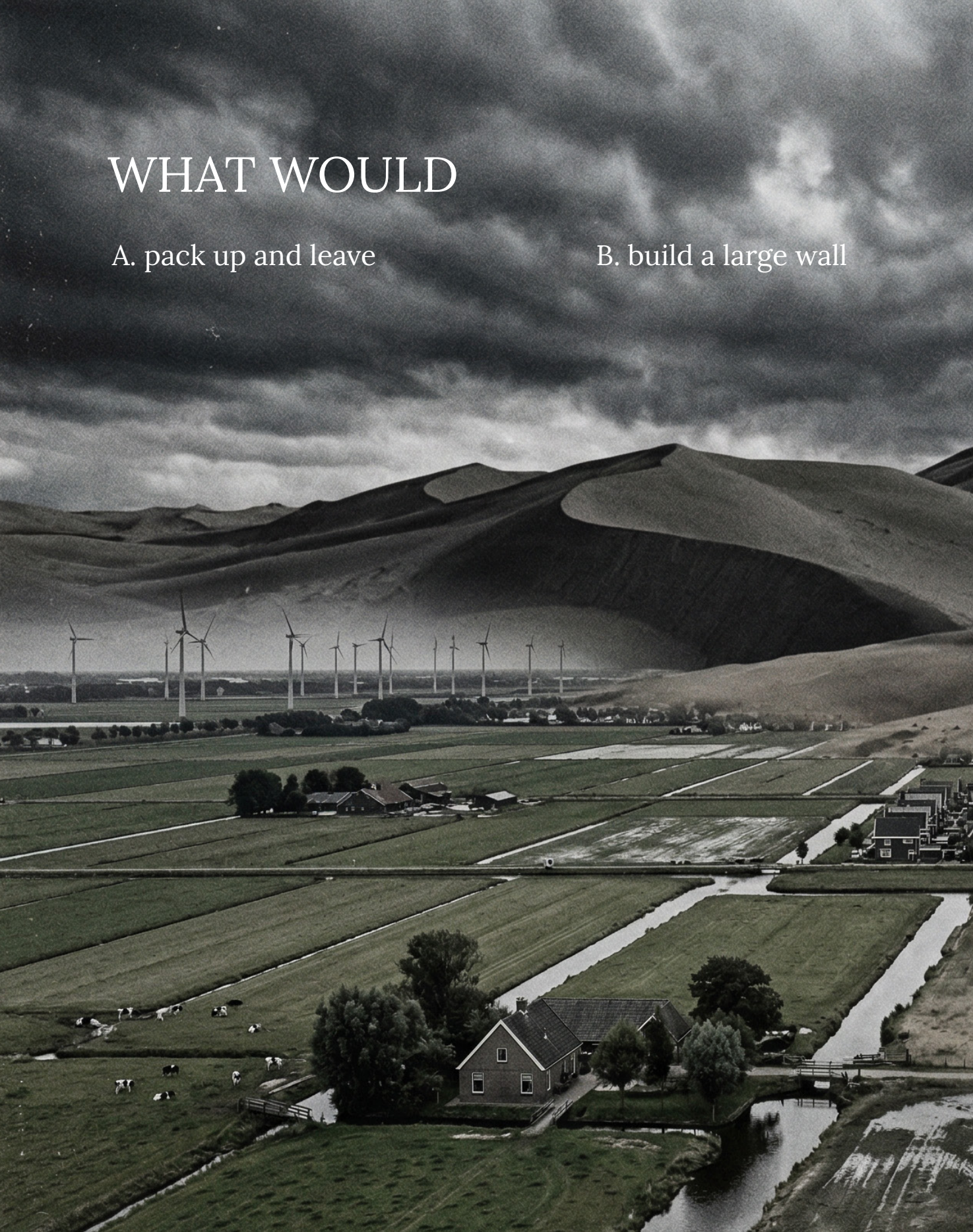


Figure 12. *Land cover West Africa and the Great Green Wall*
data source: Esri, 2024



Figure 13. *The Great Green Wall* (United Nations Convention to CombatDesertification, n.d.; World Bank Independent Evaluation Group, 2021; Mongabay, 2023)


WHAT WOULD
A. pack up and leave
B. build a large wall

YOU DO?

C. increase industry

D. protect your watersources



3. Problem statement

If your answer was B, you would be incorrect. While the Great Green Wall is a significant cooperative effort, it fails to address the main drivers of land degradation. And this shows in it's results. Satellite analysis of reforestation efforts in Senegal indicates limited long-term ecological impact and only two of the 36 assessed plots of the current wall show significant greening since planting (Zhu, et al. 2025). One of the factors could be the regions relatively low annual precipitation (figure x.), but maybe there is simply more to the story.

A common public image of desertification focuses on "desert encroachment", such as sand dunes overtaking farms, settlements, roads and railways. This phenomenon is real, but it represents only a small share of the problem (less than 10%) (Khazaal et al., 2022). Most desertification occurs when productive land outside the desert's natural boundaries deteriorates and loses its capacity to produce crops, pasture, timber and fuelwood. Degradation often begins in small patches, expands, and eventually merges into wider arid zones (Khazaal et al., 2022).

The drivers of this deterioration are complex, but the main contributor is not climate change; it is unsustainable land use (WaterAid, 2025). Apart from agriculture and urbanisation (Hepner et al., 2025), mining is attributed as a key contributor. Studies report vegetation loss up to three times higher in areas surrounding mining activities (Ahmed et al., 2025). This loss is linked to land cover change for excavation and industrial processes such as transport and processing, the destruction of water bodies, and air pollution (Worlanyo et al., 2021). These impacts are driven by the sector's use of land, energy, water and chemicals, and by waste generation (PBL, 2024). Now be it so, that the continent contains many extraction sites that are located in vulnerable and ecologically valuable places (figure x.)

These dynamics indicate that initiatives like the Great Green Wall cannot halt desertification unless degrading land uses are reduced. Mineral extraction and production are among the most destructive stages of the supply chain (PBL, 2024), and their effects are reflected in the risks now visible across West Africa. Yet only a small share of the economic value generated through mineral production is retained by local states and communities (figure x.), and it is insufficient to compensate for the social and ecological impacts borne locally (Boafo et al., 2024). If these exchanges are to become more equitable, extraction practices will need to change. And that is why:

> Current responses to West Africa's ecological crisis remain grounded in a positivist planning paradigm that treats degradation as a technical problem, leaving the extractive relations of ecological unequal exchange intact. Addressing the crisis therefore calls for inclusive, situated futures capable of engaging with place-based realities that positivist approaches abstract away.

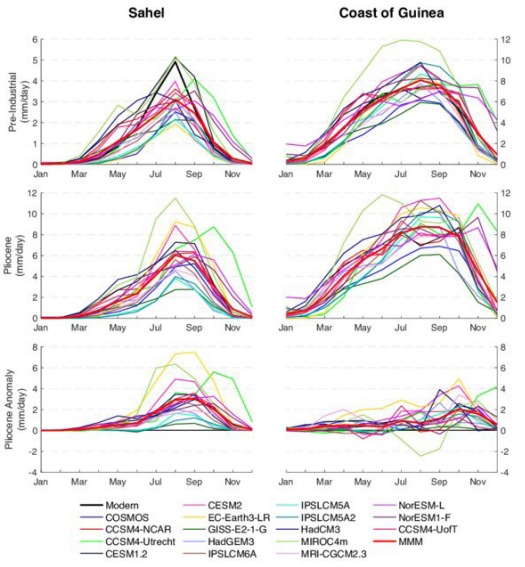


Figure 14. *Historic West African monsoon rainfall* (Berntell et al., 2021)

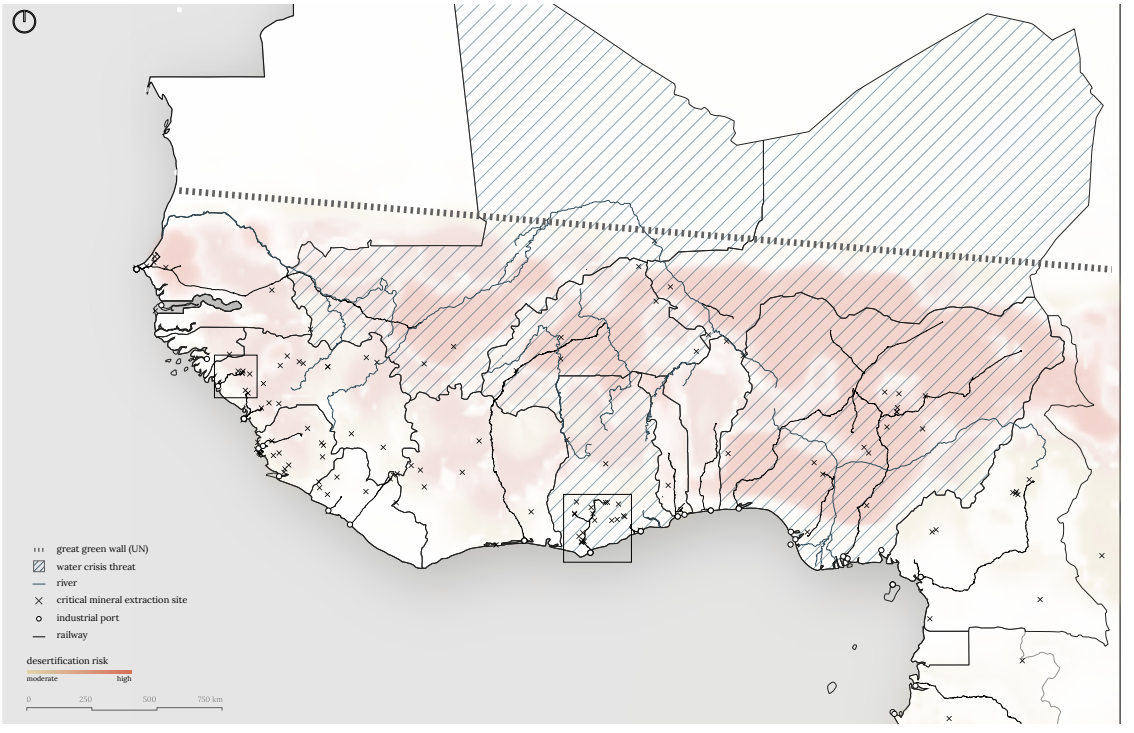


Figure 15. *Critical mineral extraction sites and desertification risk in West Africa*
Data source: USGS; Belgian Science Policy Office



Figure 16. *Deforesting industry; lumber, agriculture, extraction*

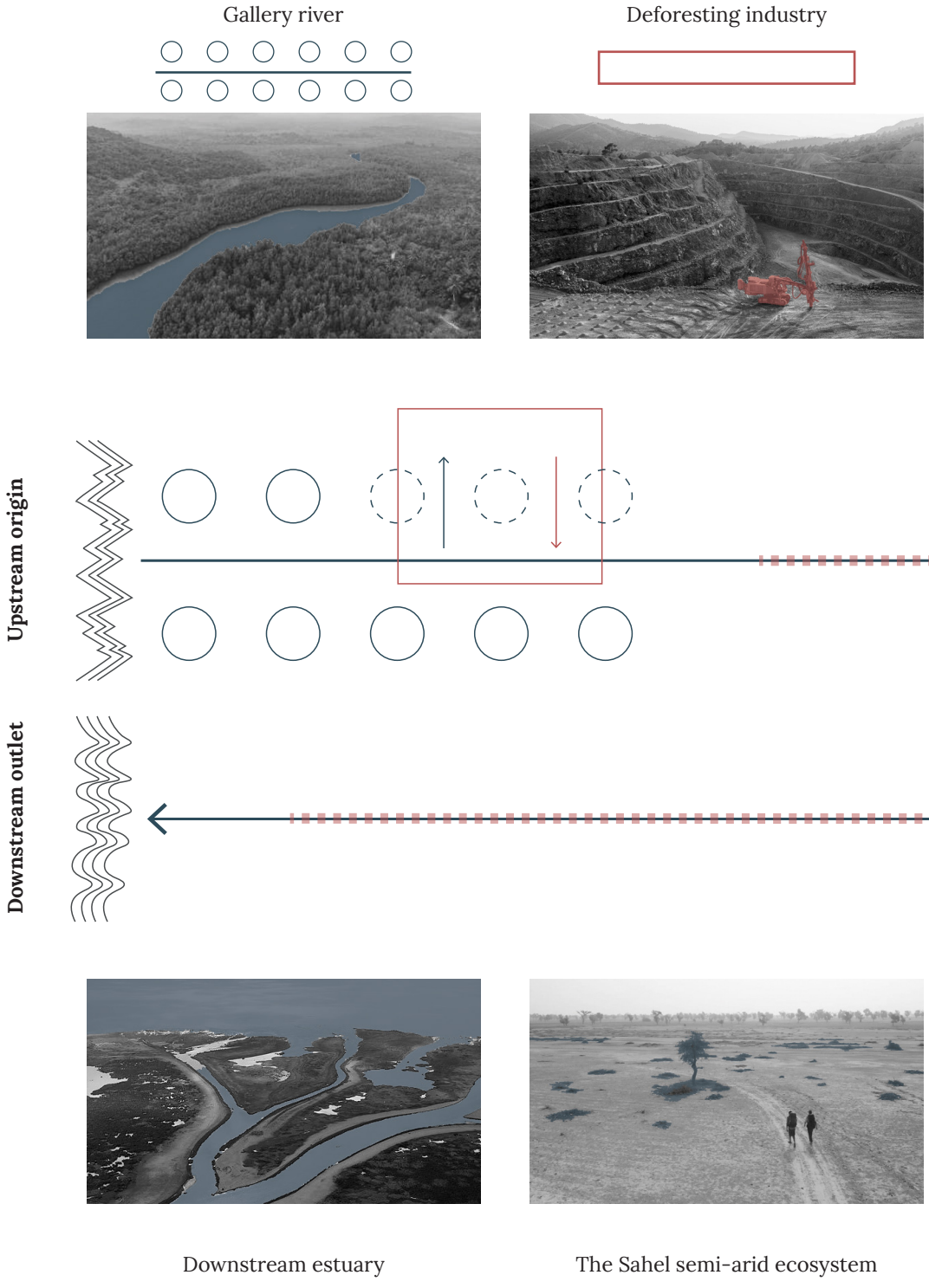


Figure 17. *Upstream extraction and downstream realities along West African headwaters*

Downstream water insecurity



Downstream urban dependencies





The Great Green Wall effort



Looming desertification threat


II



Part II. Approach

goal and vision
research questions
theory
methods
case study

4. Goal and vision

The effects of *ecological unequal exchange* and *extraction/exclusion* within the globalised operational landscape of the energy transition are best conceptualised through Weinberg and Bonelli's (2021) concept of *bipolar transitions*. They draw on the Greek notion of *humour*, in which the condition of an earthly body depends on the balance between its *fluids*. Stability produces good humour and, with it, the possibility of a good life. Within planning and design, the notion of this 'good life' can be understood through Campbell's (1996) triangle of sustainable development, composed of economic development, social equity, and environmental protection. In this thesis, the "fluids" are translated into the commons - air, soil, and water - and their distribution across these three pillars. Sustainable development depends on keeping this distribution in balance.

At present, economic development overconsumes these commons. Weinberg and Bonelli (2021) describe such overindulgence as *manic humour*, which produces a bipolar and unsustainable transition. The goal of this thesis is therefore to restore balance in the situated realities of West Africa by mediating development conflicts and redistributing the commons across the three pillars of sustainable development. To best represent each pillar, and to guide balanced redistribution, this thesis deploys spatial justice through its procedural, recognitional, and distributive dimensions (Rocco, 2026).

Procedural justice

Procedural justice requires that decision-making around extraction, closure, and future land use to not be dominated by a narrow set of powerful actors. The goal is therefore to identify diverse perspectives, include them transparently, and treat socio-cultural, environmental, and economic concerns as equal development drivers, following Campbell (1996). Within this approach, the agency of the designer is used to open space for less powerful stakeholders to influence spatial development. This is done by framing the designer not as that of an external problem-solver, but as a facilitator of situated knowledge and Pluriversal perspectives, and as a translator of local claims and territorial realities into more accountable planning and design for post-extractive futures.

Recognitional justice

With recognitional justice the goal is to asks who is exposed to harm, who is recognised as a legitimate stakeholder, and who has agency in decisions about extraction, closure, and future land use. This requires recognition of situated communities, their customs, and their livelihoods. It also requires recognition of situated ecologies, geography, flora, and fauna as active constituents of the territory with their own conditions for survival and continuity.

Distributive justice

Distributive justice concerns the fair allocation of resources, opportunities, and burdens across human and more-than-human actors. The commons of the situated context - air, soil, and water - must be distributed in ways that sustain life rather than concentrate value in one domain. This implies access to self-sustaining sources of clean drinking water, self-sustaining food sources, clean air, healthcare, and land use that protects both local livelihoods and ecological systems. In this sense, soil is not only a productive surface, but a condition for human and more-than-human continuity.

Binding factor: planetary boundaries

Even a fair distribution can become unsustainable if it exceeds the physical limits of the territory. Self-sustaining and situated futures can only exist within the boundaries of the context. The planetary boundaries therefore acts as the limit condition for planning and design. They consist out of: climate change, novel entities, stratospheric ozone depletion, atmospheric aerosol loading, ocean acidification, biochemical flows, freshwater change, land system change, biosphere and integrity (Stockholm Resilience Centre, n.d.). Because this issue spans a complex global system that cannot be completely transformed by a single project, this thesis should be judged on its own merits. If every project aims to operate within planetary boundaries, their collective impact will accumulate over time.

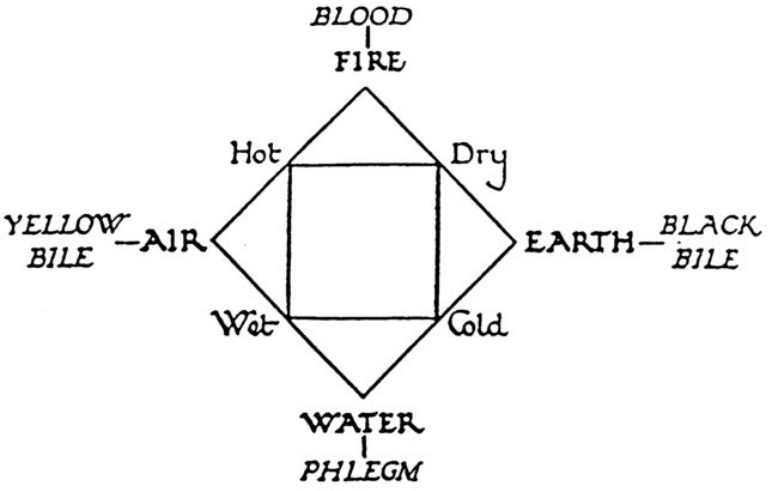


Figure 18. *The four ancient Greek cardinal body fluids*
(Berchtold & Cotman, 1998)

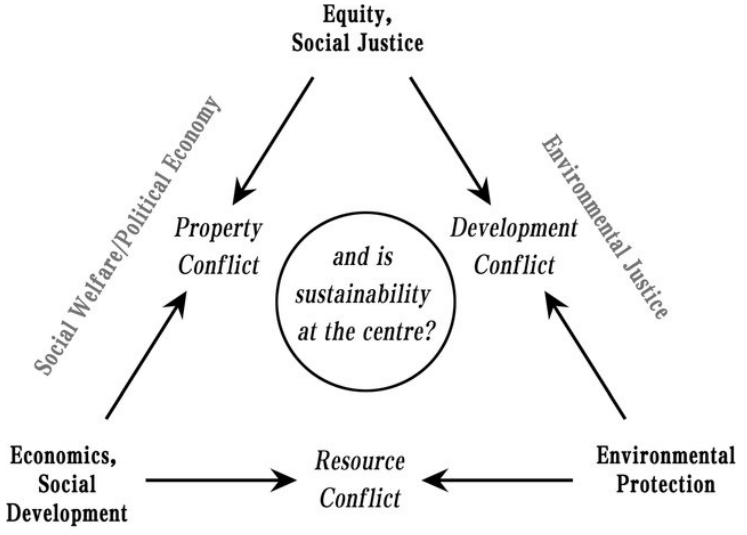
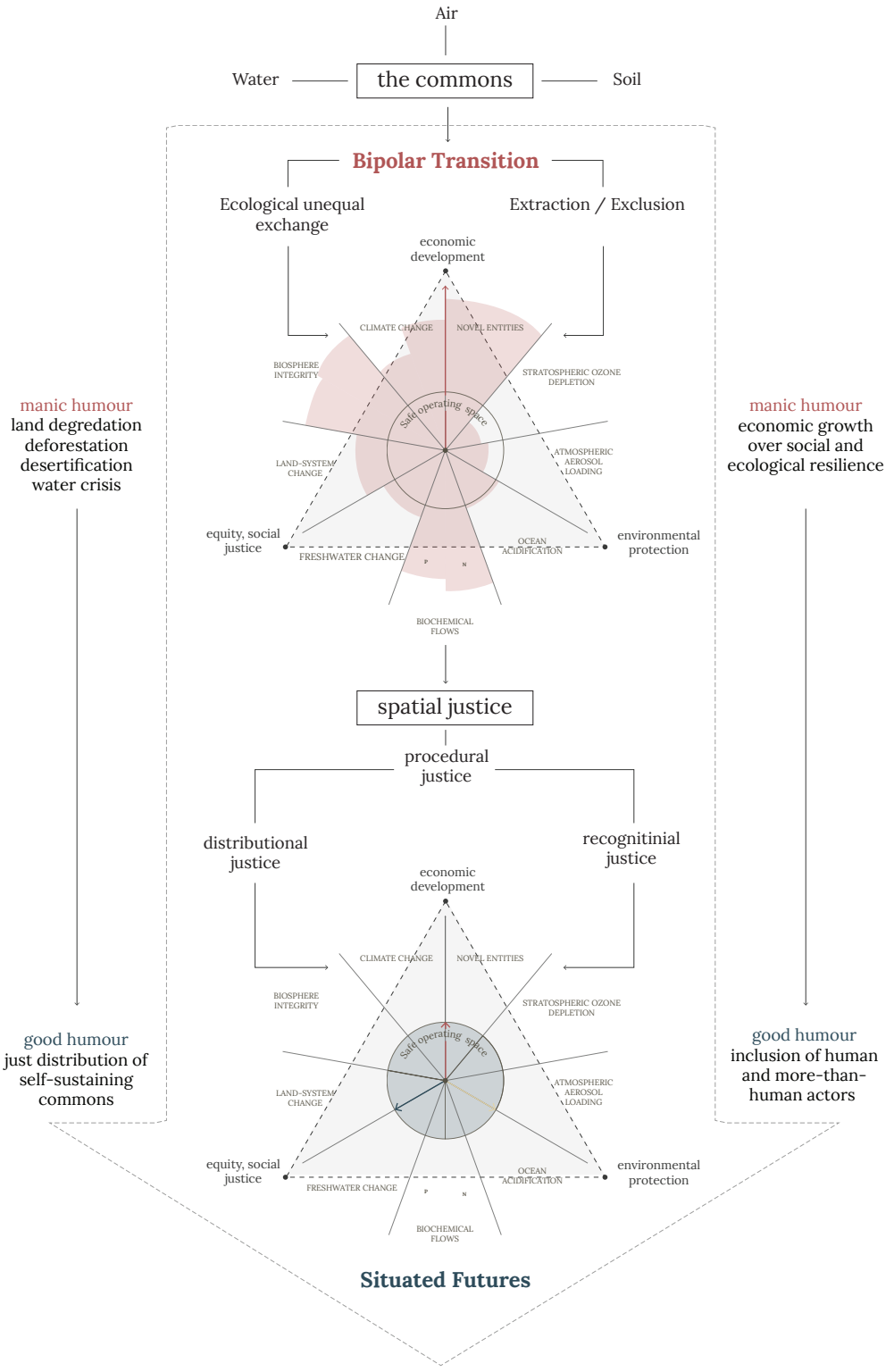


Figure 19. *Campbell's triangle of sustainable development*
(Huang, 2019)


Air
Water
the commons
Soil
Bipolar Transition
Ecological unequal exchange
Extraction / Exclusion
economic development
CLIMATE CHANGE
NOVEL ENTITIES
BIOSPHERE INTEGRITY
STRATOSPHERIC OZONE DEPLETION
Safe operating space
LAND-SYSTEM CHANGE
ATMOSPHERIC AEROSOL LOADING
equity, social justice
FRESHWATER CHANGE
OCEAN ACIDIFICATION
environmental protection
P
N
BIOCHEMICAL FLOWS
manic humour
land degredation
deforestation
desertification
water crisis
manic humour
economic growth
over social and
ecological resilience
spatial justice
procedural justice
distributional justice
recognitinial justice
economic development
CLIMATE CHANGE
NOVEL ENTITIES
BIOSPHERE INTEGRITY
STRATOSPHERIC OZONE DEPLETION
Safe operating space
LAND-SYSTEM CHANGE
ATMOSPHERIC AEROSOL LOADING
equity, social justice
FRESHWATER CHANGE
OCEAN ACIDIFICATION
environmental protection
P
N
BIOCHEMICAL FLOWS
good humour
just distribution of
self-sustaining
commons
good humour
inclusion of human
and more-than-
human actors
Situated Futures

5. RESEARCH QUESTIONS

To achieve the goal the following research questions must be answered:

How can a situated-knowledge approach to research and design guide spatially just, post-extractive futures for the operational extraction landscapes of West Africa, within planetary boundaries?

1. How can a situated, pluriversal research and design stance make visible the place-based realities that positivist planning abstracts away?

2. How are the commons - air, soil, and water - produced, consumed, and unequally exchanged among the actors and systems of the operational landscape?

3. How can spatial design mediate development conflicts and rebalance the commons across the three pillars of sustainable development without exceeding planetary boundaries?

Figure 20. *Conceptual framework*

6. Theory

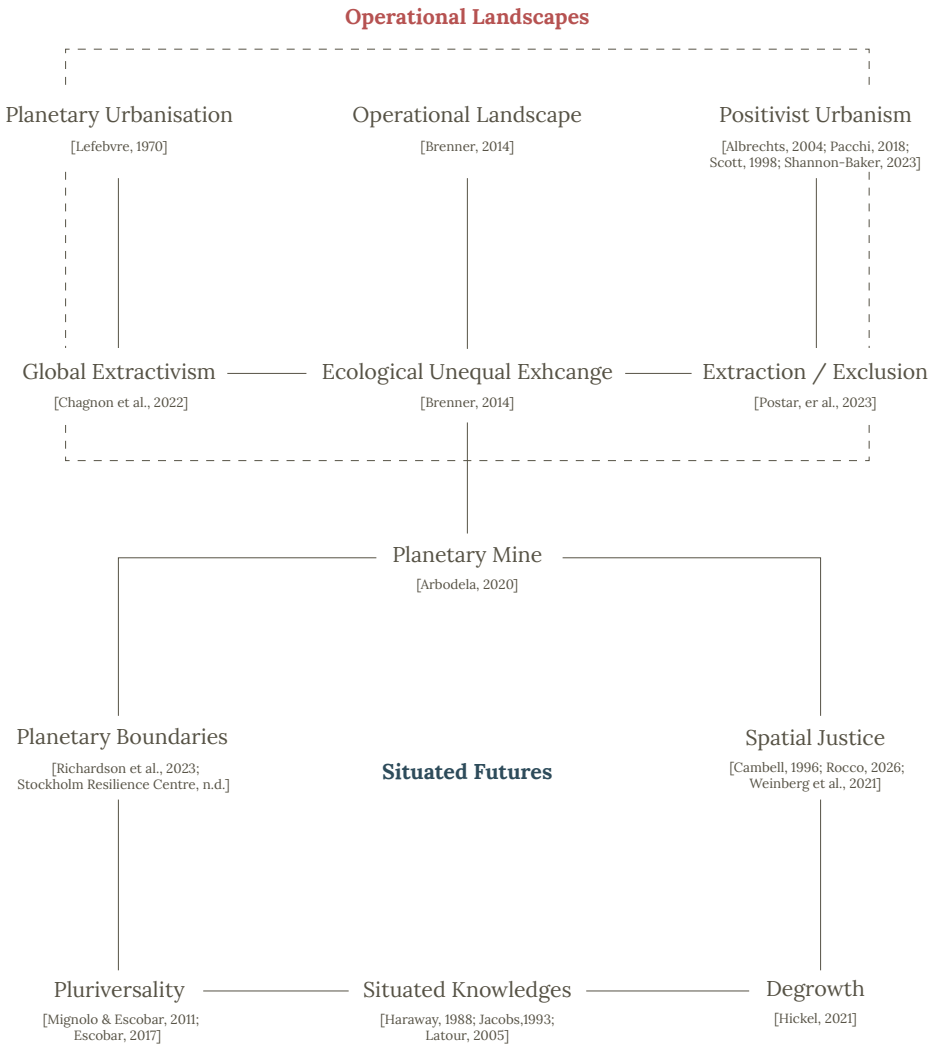
The theories explored and gathered in the preceding chapters can now be drawn into a single framework before the methodology sets out on how they are put to work.

It begins with a diagnosis. Planetary urbanisation and the operational landscape describe how distant territories are quietly reorganised to feed urban accumulation, and the critique of positivist urbanism exposes the planning mindset that renders such places abstract and merely technical. From this follows the naming of what that mindset sustains: a global extractivism built on ecological unequal exchange and a persistent logic of extraction and exclusion. Arboleda's planetary mine gathers these threads into one condition, the condition this thesis ultimately confronts.

Against that diagnosis this thesis sets its counterweights. Planetary boundaries and spatial justice supply the terms on which the design is judged, the first as an outer limit, the second as a measure of balance. Degrowth, situated knowledges, and pluriversality then open the door to other ways of imagining the future, offering perspectives from which the planetary mine might be unmade rather than extended.

The framework thus travels from a critique of how extraction landscapes are made to the limits and perspectives within which they might be remade.

Figure 21. *Theoretical framework*


Operational Landscapes
Planetary Urbanisation
[Lefebvre, 1970]
Operational Landscape
[Brenner, 2014]
Positivist Urbanism
[Albrechts, 2004; Pacchi, 2018; Scott, 1998; Shannon-Baker, 2023]
Global Extractivism
[Chagnon et al., 2022]
Ecological Unequal Exhcange
[Brenner, 2014]
Extraction / Exclusion
[Postar, er al., 2023]
Planetary Mine
[Arbodela, 2020]
Planetary Boundaries
[Richardson et al., 2023; Stockholm Resilience Centre, n.d.]
Situated Futures
Spatial Justice
[Cambell, 1996; Rocco, 2026; Weinberg et al., 2021]
Pluriversality
[Mignolo & Escobar, 2011; Escobar, 2017]
Situated Knowledges
[Haraway, 1988; Jacobs,1993; Latour, 2005]
Degrowth
[Hickel, 2021]

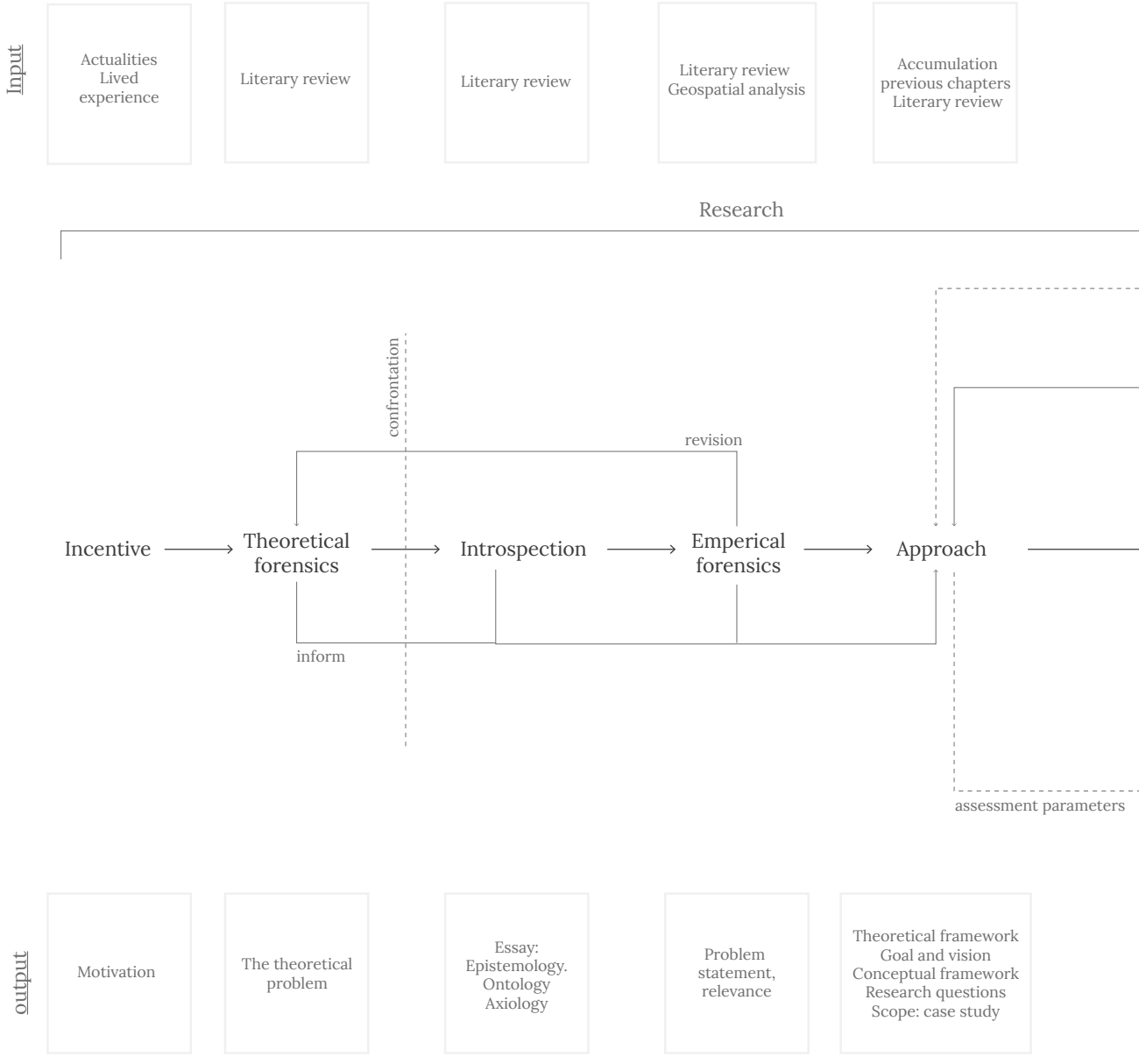


Figure 22. *Methodological framework*

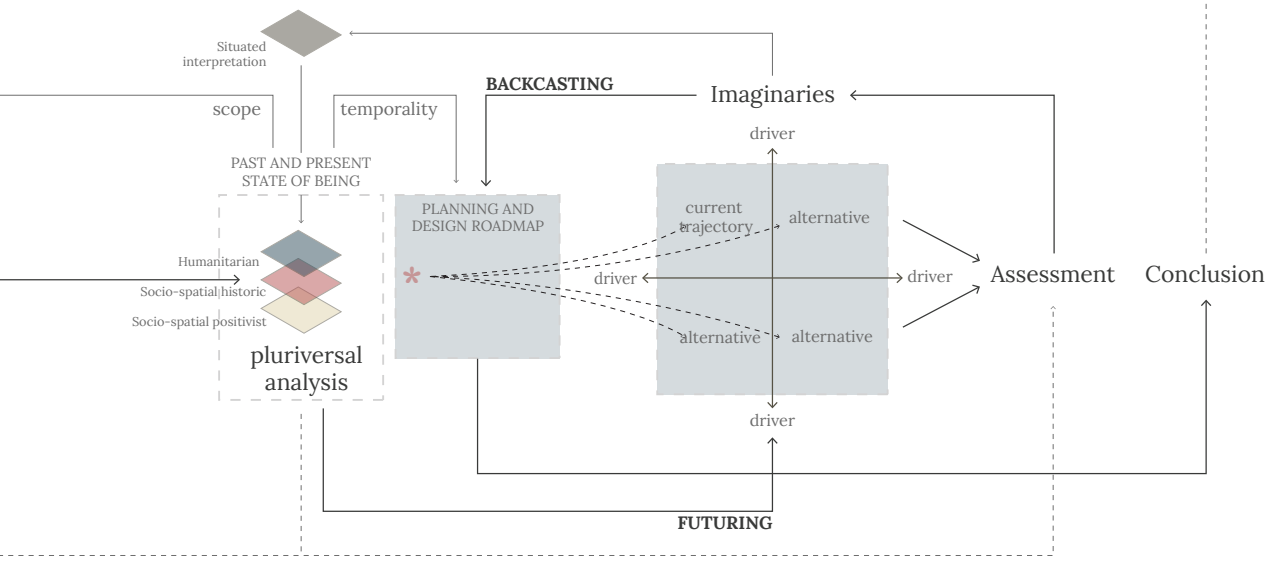
Qualitative analysis
Geospatial analysis
Field work

Qualitative analyisis
Literary review
Quantitative analysis
Field work

Qualitative
assessment

Design

answer and reflect on research questions and goal



Critical environments
Temporalities
Design incentives

Scenario specific
design roadmap
No regret design
measrues

Drivers, future
scenario's and
situated design
projection

Scenario's tested
to the goal
Scenario selection

Conclude
research questions,
Recommendations,
Reflection

7. Methods

This thesis translates its theoretical position into a structured research-and-design process. The process is reflexive before it is procedural: it opens with a theoretical and empirical *forensics*: an examination of the field's epistemology, ontology, and axiology through which the positivist paradigm is confronted and a situated approach is established. From this approach, the process unfolds across six moments that move from situated analysis to design projection, organised in two halves: a research half that builds a situated understanding of the territory, and a design half that projects and tests its futures.

1. Situated analysis. The first moment builds a systemic, situated understanding of the territory through qualitative, geospatial, and literature-based research. A broad enquiry is conducted across the theme, drawing on multiple disciplines and perspectives to engage all three corners of Campbell's (1996) triangle. Alongside planning, design studies, it draws on geological and ecological literature to account for more-than-human actors, and on socio-spatial and historical work to grasp the *longue durée* of cultural and ecological structures. To offset the partiality of institutional sources, humanitarian reporting is included for the perspectives they carry from marginalised voices. The findings are read through a pluriversal lens. This moment supports procedural and recognitional justice by making situated perspectives visible within the analysis.

2. Scoping the case and temporality. The second moment sets the spatial and temporal scope. From the analysis, a case study is selected through transparent criteria of relevance and feasibility, so that the research questions can be tested meaningfully. The same analysis defines the temporal framework of the projection, built around periods significant to both human and more-than-human actors and to change across the economic, socio-cultural, and environmental dimensions of the territory. Scoping thus fixes the case, the critical environments, and the timeframe through which situated change can be examined..

3. Futuring: flipping the script. The third moment imagines how the future might unfold. Drivers of change identified in the analysis are organised through a scenario method, in which two axes of opposed characteristics generate four distinct scenarios. These do not predict; they spread out a range of plausible situated realities so that different outcomes can be anticipated before any one is chosen. Futuring is conventionally a corporate forecasting tool (Lexicon of Design Research, n.d.); here the script is flipped, reappropriating it to weigh social and environmental futures alongside economic ones, and to think through the futures that *could* emerge before deciding which *should* be pursued.

4. Value-based assessment. The fourth moment evaluates the scenario set against the goal and vision of the thesis. Each scenario projects a different way the future could operate and be spatialised under distinct drivers, and each is appraised by the same measure the thesis sets for itself: a balanced redistribution of the commons across the three pillars of Campbell's (1996) triangle, read through spatial justice, and held within the planetary boundaries as the binding limit.

5. Imaginaries – situated fieldwork. The fifth moment is a short period of non-intrusive field observation used to validate and refine the desk-based interpretation. It includes no interviews, surveys, workshops, or participant recruitment; no individuals are asked to perform tasks or provide information. The researcher observes the landscape and visible human–environment relations in public settings to fact-check earlier findings: land-use patterns, infrastructural configurations, and the relations between settlements, extraction sites, and ecological features. No personal data are collected; field notes, images, and sketches remain non-identifying and aggregated. Entering the social life of the territory, even as a silent observer, produces a reading that is always located rather than objective. These situated interpretations feed back into sharpening the analysis and the scenario assessment, while remaining transparent about their own partiality.

6. Backcasting: design roadmap. The sixth moment turns assessment into design direction. One scenario is selected for development on the basis of its relevance to the thesis goal and its feasibility within the project timeframe. The situated interpretations gathered in the previous moment inform this step directly, grounding a design projection for the selected scenario in the located readings of the territory rather than in desk research alone. Backcasting then lets a future goal guide present action in a coordinated way, this is particularly suited to complex problems in which present trends are themselves part of the problem (Holmberg et al., 2000). Working backwards from the selected scenario, it defines a planning and design roadmap that mitigates the identified burdens and implements the identified benefits along the temporality set in scoping. Within this roadmap, measures advantageous across all four scenarios are identified as *no-regret* measures, marking the robust actions worth taking whichever future arrives.

8. The case of Boké, Guinea

To test the research questions, this thesis works with a single case study. The case is selected on the basis of relevance to the problem and goal defined in the earlier chapters. This means that the area must clearly express bipolar transitions through ecological unequal exchange and exclusionary practices. It must also have significance beyond its immediate locality, so that findings can inform wider territorial questions. At the same time, the case must remain feasible within the scope of a graduation thesis by allowing clear spatial boundaries and a manageable focus area. Based on these criteria, the Boké region in Guinea is selected as the case study.

8.1 Boké as a case of bipolar transitions

The Boké region contains one of the world's largest bauxite deposits and is therefore highly significant to the aluminium and gallium supply chain. It is also a clear case of bipolar transitions driven by an excess of economic priority. Environmental protection is weak, and existing laws have reportedly been set aside in favour of increasing extraction and competitiveness. Development in the region has largely followed the interests of the mining industry, with healthcare, education, and drinking water prioritised for inhabitants of company towns serving extraction. At the same time, rural communities are displaced from ancestral land without fair relocation or compensation (Human Rights Watch, 2018).

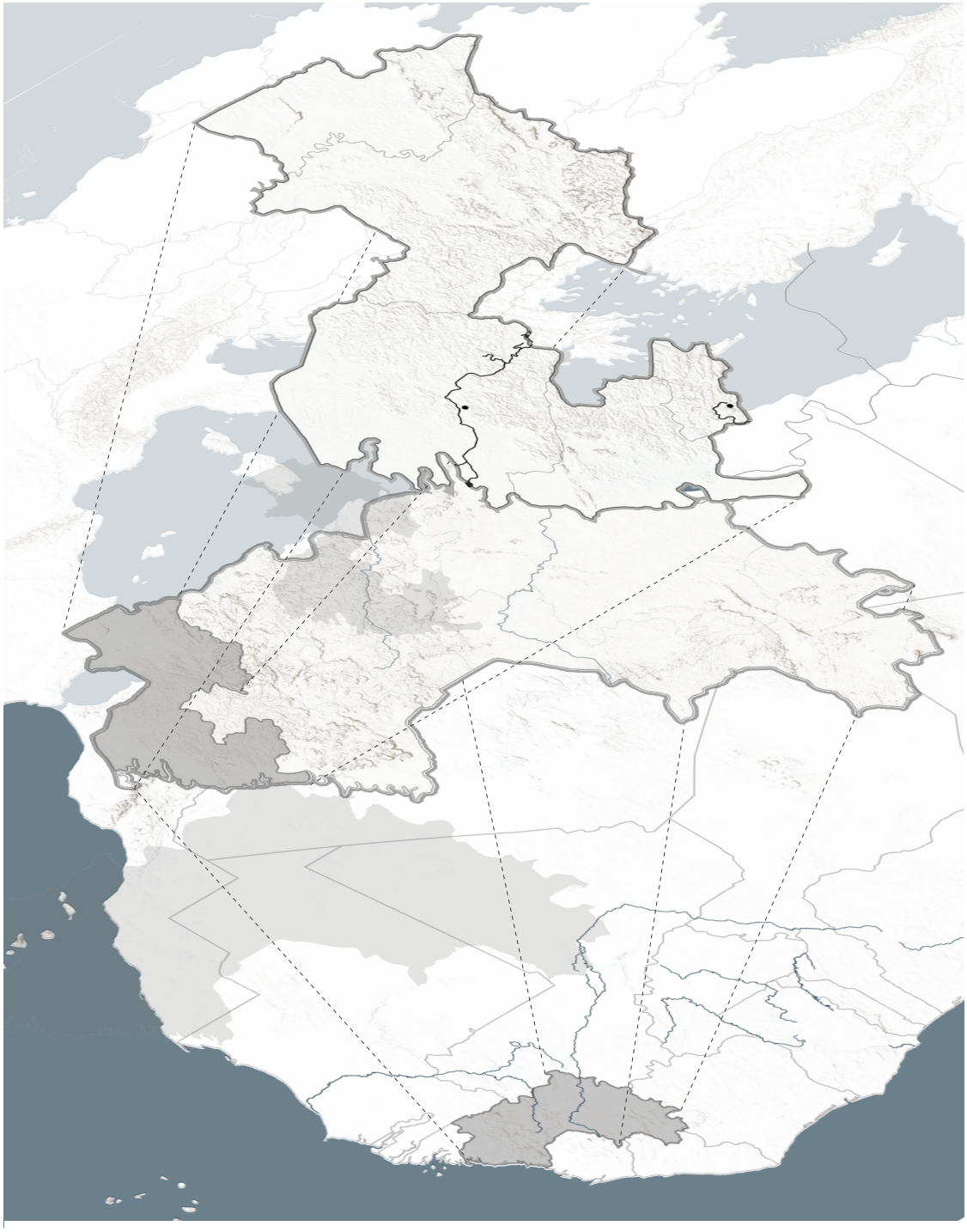
The environmental effects are equally visible. Air pollution from "red dust" affects homes and agricultural land and water sources are depleted (Human Rights Watch, 2018). This takes place in a sensitive landscape. Rivers connect the highlands to the estuary, gallery forests line their banks, endangered chimpanzees depend on these habitats (Mongabay, 2019), and mangroves in the estuary are essential to coastal ecological stability. Yet extraction takes place directly next to the rivers, and bauxite is transported to Kamsar port, which is located in the estuary between the mangroves.

8.2 Guinea as the watertower of West Africa

The relevance of Boké exceeds the region itself. Guinea's ecosystems and hydraulic systems are of wider regional importance because major rivers such as the Niger and the Senegal originate in its highlands. These rivers function as lifelines for large parts of West Africa (United Nations Industrial Development Organization, 2021). Continued ecological degradation and advancing desertification in Guinea would therefore have serious effects not only domestically but also downstream.

Boké is not located at the source of these major rivers, but it is home to the Sangarédi mine, the largest industrial bauxite mine in the country (Mining Technology, 2024) and contains the main concentration of the bipolar transitional effects described. This makes it a strategic site for developing situated futures. If practices can be developed here that reduce ecological unequal exchange and exclusionary development, they may also inform future decisions elsewhere. This is especially relevant because mining concessions have already been granted along the Senegal River, where operations have yet to begin. Findings from Boké can therefore contribute preventatively to the protection of one of the main water sources of Guinea, Mali, and Senegal.

Figure 23. *Boké, Guinea exploded view*





III



Part III. Analysis

territory in layers
temporalities
critical environments

9. The territory in layers

9.1 Ecological inventory

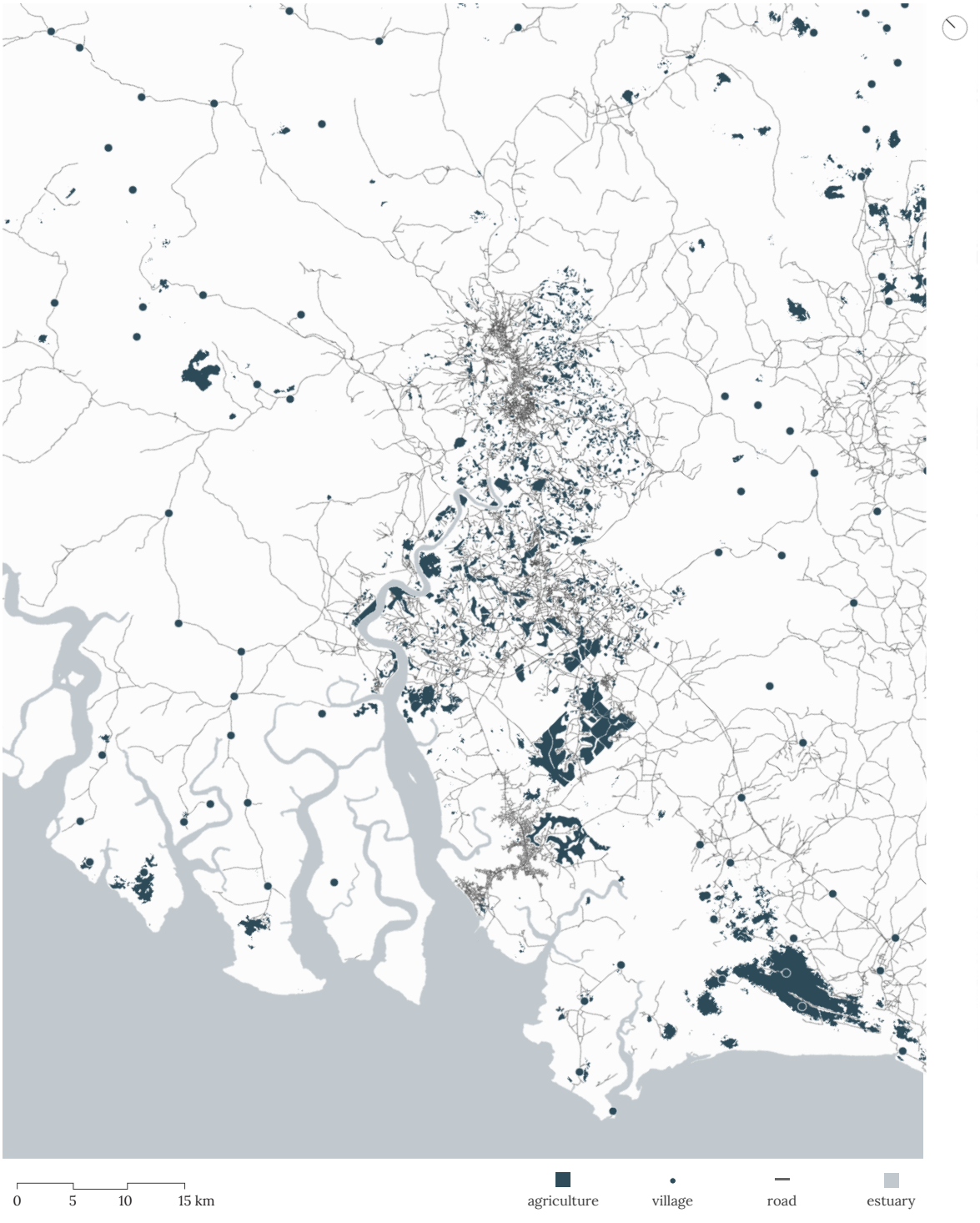
With the case study selected, it is time to do a reading of its territory. The analysis builds in three layers over the same ground: ecology, inhabitation, and the structures of extraction. It is a remote, geospatial reading, assembled from a distance to establish what the compisition is of the situated structures.

This first layer reads the territory as an ecology. The estuary opens where the river meets the sea, its edges are held by mangroves; inland, gallery forests trace the watercourse in parallel bands of vegetation. Mapped from a distance, this layer establishes what the land is before asking what is done to it: a living system with its own structure and its own conditions for continuity.



Figure 24. *Boké ecological land cover*
data source: Esri.2024


0
5
10
15 km
gallery forest
mangrove forest
estuary
headwater


0
5
10
15 km
agriculture
village
road
estuary

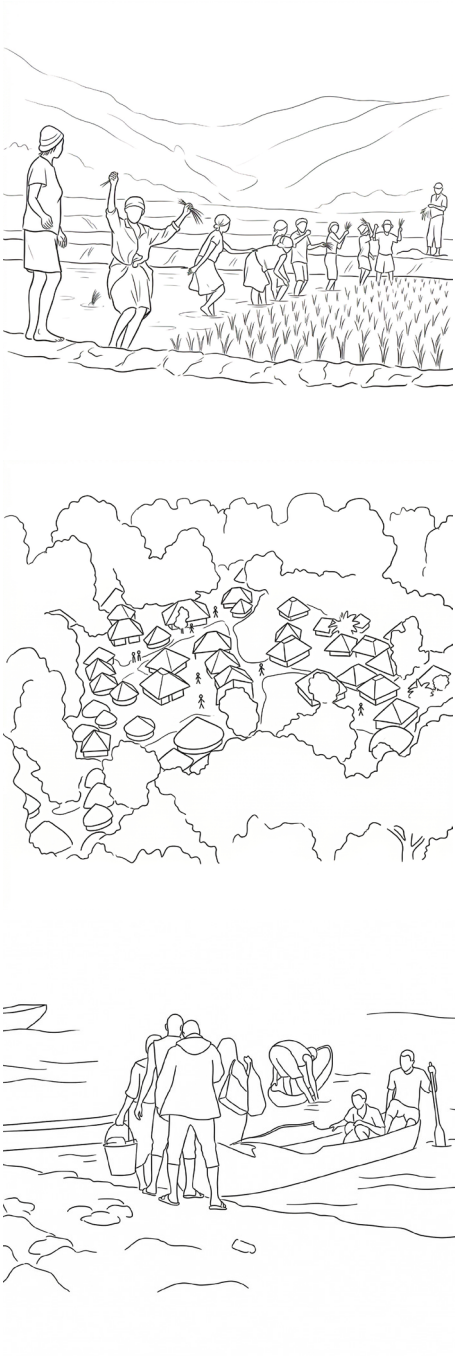


Figure 25. *Boké rural land cover*
data source: Esri.2024; OpenStreetMap

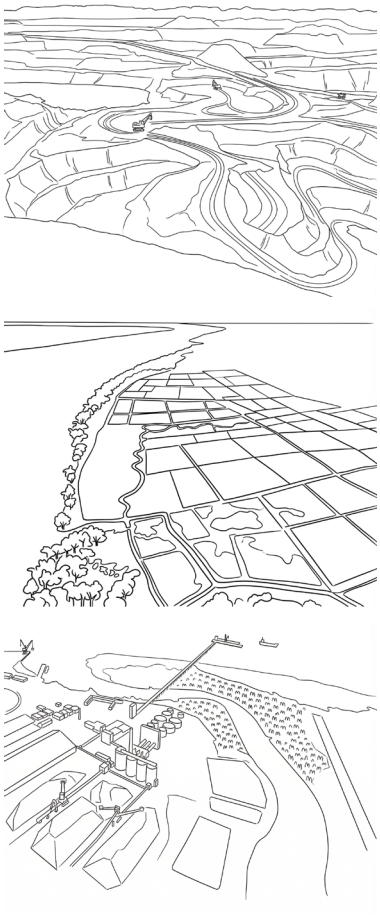
9.2 Boké inhabitated

The second layer adds human presence to the same grounds. Rural villages sit within the landscape, linked by a road network. Their livelihoods are drawn from what surrounds them: rice cultivation across the lowlands, fishing along the estuary. Here the territory appears as an inhabited one, where settlement and subsistence are woven into the ecological structure of the first layer. Read remotely, this is a landscape of situated, place-based life; though the texture of that life is only legible up close, a limit this method of analysis does not yet cross.

9.3 Extraction structures

The third layer overlays the apparatus of extraction. Open-pit bauxite quarries follow the deposits and urban agglomerations house workers and migrants. Ports, railways, and energy corridors carry ore and power. Services concentrate where extraction does with healthcare in the company towns and a university oriented to geology and mining. Distant hydraulic dams reshape other land to feed the industry's energy demand. Seen together, the three layers expose a territory whose ecology and inhabitation are being reorganised around a new purpose.

This would provide a sufficient basis for a positivist reading a starting point for the design process.. What these maps reveal is real but partial. It is but a remote sketch of structures whose meaning cannot be read from above. The chapters that follow return to this same ground through historical, humanitarian, and situated fieldwork, layers that reinterpret what is mapped here. This chapter, then, is not the foundation of the design but a point of departure: a first reading, made to be revised.



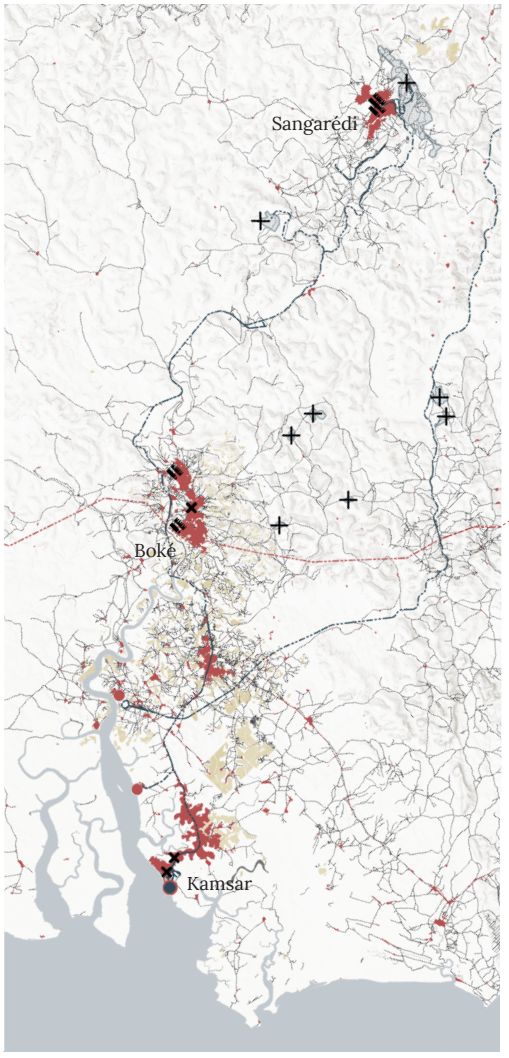
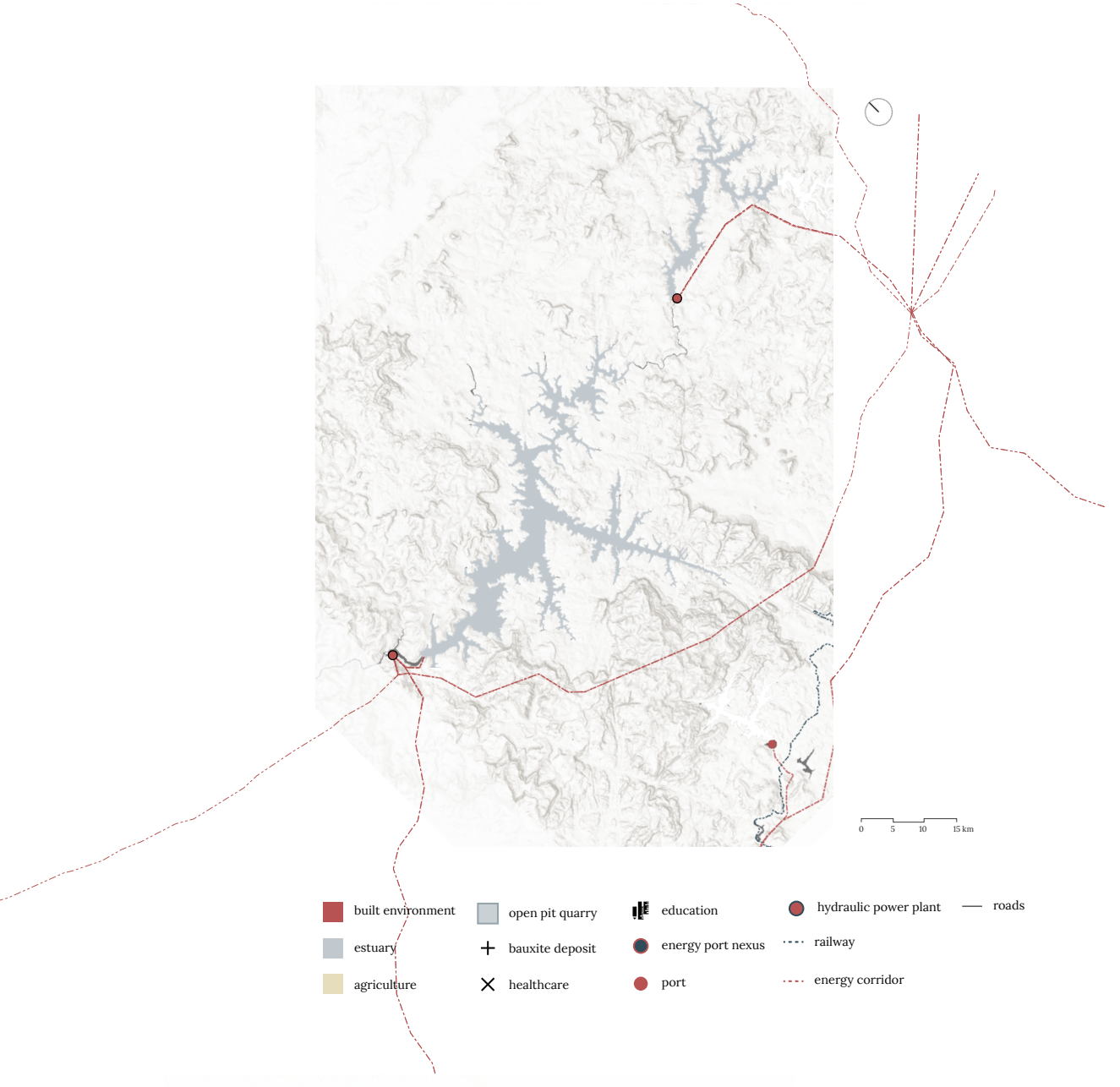
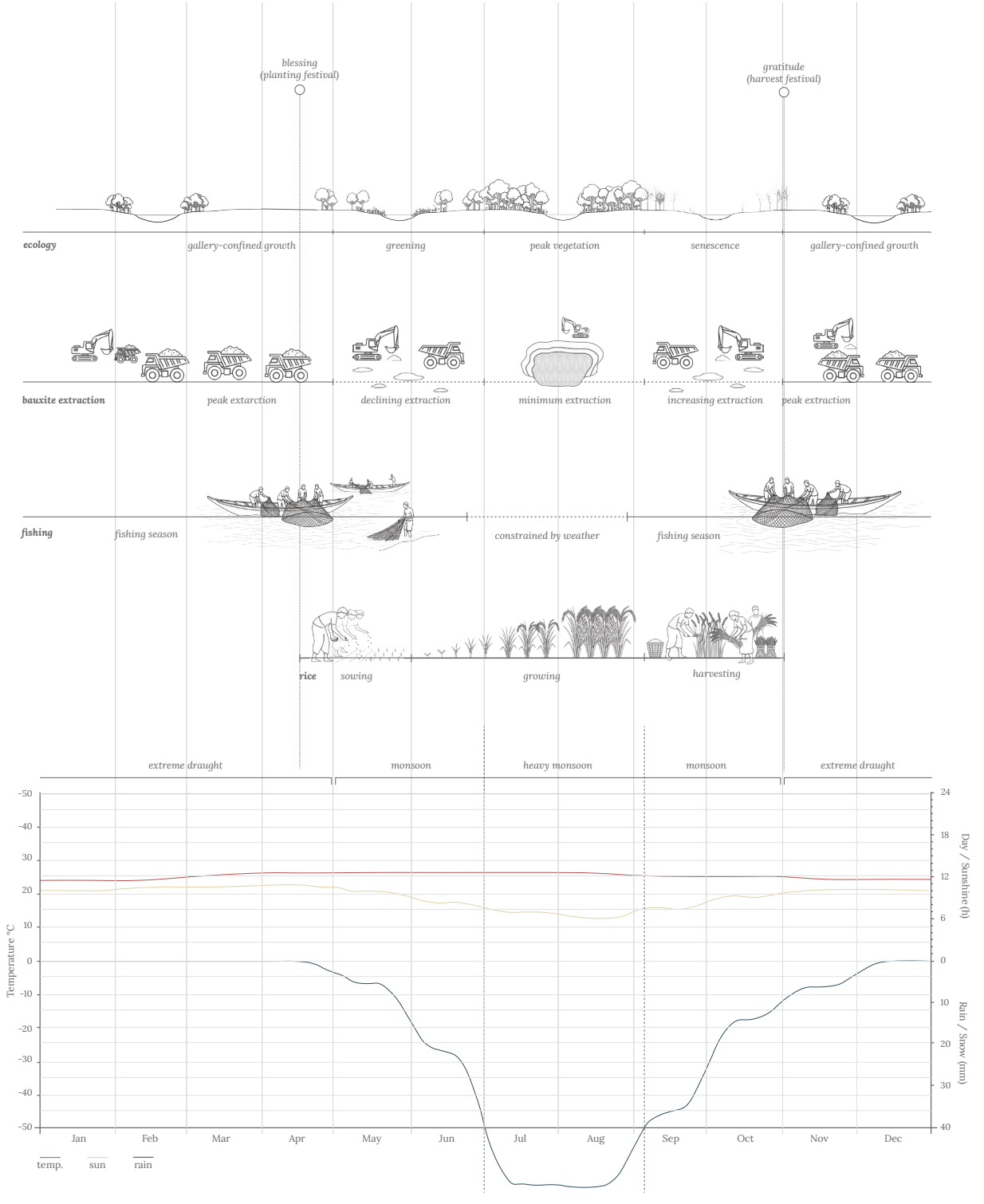


Figure 26. *Boké extraction structures*
data source: Esri.2024; OpenStreetMap


0
5
10
15 km
built environment
estuary
agriculture
open pit quarry
bauxite deposit
healthcare
education
energy port nexus
port
hydraulic power plant
railway
energy corridor
roads


INSTITUT SUPERIEUR DES MINES ET GEOLOGIE DE BOKE


blessing
(planting festival)
gratitude
(harvest festival)
ecology
gallery-confined growth
greening
peak vegetation
senescence
gallery-confined growth
bauxite extraction
peak extarction
declining extraction
minimum extraction
increasing extraction
peak extraction
fishing
fishing season
constrained by weather
fishing season
rice
sowing
growing
harvesting
extreme draught
monsoon
heavy monsoon
monsoon
extreme draught
Temperature °C
Day / Sunshine (h)
Rain / Snow (mm)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
temp.
sun
rain

10 The temporalities of Boké

10.1 Seasons

The chart to the left maps a year in Boké across four interlocking processes against the region's climatic rhythm of rainfall, temperature, and daylight. Rainfed rice is planted at the onset of the rains and harvested as they end, locked to the monsoon because no other reliable water source exists (USDA Foreign Agricultural Service, 2018). Fishing follows the inverse rhythm, opening up as estuary and sea calm in the dry months and retreating when the rains return. Bauxite extraction, too, is throttled by the rains: haul roads, pits and ports all slow as the monsoon arrives, with July and August recording the lowest export volumes of the year (The Signal Group, 2024). Ecology breathes with the opposite pulse, withdrawing to gallery forests in the dry months and unfolding across the landscape as the rains return. Festivals mark the transitions in and out of the wet season (Luft Time, 2025). Read together, they reveal a territory in which every system is, in one way or another, bound to water. Water is the organising condition of the region, making tight, place-based water management instrumental to anything that is grown, caught, mined, or restored in the region.

10.2 Generations

While the seasonal chart shows the rhythm of a single year, the second one traces the rhythm of decades. Agricultural cycles renew quickly (FAO, 2022), but bauxite extraction operates on an entirely different temporal order. Mining plateaus remain active for twenty to forty years each, with several worked simultaneously across the Boké–Sangarédi region (African Development Bank, 2014), and once a plateau is closed the ground itself takes years to begin functioning as soil again (Reis et al., 2021). Vegetation cover and ecological value return more slowly still (Cook-Patton et al., 2020).Read together, these timescales describe a sustained hollowing of the territory. While the seasonal rains continue to arrive, the land beneath it is compacted, stripped of topsoil and slow to revegetate. It cannot hold or filter water as it once did. The result is an extended period in which water security and ecological function are both diminished, not for a season but for a generation.

However, the region's timescales do not end with generations. Beyond generations lie eras, the historical layers through which Boké became the territory we now read.

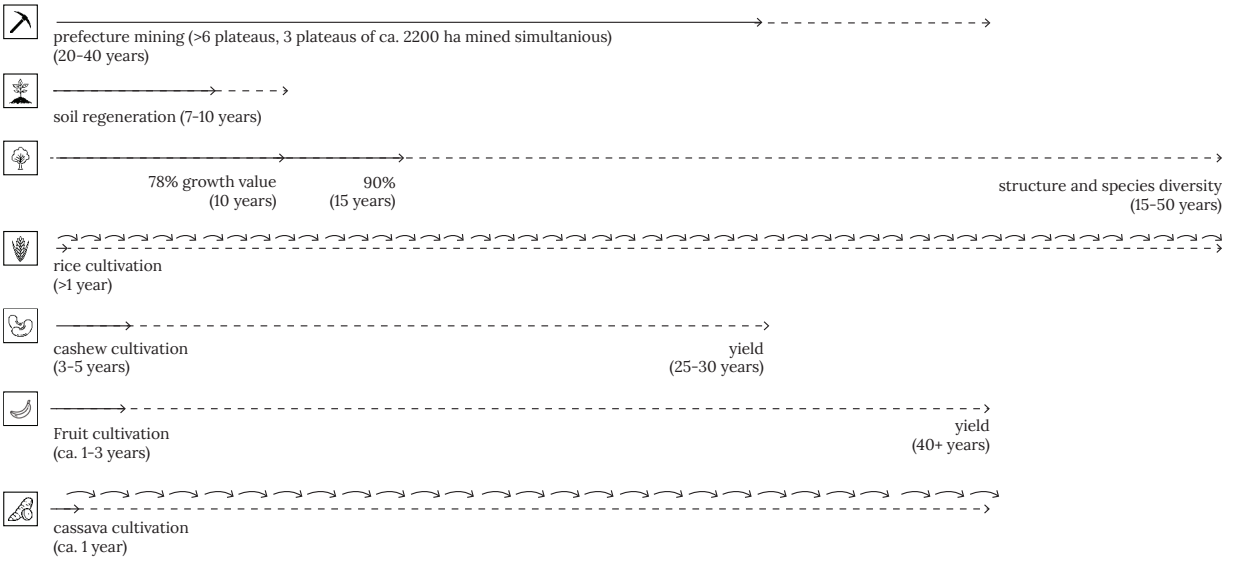


Figure 26. *Temporalities of Boké, Guinea*

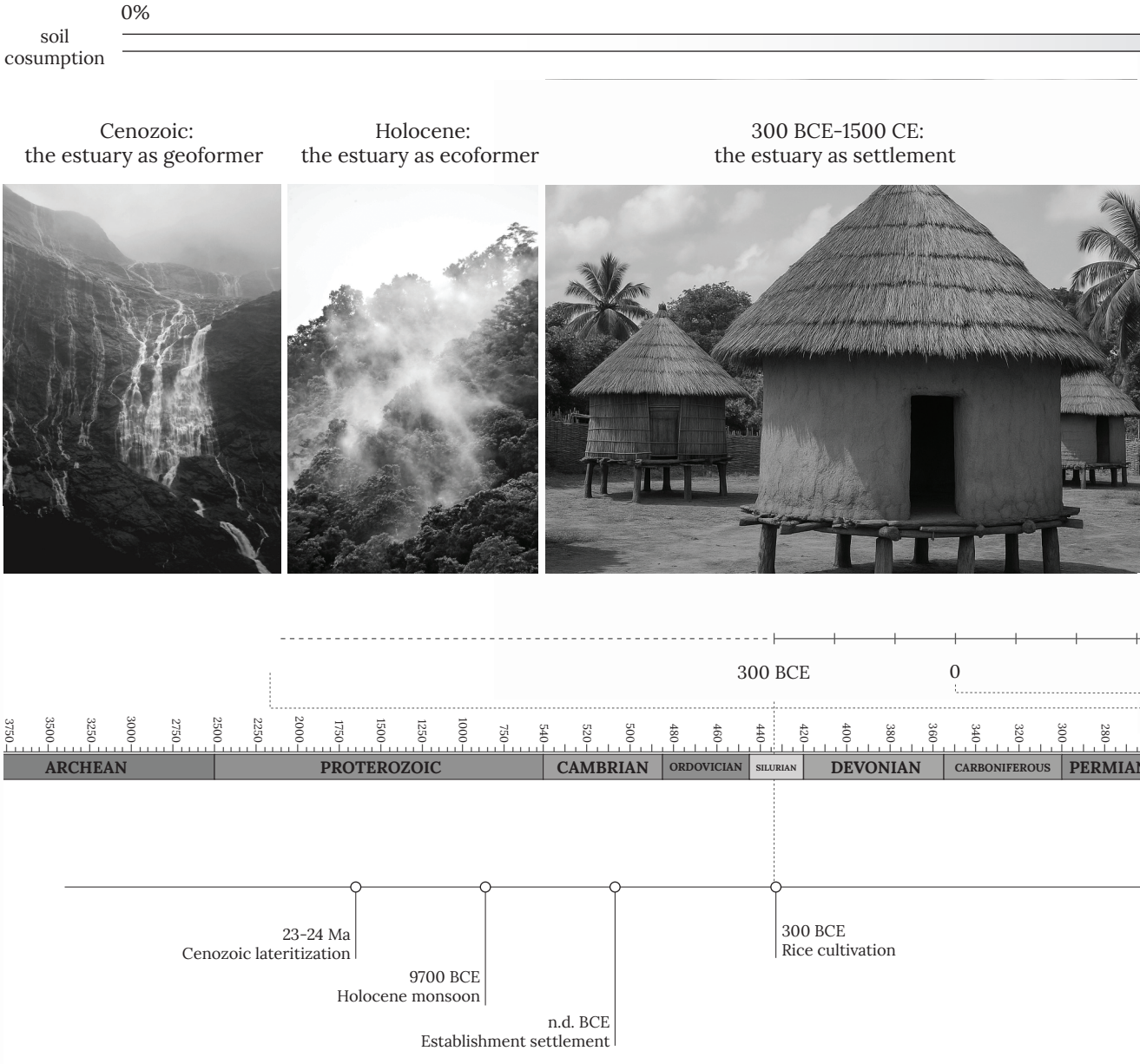


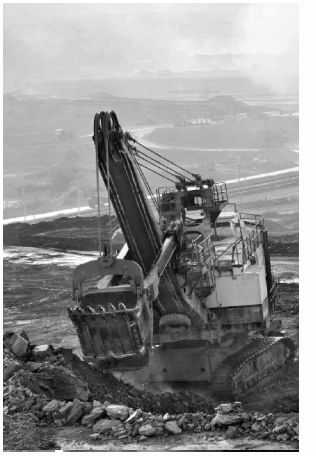
Figure 28. *History of Boké,Guinea; from geological and ecological formation to human activity*

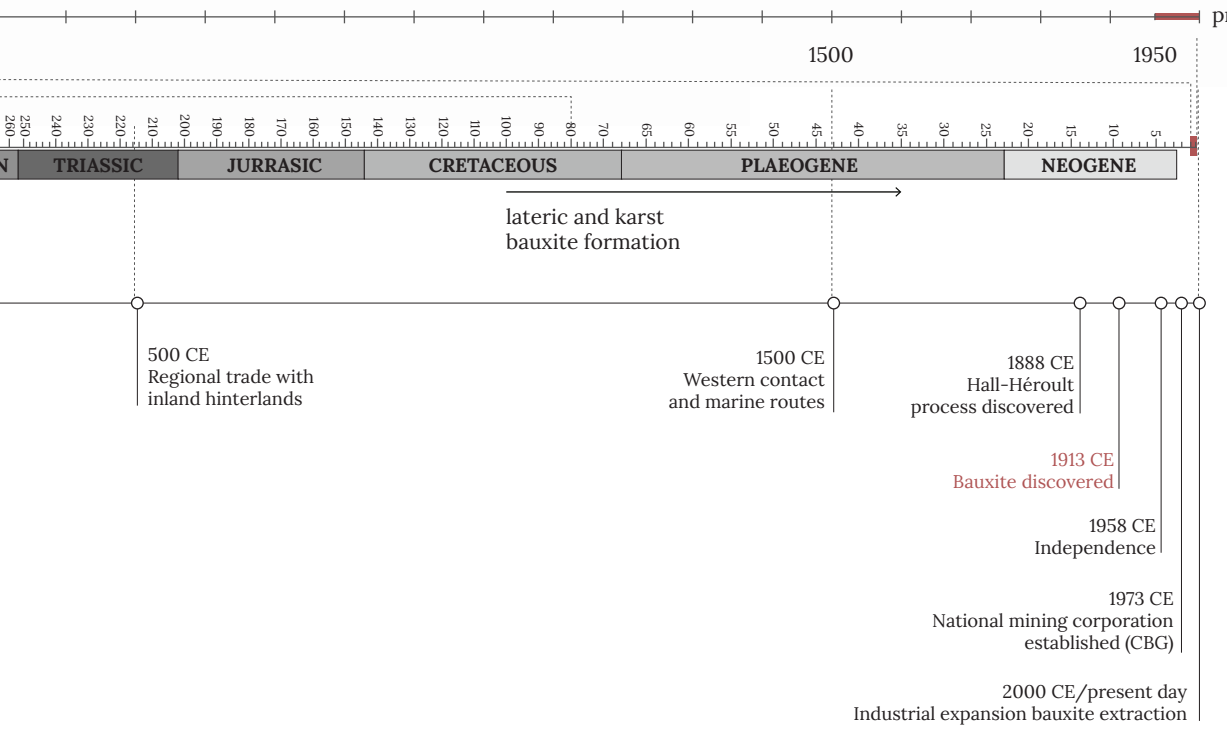
1500- 1950 CE:
the estuary as trade route

1950 CE-now:
the estuary as industry









10.3 Eras - an estuary through time

This spread traces the systemic processes of the Rio Nunez estuary (modern-day Boké) by following the river upstream from the estuary to the highlands across time.

Cenozoic. Heavy tropical rainfall weathered the aluminium-rich rocks of the inland highlands across the Cenozoic. Sedimentary runoff carried the eroded material downstream, where it settled along the river's floodscape and gradually formed the lateritic bauxite deposits that still define the region's geology today (Schellmann, 1994).

Holocene. During the Holocene, intensified monsoons greened the Sahara and stabilising sea levels allowed extensive mudflats and tidal deltas to form along the West African coast. This is when the region's current ecological base, its mangroves, gallery forests, and estuarine systems, was established (Lézine, 1997; Ndiaye et al., 2022).

300–1500. Historical reconstructions describe coastal settlements living from shellfish and cultivating rice between the mangroves; the exact date of first settlement is unclear, but accounts of such communities precede European contact (Fields-Black, 2008). The rice was Oryza glaberrima, the African red rice (drought-tolerant and suited to poor soils) first domesticated in the inland Niger delta and spread westward (Linares, 2002). Inland trade with the Mali Empire was present though modest, the region kept partly isolated by the highlands and rainforest behind it (UNESCO, 1988, 1992).

1500–1970. Isolation ended with Portuguese contact in the 1500s, soon followed by Portuguese, French, and British trading posts and industries (Hair, 1997). The Portuguese introduced Oryza sativa, the more productive Asian rice, which displaced the African variety. The estuary became a node in the transatlantic slave trade, with people brought from the interior for shipment (Jorati, 2025); for the first time the land was made to feed more than it could locally sustain, as coastal and agricultural produce supplied both foreign trade and maritime provisioning. In 1888 the Hall–Héroult process made it possible to extract pure aluminium from bauxite (Ratvik et al., 2022); in 1913 Lacroix identified the region's bauxite deposits during a visit to the French colony (Cambridge University Press, 2009). Guinea gained independence from France in 1958 and began laying the foundations of a domestic industry (MacDonald, 2010).

1970–present. Industrial bauxite extraction took its current form with the establishment of the Compagnie des Bauxites de Guinée in 1973, which developed the port, the railway, and the industrial extraction infrastructure of the Boké–Sangarédi plateau. Since then, Russian, Chinese, and American ventures have entered the region, expanding extraction further across the landscape mapped today.

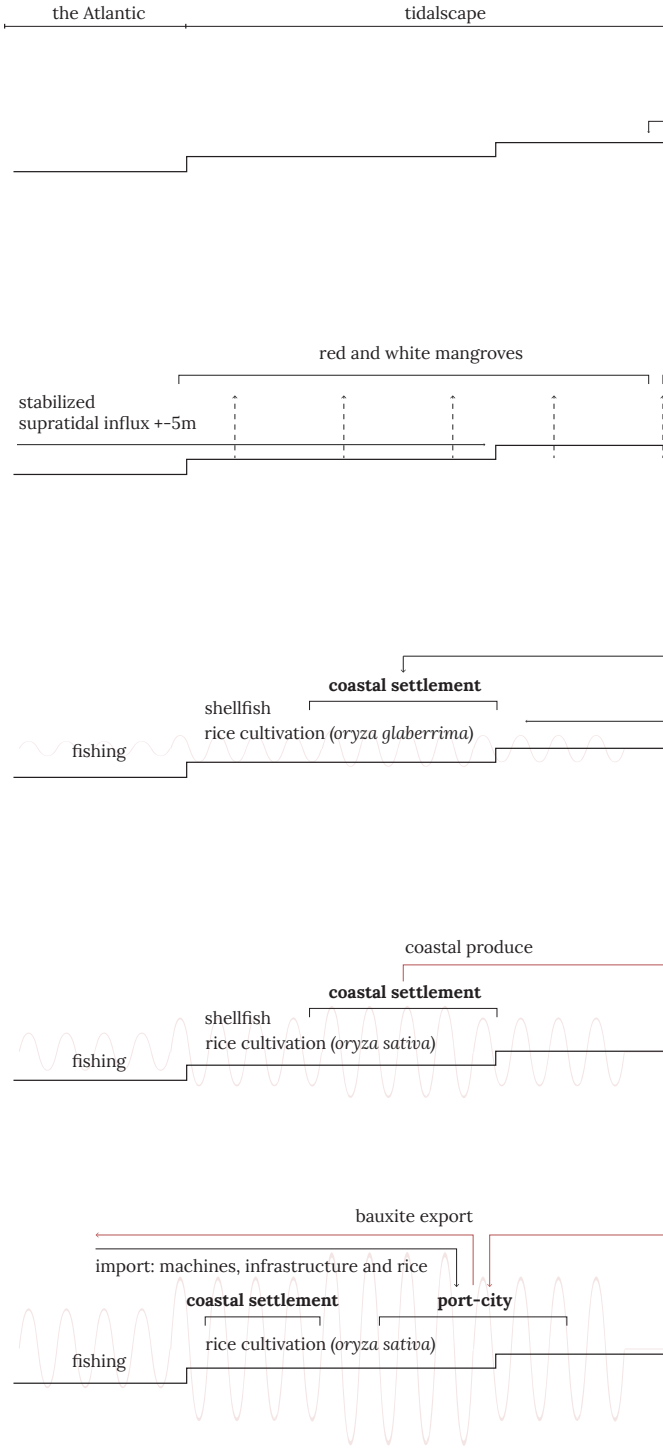
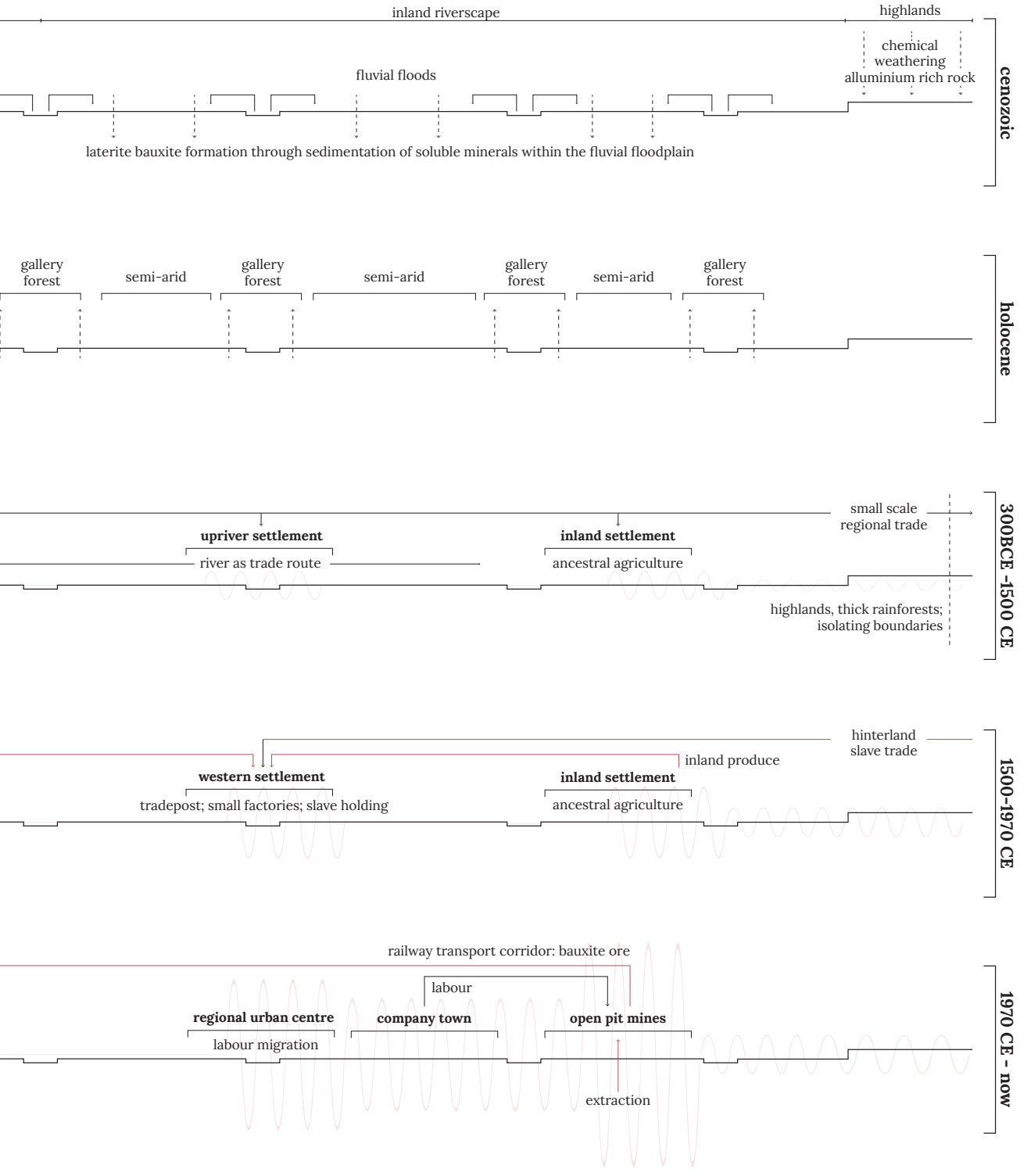


Figure 29. *History of the Rio Nunez estuary, schematic cross sections*


inland riverscape
highlands
chemical
weathering
alluminium rich rock
fluvial floods
laterite bauxite formation through sedimentation of soluble minerals within the fluvial floodplain
cenozoic
gallery
forest
semi-arid
gallery
forest
semi-arid
gallery
forest
semi-arid
gallery
forest
holocene
small scale
regional trade
upriver settlement
river as trade route
inland settlement
ancestral agriculture
highlands, thick rainforests;
isolating boundaries
300BCE -1500 CE
hinterland
slave trade
inland produce
western settlement
tradepost; small factories; slave holding
inland settlement
ancestral agriculture
1500-1970 CE
railway transport corridor: bauxite ore
labour
regional urban centre
labour migration
company town
open pit mines
extraction
1970 CE - now

CRITICAL ENVIRONMENTS

11. Critical environments



facts
design incentives
critical typologies

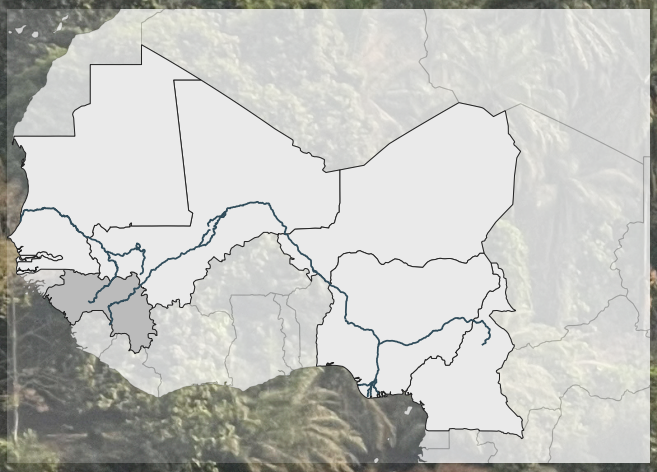


Figure 30. Guinea, the watertower of West-Africa

More than 20 major rivers originate in Guinea's highlands, including the Niger and the Senegal, earning it the name of "water tower of West-Africa". These rivers provide essential water, food, irrigation, productive use, and hydropower to hundreds of millions of people across the region.

United Nations Industrial Development Organization. (2021)



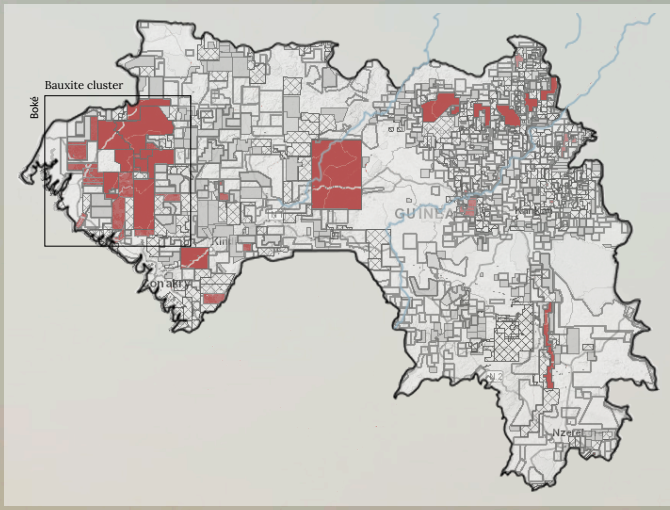
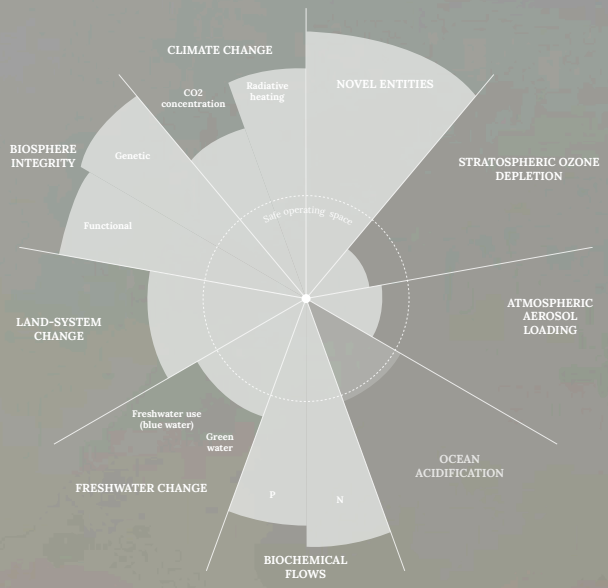
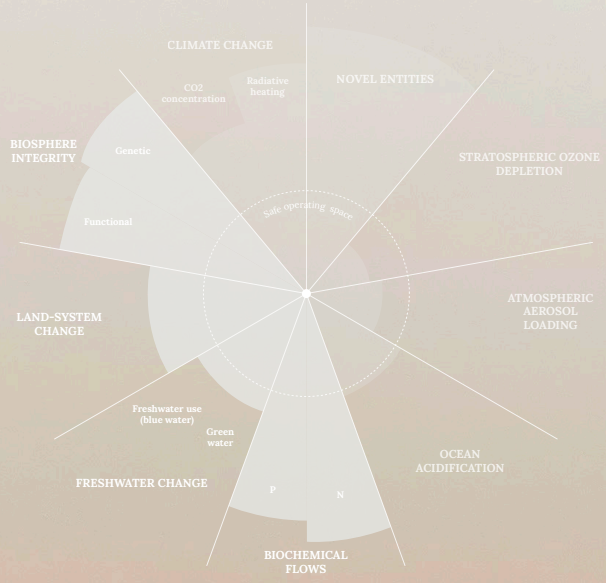


Figure 31. Active mining concessions Guinea
(Le ministère des Mines et de la Géologie, 2026)



Mining concessions cover a large share of the Boké region, with some reports indicating that permits occupy more than 60% of Boké prefecture. Satellite imagery shows rapid expansion of bauxite mining across these concessions.

Souare, S. (2019)



In Boké, bauxite mining has caused over 8,500 hectares of deforestation since 2018. In Fria, 62 years of mining have cleared more than 5,000 hectares of land, including 3,218 hectares of forest.

Souare, S. (2019)







In areas like Sangarédi, mining occupies up to 80% of the land, reducing grazing areas to less than 6%.

Souare, S. (2019)

Figure 32. *The impact of bauxite mining on livestock farming and fishing in the prefecture of Boké in Guinea* (Action Mines Guinée & IPIS, 2026)



Figure 33. *Chimpanzee on tree (David Shepherd Wildlife Foundation, n.d.)*

The population of western chimpanzees has declined sharply from around 175,000 in 1990 to about 53,000 today, with roughly half now remaining in the Guinean forests, their last stronghold in West Africa.

Mongabay. (2019)




CLIMATE CHANGE
CO2 concentration
Radiative heating
NOVEL ENTITIES
BIOSPHERE INTEGRITY
Genetic
Functional
STRATOSPHERIC OZONE DEPLETION
Safe operating space
ATMOSPHERIC AEROSOL LOADING
LAND-SYSTEM CHANGE
Freshwater use
Blue water
Green water
OCEAN ACIDIFICATION
FRESHWATER CHANGE
P
N
BIOCHEMICAL FLOWS



Post-mining soils show very low nutrient levels (N, K, Ca, Mg, Na), low cation exchange capacity (2.56–5.82 cmol(+)/kg), low base saturation (6.53–12.45%), and acidic conditions (pH 4.32–5.11).

Abdillah, et al. (2023)



Mining damages water sources and increases demand through migration, reducing access to water for drinking, washing, and cooking; women are often forced to walk further or rely on filtered sources controlled by mining companies.

Human Rights Watch. (2018)


CLIMATE CHANGE
CO2 concentration
Radiative forcing
NOVEL ENTITIES
BIOSPHERE INTEGRITY
Genetic
Functional
STRATOSPHERIC OZONE DEPLETION
Operating
ATMOSPHERIC AEROSOL LOADING
LAND-SYSTEM CHANGE
Freshwater use (blue water)
Green water
OCEAN ACIDIFICATION
FRESHWATER CHANGE
P
N
BIOCHEMICAL FLOWS

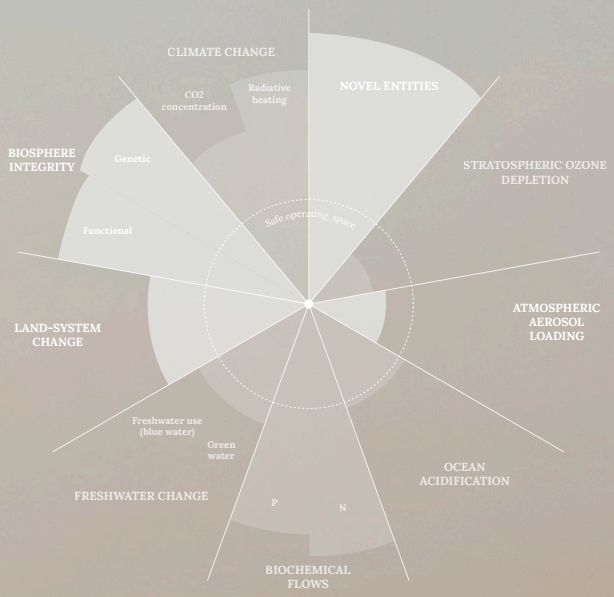
The expansion of Kamsar port caused the loss of 700,000 m² of mangroves in the Bay of Sangaréya. More broadly, Guinea has lost about 32% of its mangroves since 1980, increasing habitat loss, coastal erosion, and exposure to sea-level rise and flooding.

World Bank. (2023)




CLIMATE CHANGE
CO2 concentration
Radiative heating
NOVEL ENTITIES
BIOSPHERE INTEGRITY
Genetic
Functional
STRATOSPHERIC OZONE DEPLETION
Safe operating space
ATMOSPHERIC AEROSOL LOADING
LAND-SYSTEM CHANGE
Freshwater use (blue water)
Green water
OCEAN ACIDIFICATION
FRESHWATER CHANGE
P
N
BIOCHEMICAL FLOWS





Bauxite mining relies on heavy machinery and generates large amounts of mineral dust, causing severe air pollution that enters homes and covers agricultural land.

Di Battista, et al. (2023); Human Rights Watch. (2018)



Maritime transport emits over 1,000 million tonnes annually, accounting for about 2.9% of global GHG emissions, with shipping emissions projected to rise significantly by 2050.

European Commission. (n.d.)


CLIMATE CHANGE
CO2 concentration
Radiative heating
NOVEL ENTITIES
BIOSPHERE INTEGRITY
Genetic
Functional
STRATOSPHERIC OZONE DEPLETION
Safe operating space
ATMOSPHERIC AEROSOL LOADING
LAND-SYSTEM CHANGE
Freshwater use (blue water)
Green water
FRESHWATER CHANGE
OCEAN ACIDIFICATION
P
N
BIOCHEMICAL FLOWS



Guinea's energy system is heavily shaped by mining, with the industrial sector consuming about 48% of electricity and most hydrocarbon imports, driven largely by the rapid growth of bauxite extraction. Furthermore it is made up of significant residential (~46%) and public sector (~6%) consumption.

African Development Bank. (2021)

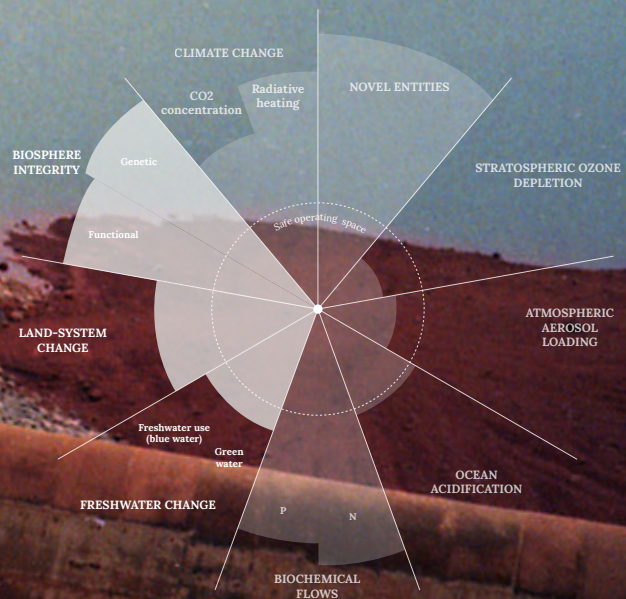




Figure 34. *Garafiri dam, Guinea (Evolutio, n.d.)*

To power Guinea's industry, hydropower projects such as the Souapiti and Kaleta dams flood vast areas of land; Souapiti alone will inundate 253 km², including 42 km² of crops and more than 550,000 crop-bearing trees, while displacing around 16,000 people from 101 villages and hamlets.

Human Rights Watch. (2020)



Guinea has a strong rural identity but is rapidly urbanising, with the rural population declining from 70% in the 1990s to 62.5% in 2023, driven in Boké by bauxite extraction, concentrating growth in towns like Kamsar, Boké, and Sangarédi.

Human rights watch. (2018); ISS (2023)



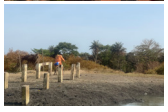

CLIMATE CHANGE
CO2 concentration
Radiative heating
NOVEL ENTITIES
BIOSPHERE INTEGRITY
Genetic
Functional
STRATOSPHERIC OZONE DEPLETION
Safe operating space
ATMOSPHERIC AEROSOL LOADING
LAND-SYSTEM CHANGE
Freshwater use (blue water)
Green water
OCEAN ACIDIFICATION
FRESHWATER CHANGE
P
N
BIOCHEMICAL FLOWS

In Boké, healthcare and education are concentrated in urban cores (company towns). Rural communities have limited access and a dependency on external transport. This, together with education primarily focusing on preparing extraction workers, reinforces low social mobility.

Human rights watch. (2018); CAO. (2026); Higher Institute of Mines and Geology of Boké (ISMGB). (n.d.)





	development conflict		development risk
	1	2	
	Rc		**Water tower of West Africa** *Without protective planning, contamination and over-abstraction at the source threaten the water security of millions of people across the wider West African region.*
	Pc	Rc	**>60% of Boké under mining concessions** *Without spatial planning that reasserts non-extractive land claims, the prefecture risks being locked into a single-use, single-sector territory with no land left for post-extraction futures.*
	Rc		**Rapid deforestation** *Unchecked clearing erodes carbon storage, biodiversity, and the ecological substrate on which any future regional economy must be built.*
	Pc	Dc	**Monofunctional land use** *Without design that safeguards pastoral and subsistence land, traditional livelihoods will be extinguished and rural food systems will collapse into dependency.*
	Rc		**Western chimpanzee decline** *Failure to integrate habitat corridors and protected zones into regional planning risks the extinctions and irreversible loss of forest ecosystem integrity.*
	Rc		**Degraded post-mining soils** *Without planned remediation and soil-rebuilding strategies, mined land will remain unproductive for generations, foreclosing agricultural, ecological, and settlement reuse.*
	Pc	Dc	**Water access and gendered burdens** *Without planning that secures public water infrastructure, communities - and women in particular - will remain dependent on corporate goodwill for a basic human need.*
	Rc	Dc	**Mangrove loss** *Without coastal design that restores and protects mangrove belts, Kamsar and surrounding settlements face accelerating erosion, flooding, and exposure to sea-level rise.*
	Dc	Rc	**Dust pollution** *Without dust-suppression infrastructure, and settlement planning, chronic respiratory disease and agricultural decline will continue to fall disproportionately on host communities.*
	Rc		**Shipping emissions** *Without logistics and supply-chain design that decarbonises export, the region's economic model will remain structurally incompatible with global climate targets.*
	Pc	Rc	**Industrial dominance of the energy system** *Without energy planning that rebalances supply, the region risks entrenching an unjust system in which citizens subsidise industry through chronic underservice.*
	Pc	Dc	**Expansive hydraulic power land cover conversion** *Without planning for diversified and decentralised energy systems the region will remain dependent on large-scale hydropower that drives further land-cover change and community displacement.*
	Dc	Pc	**Rapid extraction-driven urbanisation** *Without urban design that structures growth, mining-linked towns will develop as informal, expansive and service-poor settlements vulnerable to collapse once extraction ends.*
	Pc		**Service concentration in company towns** *Without a regional mobility strategy that connects rural communities, social mobility will remain tied to the mining sector and collapse with it once extraction ceases.*

Pc: property conflcict Dc: development conflict Rc: resource conflict

Safeguard and regenerate the regional water system
Design for the integrity of watersheds, headwaters, and aquatic ecosystems as a transboundary common good, decoupled from industrial control.

Reclaim spatial diversity in a concession-dominated territory
Design to rebalance land use beyond the extractive monofunction, securing space for ecological, agricultural, pastoral, and residential futures

Strengthen ecological networks and biodiversity
Design for connected habitats, protected ecosystems, and species corridors that maintain regional ecological integrity under extractive pressure.

Restore productive capacity to degraded land
Design for the active rehabilitation of mined and damaged soils so that post-extraction landscapes can sustain ecological and human reuse.

Strengthen coastal resilience and ecological diversity
Design to protect and enhance coastal ecosystems as buffers against erosion, flooding, and sea-level rise, while sustaining their socio-ecological functions.

Mitigate the spatial footprint of pollution
Design settlement patterns, buffer zones, and infrastructure so that the burdens of extractive activity are not absorbed by host communities and productive land.

Decarbonise and diversify the regional energy system
Design for distributed, diversified, and low-impact energy infrastructures that reduce dependency on land-consuming systems and align with climate boundaries.

Plan for a just and resilient urban transition
Design urban growth in extraction-linked towns so that settlements can outlast the mining cycle and provide equitable access to services and infrastructure.

Establish a regional mobility and access network
Design a connective spatial framework that links rural and urban communities to diversified services, education, and non-extractive economic opportunities.



The coastal typology



The urban typology



The infrastructural typology



The rural typology

11. The critical environments

The preceding register shows a region under pressure: water, soil, ecology coasts, settlements, infrastructure, and communities are all being reshaped by extraction. Taken together, these risks reveal a deeper pattern in which environmental degradation, spatial injustice, and economic dependency are tightly linked.

A post-extraction future for Boké therefore cannot be addressed through one scale or one lens alone. It requires design across the operational landscape. From this, four critical environments emerge in which risks and design incentives must be addressed: the coastal, the urban, the infrastructural, and the rural.

11.1 The coastal typology

The Guinean coast is the interface where extractive infrastructure, fragile ecosystems, and isolated communities meet. Port expansion has already consumed substantial mangrove belts, exposing settlements to erosion, flooding, and sea-level rise, while coastal villages remain peripheral to the spatial logic of the extractive economy. A design response is necessary to strengthen coastal resilience and ecological diversity, ensuring that the shoreline is treated not as a logistical edge of the mining industry but as a layered socio-ecological system in its own right. Design must reconcile future port development with the protection and enhancement of coastal ecosystems, and integrate isolated coastal communities into a more equitable spatial framework.

11.2 The urban typology

The mining-linked towns of Boké, Kamsar, and Sangarédi are growing rapidly as rural populations migrate toward extractive employment, yet their urban form has emerged as a by-product of industrial logistics rather than as the deliberate outcome of urban design. Without intervention, these settlements risk consolidating as informal, service-poor, and single-sector dependent towns whose viability is tied to the lifespan of extraction. A design response is necessary to plan for a just and resilient urban transition in which growth is anticipated and structured, public services and social functions are diversified, and the spatial fabric of the city can outlast the mining cycle. The urban environment must be designed to host plural ways of living and working, not only those geared to extraction.

11.3 The infrastructural typology

The current infrastructural backbone of the region (energy generation, transport corridors, and export logistics) has been shaped almost exclusively by the demands of bauxite extraction. Industry consumes nearly half of national electricity, large hydropower projects flood vast tracts of land and displace thousands, and shipping emissions tie the regional economy to a carbon-intensive global supply chain. A design response is necessary to decarbonise and diversify the regional energy system through distributed and low-impact infrastructures, and to establish a regional mobility and access network that connects rural and urban communities to diversified services and opportunities. Infrastructure must be redesigned as a public good that serves the whole region, rather than as a service grid for extraction.

11.4 The rural typology

The rural territory of Boké carries the heaviest environmental burden of extraction while receiving the fewest of its benefits. Mining concessions cover the majority of the prefecture, deforestation and soil degradation undermine ecological and agricultural capacity, biodiversity is in retreat, and rural communities face contamination and uneven access to water. A design response is necessary to safeguard and regenerate the regional water system, to reclaim spatial diversity in a concession-dominated landscape, to strengthen ecological networks and biodiversity, and to restore productive capacity to degraded land. The rural environment must be redesigned as a multi-functional landscape capable of sustaining ecological integrity, customary livelihoods, and the long-term regenerative base on which any post-extraction future depends.

Figure 35. *Critical typologies collage*



IV



Part IV. Futuring



drivers
scenarios
assessment

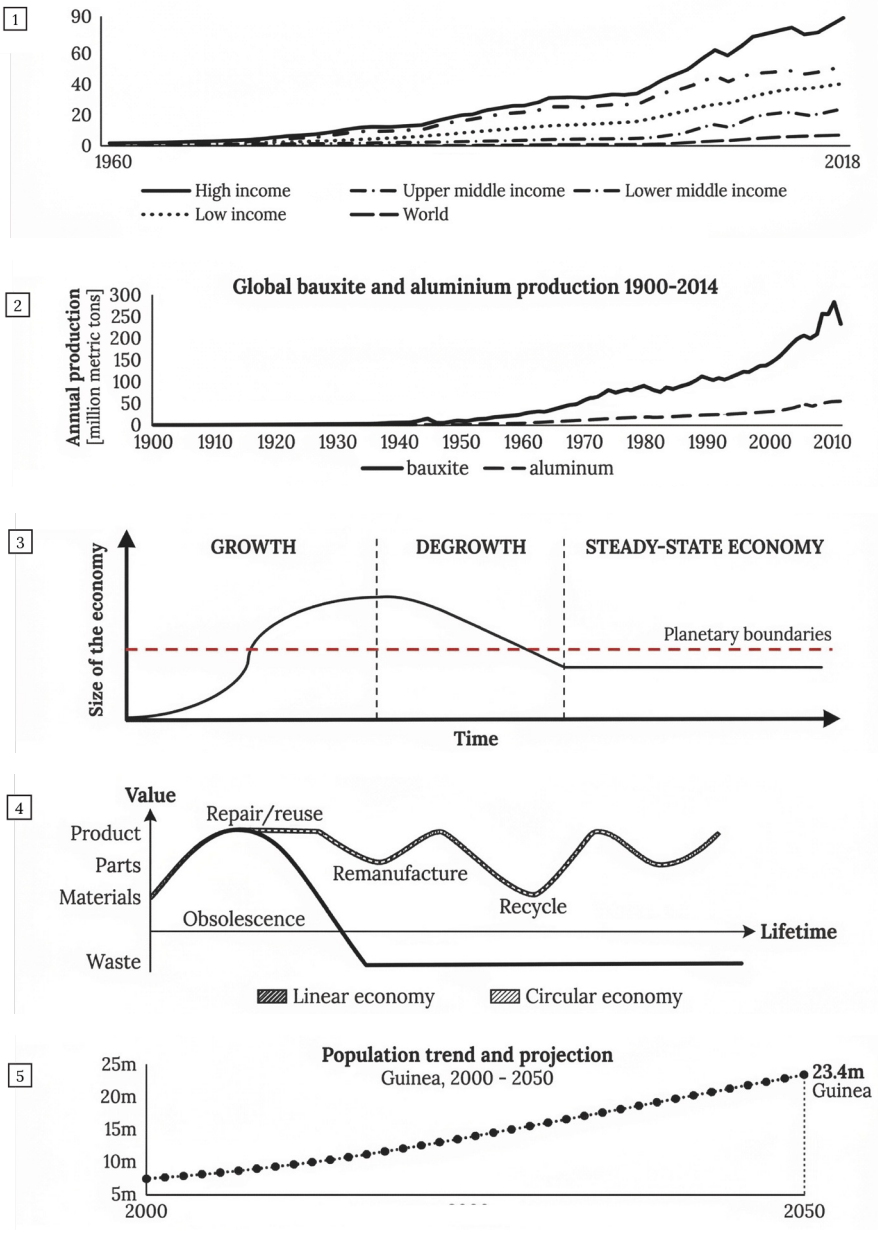


Figure 36. *Collection of projected drivers*

12. Drivers

The future development of any territory cannot be predicted with certainty. This does not mean, however, that preparation is impossible. Many of the forces that shape extraction landscapes lie outside the direct influence of the urbanist. Geopolitical shifts, economic transitions, and changing global demands cannot be fully directed through planning and design alone (good luck to the ones that try).

Yet their possible effects can still be anticipated. For this reason, the thesis does not work towards one fixed image of the future, but towards multiple plausible trajectories. To do so, futuring is applied through a scenario axis composed of two juxtaposed development trajectories with clear spatial implications. These trajectories are driven by tangible forces derived from current global consensus and projected trends. Different combinations of these drivers position the future within one of four quadrants, each representing a distinct but plausible spatial future that could emerge if certain drivers become dominant.

12.1 Driver 1 - capitalist development

Capitalism is not only defined by institutions such as private property or markets, but by a broader set of values centred on securing the highest economic return and continuously reorganising activity when markets, technologies, or opportunities shift. In this sense, capitalist development is not static. It is adaptive, expansionary, and future-oriented (Wells, 2020). Since it remains the dominant economic model globally, it is likely to continue shaping development trajectories unless the wider global order is fundamentally overturned.

For extraction landscapes, this means that crisis does not necessarily slow expansion. Instead, capital searches for new territories, infrastructures, and investment opportunities through what a spatial fix. When existing arrangements become less profitable, development is redirected into new spaces to sustain accumulation and delay devaluation. This produces a continued expansion of railways, roads, ports, industrial zones, and other territorial infrastructures that accelerate circulation and throughput (Harvey, 2001). Within the scenario framework of this thesis, capitalist development therefore acts as a structural driver that pushes futures towards continued extraction and increasing soil consumption.

12.2 Driver 2 - bauxite relevance

More than 90% of global bauxite production is used for alumina, making it the primary basis of aluminium production. Aluminium remains highly valuable because of its low density, strong electrical and thermal conductivity, and high resistance to corrosion (Valeton, 1972). In addition, bauxite is indirectly relevant to other strategic materials. Gallium, which is recovered during aluminium production, has distinctive semiconductor properties and is increasingly important for applications such as light-emitting diodes, solar cells, and aerospace technologies (Yuxin et al., 2025).

Together, aluminium and gallium serve sectors that are expected to continue expanding. As demand grows across automotive, aerospace, construction, packaging, consumer products, and advanced technologies, demand for aluminium and therefore for bauxite is expected to remain high in the coming decades (Mining Technology, 2024). Within this thesis, bauxite relevance functions as a material driver that reinforces the likelihood of continued extraction and the persistence of extraction infrastructures.

12.3 Driver 3 - post-capitalist development

Although capitalist development remains dominant, it is also widely criticised across many fields. Central critiques concern climate change, environmental limits, and the inability of green growth to significantly reduce resource use. One of the clearest alternatives is found in degrowth and eco-economy thinking, which has become influential among environmental scientists and sustainability scholars. This perspective rejects GDP growth as the main measure of success and instead centres well-being, sustainability, reduced resource consumption, and more localised forms of development (Hickel, 2021).

Such a shift would require a major ideological transformation, but it cannot be excluded. Its spatial effect would be a planned reduction in the extraction of natural resources and a move away from endless growth. This would involve downsizing non-essential and ecologically intensive sectors in order to bring human activity back within planetary boundaries (Hickel, 2021). Within the scenario framework, post-capitalist development therefore acts as a driver towards lower soil consumption.

12.4 Driver 4 - bauxite redundance

As the primary ore for aluminium production, bauxite could lose relevance through technological change, circular economy strategies, or alternative material pathways. This could occur either through an industrial breakthrough that reduces the need for aluminium itself, or through a shift in how aluminium is sourced. A major factor is recycling: aluminium can be recycled indefinitely without major loss of material quality, which means that very high recycling rates could substantially reduce the demand for primary extraction from bauxite (Al-Alimi et al., 2024).

Demand could also decline through substitution. In construction and manufacturing, aluminium may increasingly be replaced by other materials such as advanced carbon fibres, plastics, or high-strength steels. In addition, the strategic value of gallium could decrease if next-generation semiconductor materials offer better performance or lower costs. Within this thesis, bauxite redundance functions as a driver towards extraction closure. Its likely spatial effect is the end of extraction activity and stranded infrastructural assets.

12.5 Overarching driver - population growth

Within the temporal horizon of this thesis, this is the one factor that must be anticipated in every possible future. In Guinea alone, the population is projected to increase from 15.4 million to 23.4 million by 2050 (WHO, n.d.). More broadly, West Africa is a major contributor to Africa's wider population surge and is becoming increasingly urbanised, particularly along the coast, where a multi-national coastal megalopolis is emerging.

This growth places additional pressure on infrastructure, housing, and social services, and risks severe shortages without strategic planning. It also intensifies pressure on planetary boundaries and on the distribution of regional resources. Within this thesis, population growth does not determine whether extraction continues or declines, but it amplifies the spatial consequences of both trajectories by increasing demand for land, services, and environmental capacity.

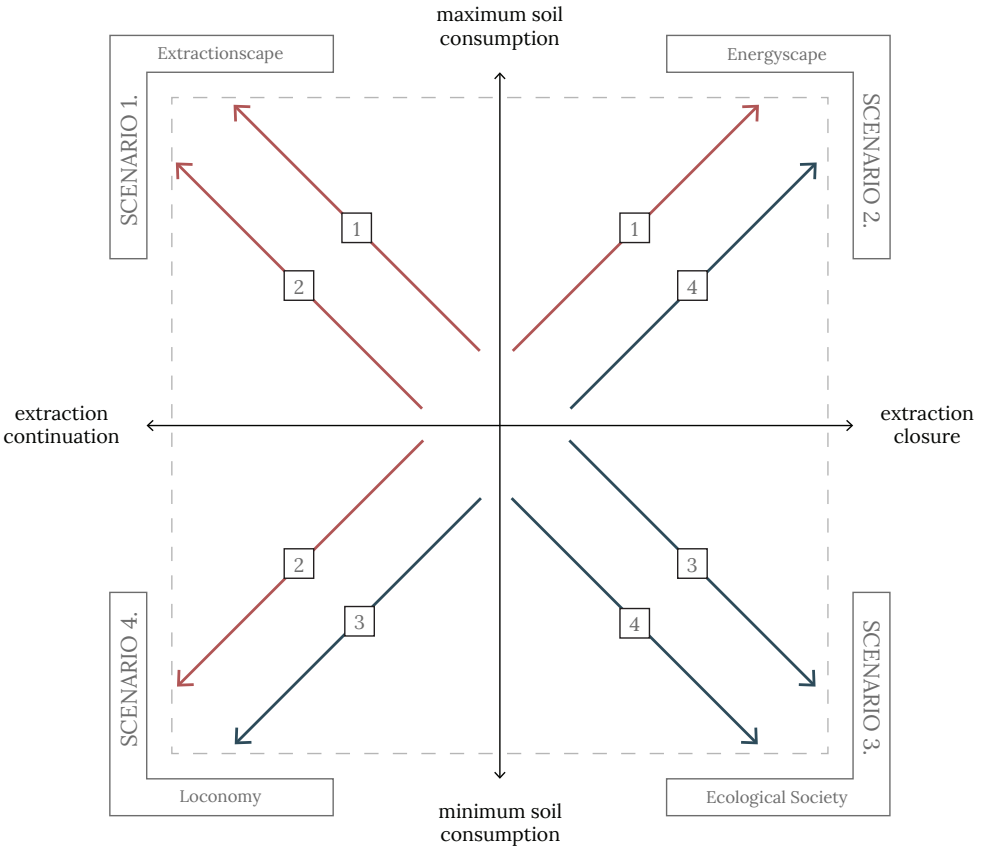


Figure 37. *Scenario axis*

13.1 Scenario 1 — Extractionscape

Capitalist development × Bauxite relevance

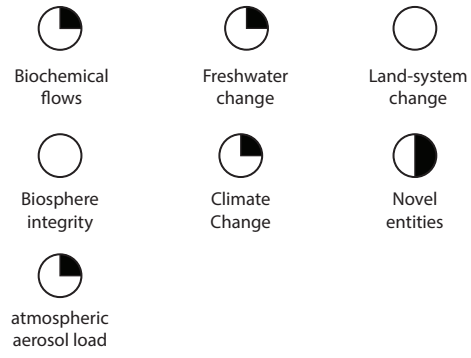
This future continues the current trajectory. Driven by capitalist development's search for new territory through the spatial fix, and by sustained bauxite demand, it pushes towards continued extraction and rising land consumption.

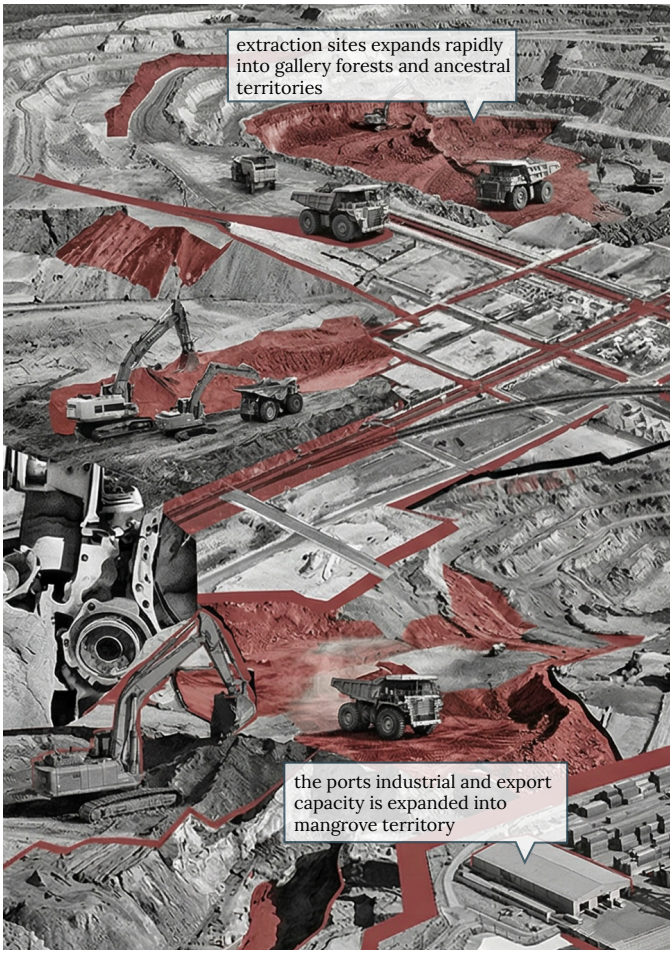
Mining proceeds plateau by plateau. Each plateau is worked for several years before the topsoil is replaced and the land is either returned to agriculture or revegetated, after which extraction shifts elsewhere. In principle, small ecological buffers are maintained around water bodies, headwaters and gallery forests, community water sources, sensitive ecological sites, blasting zones, and port mangroves.

Extraction follows existing corridors until depletion, then extends or opens new ones. Port throughput and processing capacity expand where returns justify it, potentially across borders: current proposals include a new port at Nikine, Senegal, in the Casamance estuary, where Boké bauxite could be shipped and processed. Such a node would concentrate economic value and employment there while shortening the marine route otherwise bound for refining in China.

Energy and water demand rise, requiring new dams for power and retention. Plateau mining fragments villages and ancestral land on bauxite-bearing ground. Population growth is absorbed into company towns, expanding existing urban cores where labour, services, and critical infrastructure (education, healthcare) concentrate. Rising subsistence needs increase both agricultural land use and port-borne imports.







Social justice. This scenario is the most regressive. Plateau expansion fragments villages and ancestral land, transferring de facto land rights from local users to extractive capital, while environmental burdens fall on rural communities and economic benefits concentrate in company towns. Formal buffers persist but are progressively surrounded, eroding the distributional value of remaining commons.

Economic development. Output and value are highest here, but narrowly captured: a deepening single-sector dependency anchored in company towns and export infrastructure, with a possible cross-border node at Nikine concentrating gains externally. Resilience is low — the economy rises and falls with bauxite.

Ecological protection. Weakest of the four scenarios. Land-system change and biosphere integrity face sustained transgression, with freshwater, climate, and aerosol pressures compounding.

Planetary-boundary reading. The ball distribution sits overwhelmingly at the empty-to-quarter end — the lowest aggregate performance of any scenario. Extractionscape maximises economic throughput at the direct cost of ecological boundaries and distributional equity, and so sits farthest from the thesis goal of advancing all three corners within planetary limits.



Figure 38. *Envisioning collage Extractionscape*

13.2 Scenario 2 — Energyscape

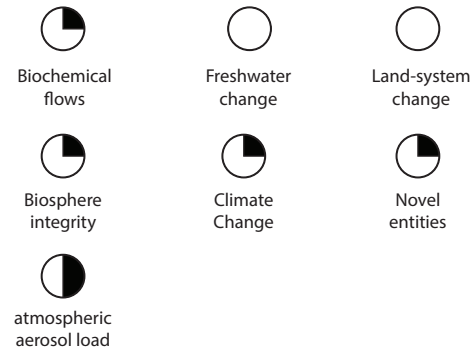
Capitalist development × Bauxite redundance

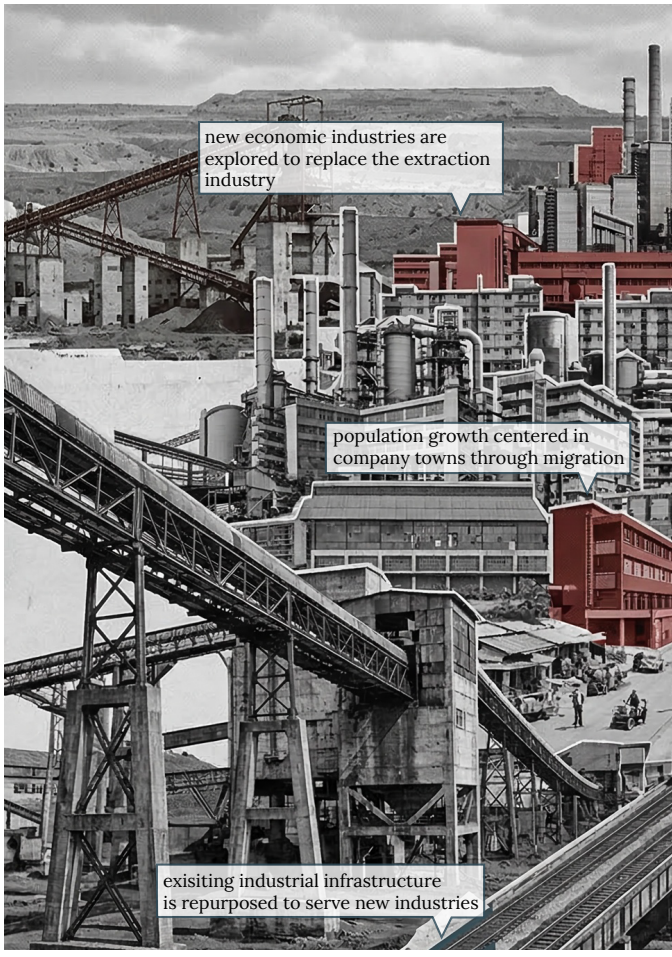
This future is driven by capitalist development under the redundancy of bauxite. Extraction ends as bauxite loses economic relevance, but the capitalist drive for a spatial fix persists. Rather than abandoning infrastructure, capital repurposes it: existing railways, ports, and extraction sites become the basis for new industries and development trajectories.

Old extraction sites are reused for new economic activity: industrial agriculture, iron refining from eastern Guinean ore, or other industries shaped by future conditions. The port retains its import–export function under this new commodity mix.

Guinea's role as the hydraulic core of West Africa becomes central. With major rivers rising in the country, including the Niger and the Senegal, hydraulic potential is developed further through dams and power plants. The energy produced powers new industrial processes and is exported to neighbouring states. This drives land-use change, as reservoirs form around new dam sites.

Population growth is absorbed through continued migration into company towns, now serving these new industries. Subsistence needs rise, increasing agricultural land use and port-borne imports. Because plateau expansion halts, direct encroachment on ecological and ancestral land is limited, but the new industries expand in turn to sustain growth.







Social justice. Marginally less regressive than Extractionscape, but the underlying dynamic is reproduced. The spatial fix migrates to new industries on the same territory, so dispossession recurs in a new form; company towns remain the locus of labour and services, and burdens stay rural while value concentrates around industrial and port nodes. Dam inundation introduces novel displacement.

Economic development. Potentially the most robust of the four in pure output terms, because it diversifies beyond a single commodity: energy export, refining, and agro-industry spread risk across sectors. But the model remains extractive-export in character and continues to externalise costs onto rural and downstream populations.

Ecological protection. A weak improvement over Scenario 1 on land and aerosols, offset by intensified freshwater pressure and possibly higher novel-entity loading. Pressure is redistributed, not relieved.

Planetary-boundary reading. The balls shift from the empty–quarter band towards quarter–half, but freshwater drops to empty. The aggregate signals that ending extraction under unchanged economic logic substitutes one set of transgressions for another. Energyscape advances the economic corner but leaves ecological protection and distributional justice largely unimproved, so it too sits well short of the thesis goal.

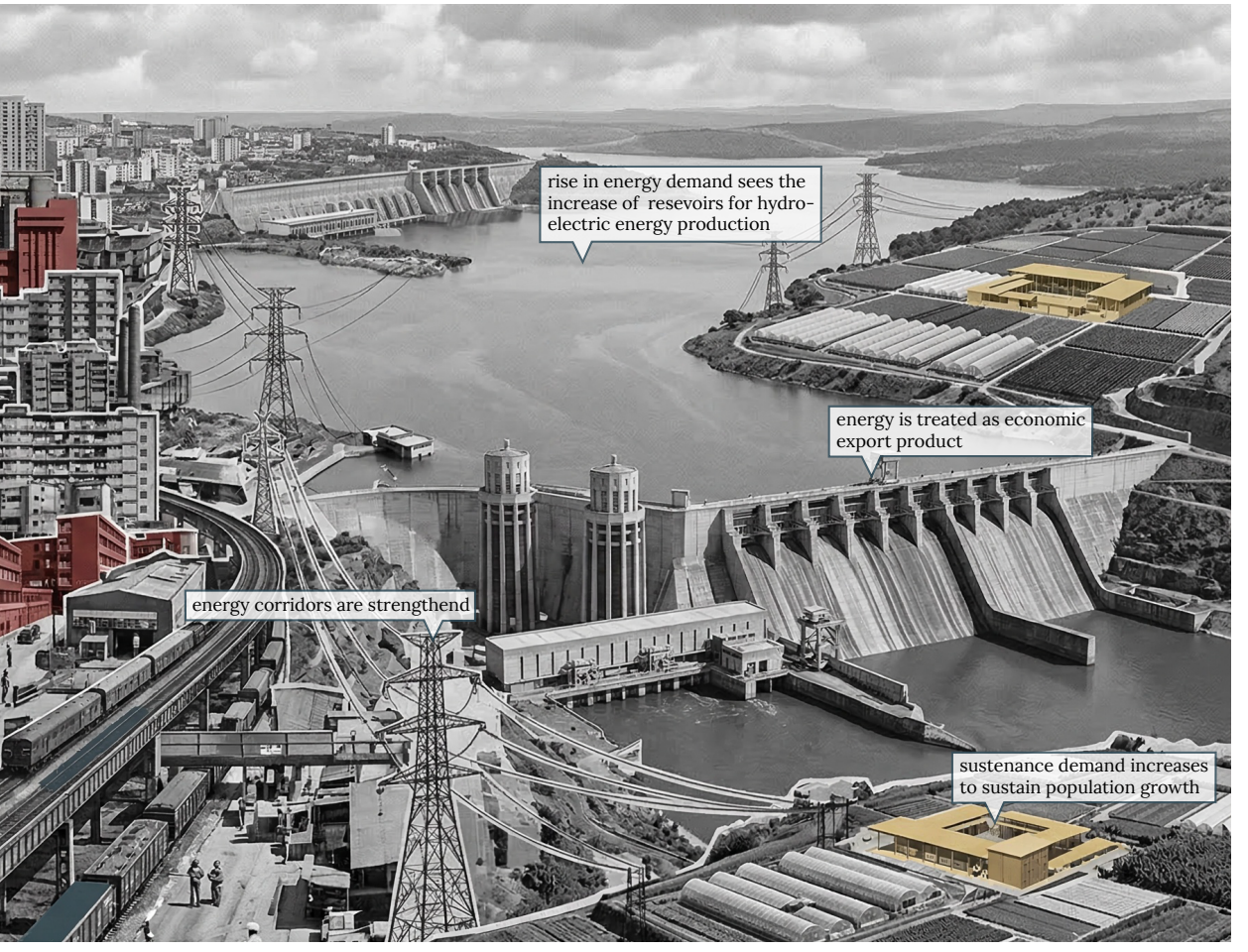


Figure 39. *Envisioning collage Energyscape*

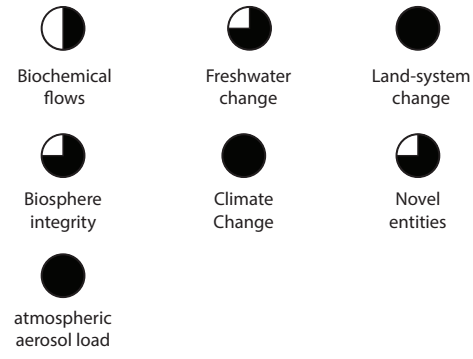
13.3 Scenario 3 - Ecological society

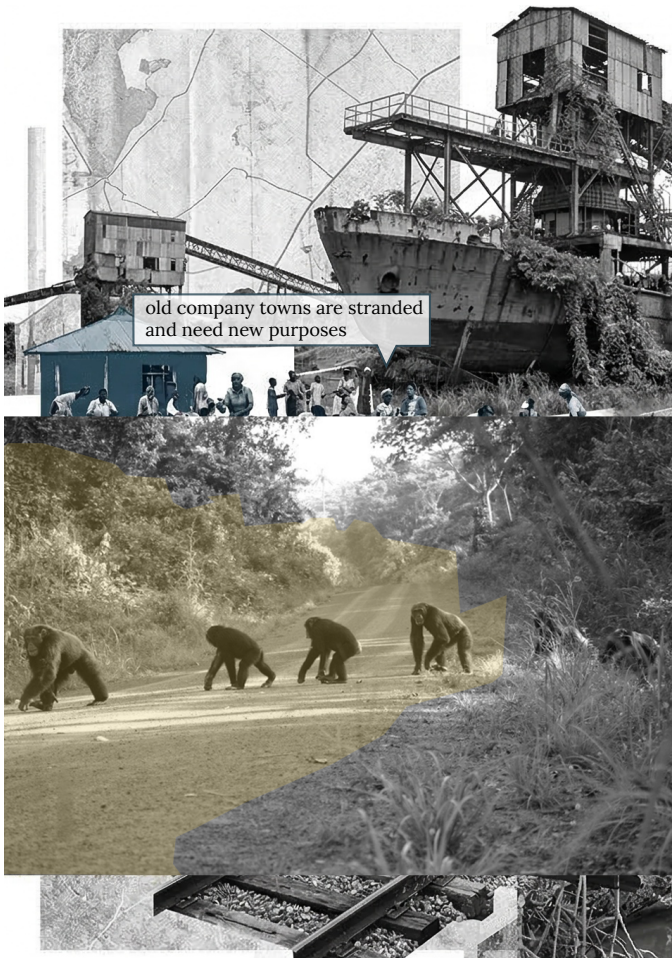
Post-capitalist development × Bauxite redundance

This future combines post-capitalist development with the redundancy of bauxite. Extraction ends, and the growth logic that sustained it recedes with it. Human activity is reorganised to stay within planetary boundaries, producing both lower soil consumption and the closure of extraction. Stripped of mining and of any broader expansionary model, the extraction network loses its industrial function.

Company towns and surrounding settlements no longer depend on extraction or on replacement export sectors. Communities reorganise around self-sufficiency and local stewardship: food production, daily services, and social life are rooted in situated ecological and territorial capacities rather than long-distance industrial circulation. The railway and port lose their purpose, becoming stranded assets.

Post-extraction sites are prepared not for new industry but for ecological and social regeneration. Land is gradually reabsorbed into rural, agricultural, forest, and mangrove systems that support local continuity. Population growth is absorbed not through industrial concentration but through a wider distribution of self-sustaining communities across the territory.







Social justice. The extractive land regime recedes, so the property and resource conflicts that defined Scenarios 1 and 2 largely dissolve, and burdens are no longer concentrated on rural communities. But a new distributional question replaces them: whose vision of ecological regeneration prevails, and where? Conservation or stewardship framings without local authorship would reproduce inequity in a new register.

Economic development. Export-based value and industrial employment effectively end; the economy contracts to localised, subsistence-oriented activity. Resilience to local ecological shocks may rise, but aggregate economic development, by any conventional measure, falls sharply. This is the scenario's central trade-off.

Ecological protection. Strongest of the four. Land, climate, and aerosol pressures are relieved or reversed; biosphere and soil recover, though slowly.

Planetary-boundary reading. The ball distribution is the highest of any scenario, clustering at three-quarter–full, with only biogeochemical flows held at half to reflect slow soil recovery. Ecological society maximises ecological protection and largely resolves distributional burdens, but at a steep cost to the economic corner. It advances two corners strongly while retreating on the third, sitting close to the planetary-boundary target yet failing the goal of advancing all three corners simultaneously.

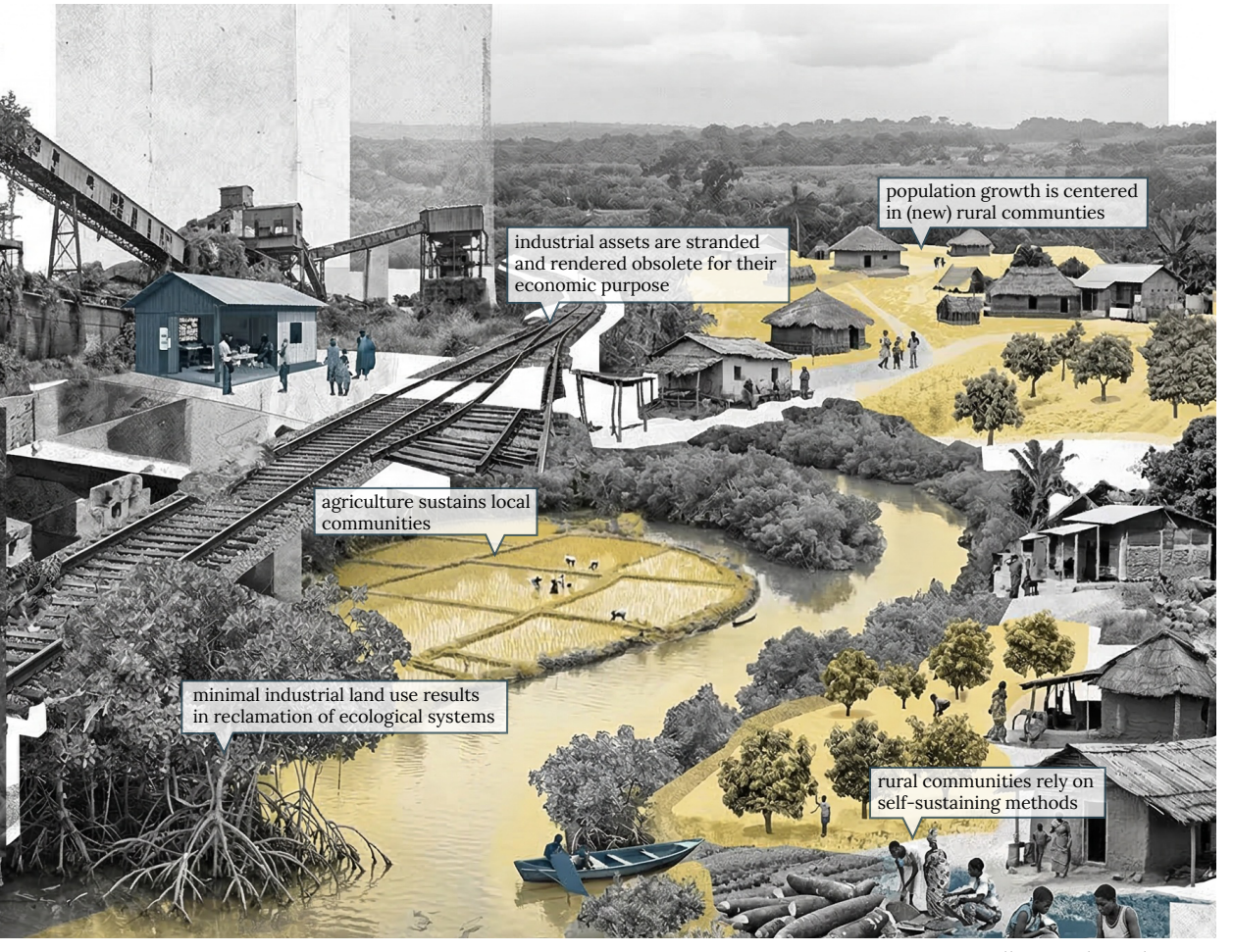


Figure 40. *Envisioning collage Ecological society*

13.4 Scenario 4 - Loconomy

Post-capitalist development × Bauxite relevance

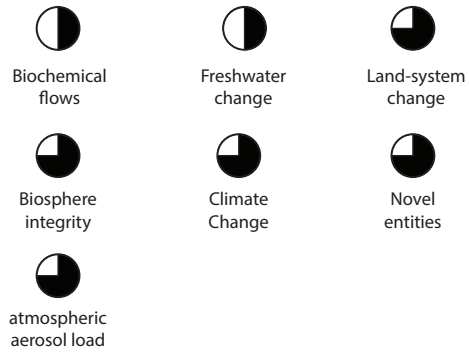
This future combines post-capitalist development with the continued relevance of bauxite. The material remains important, but extraction is no longer driven by endless growth or an expansionary spatial fix. Lower overall consumption slows the pace of mining, allowing ecological regeneration to establish before operations advance.

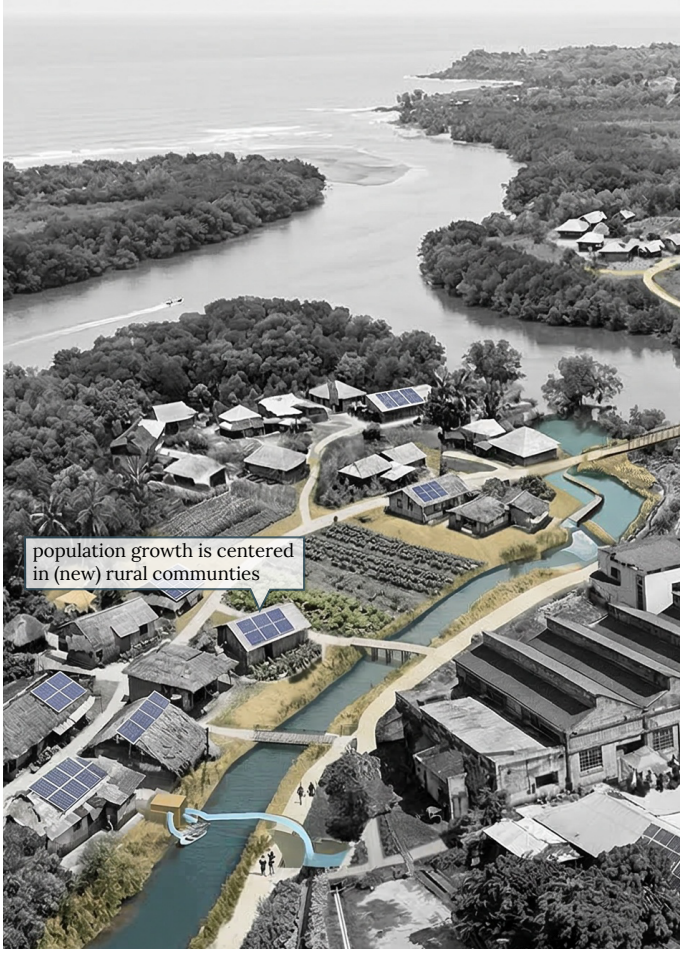
Company towns shift from migration-driven industrial centres to regional urban cores, concentrating cultural life. Population growth is partly absorbed within these readjusted centres and partly into more self-sustaining rural communities in gallery-forest and mangrove zones. These communities draw on sustainable energy, agriculture, and coastal products, increasing agricultural land use and dispersed hydraulic, wind and solar land-use. New rural communities gain stewardship over regenerating post-extraction sites, giving those landscapes social and ecological functions after mining. The railway and port are retained but operate at reduced load as exports and imports decline.

Design selection. Loconomy is chosen because it best aligns with this thesis's aim: advancing all three corners of sustainable development while staying within planetary boundaries. Unlike the other scenarios, which privilege some goals at the expense of others, Loconomy holds them in tension, making it both the most demanding and the most productive setting for design.

It also keeps all four design typologies (rural, urban, coastal, and infrastructural) active, whereas the other scenarios close off one or more. As a result, its design lessons are not scenario-specific. Strategies for stewarding regenerating land, reorienting company towns, or operating infrastructure at reduced load can inform interventions across the other futures as well. Designing for Loconomy therefore offers the broadest transferable insight







Social justice. Property and resource conflicts are softened rather than displaced: extraction operates within ecological cycles, and stewardship over post-mining land introduces shared authority instead of dispossession. The residual risk shifts from concentration of burdens to fragmentation. The danger lies that slowed extraction, agriculture, distributed energy, and rural stewardship fail to align spatially.

Economic development. Moderate and diversified. Bauxite revenue continues at reduced volume alongside agriculture, coastal products, and distributed energy, and value is retained more locally through regional cores. It neither maximises output nor sacrifices it, but sustains a viable, less commodity-dependent economy.

Ecological protection. Strong, though deliberately short of Scenario 3. Slowed extraction with regeneration moderately relieves land, biosphere, freshwater, and biogeochemical pressures without fully reversing them.

Planetary-boundary reading. The ball distribution clusters at half–three-quarter, with no empty and no full balls. The most balanced profile of the four. Loconomy is the only scenario that advances all three corners of sustainable development together while bringing pressures meaningfully within planetary limits. It tops no single dimension, but it is alone in failing none.

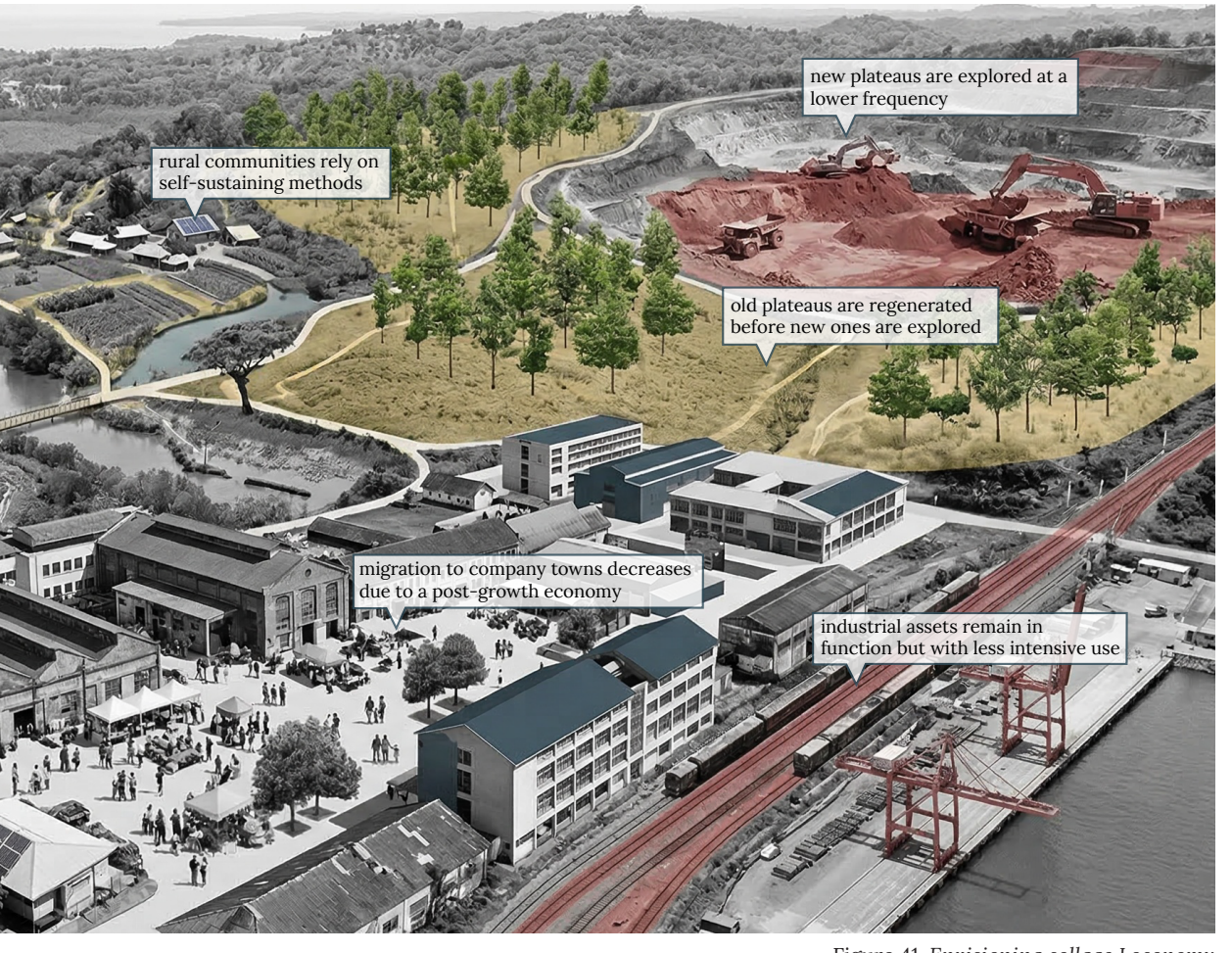


Figure 41. *Envisioning collage Loconomy*

Imaginaries [Guinea]

"Imaginaries are the shared sets of values, institutions, laws, and symbols through which people imagine their collective social life."

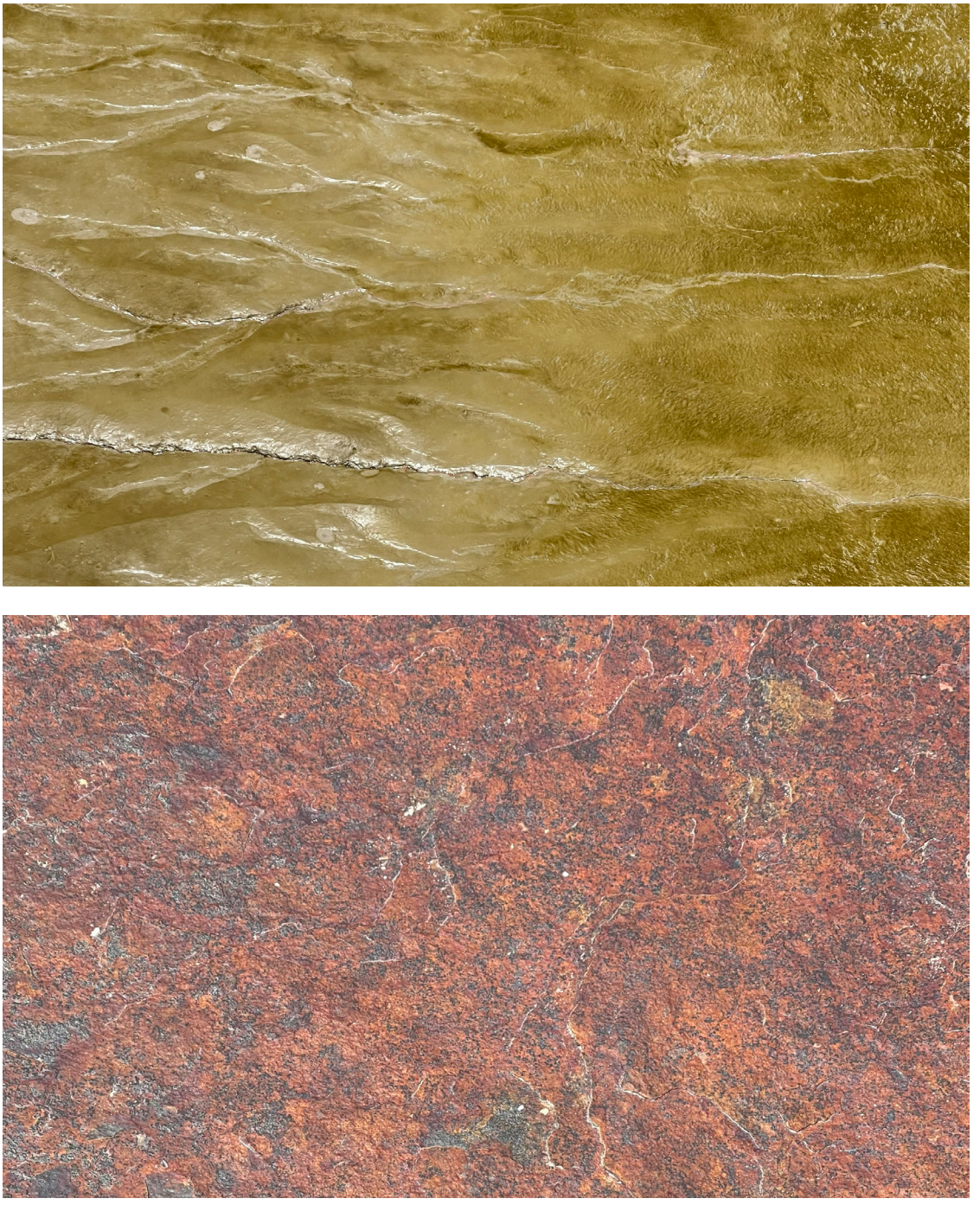
Introduction

It has been almost seven decades since Jane Jacobs reshaped urban planning with *The Death and Life of Great American Cities*. In it she argued that space is best decoded through patient observation of form, use, and design. This typo-morphological reading seeks to reveal the internal logic of spatial patterns rather than their outer appearance.

This chapter takes you with me on the journey I made, and on my own attempt to decode the space I submitted myself to: first in research, and now to inform design.

I have called the chapter *Imaginaries* because, wanted or not, this project has entered me into the social life of its subject, albeit as a silent observer until now. Those observations, together with the encounters and conversations I had on the ground, have shaped my interpretation of the values and unspoken laws we now, in some small way, share through this work. The format follows from this. Each page offers an unfiltered look at what I saw, accompanied by a situated account of how I read it: never objective, always located.

But, before you turn to my words, I want to ask something of you first. Look at the image yourself. Ask what you see, what you feel, or perhaps what you do not feel at all. My assumption is that your reading will never quite match mine, even with everything the earlier chapters have placed before you. That gap is the point. Within the global operational landscape, if interpretation can already diverge this much between you and me, consider the divergence between either of us and the people who have lived their reality, every day, for the whole of their lives.



Dried up riverbed gallery river (top) and
exposed stone formation at the coast (bottom)

Loconomy

"Loconomy is an economic and social concept that focuses on strengthening local economies and stimulating local consumer behavior."

In search of the vernacular

The two images on the previous page hold a quiet opposition. The dried riverbed is fluid and changeable, redrawn with each season; the exposed rock at the shore is rigid and dormant, revealed only by the slow withering of time. The first I see as the register of our habits: provisional, responsive, always being rewritten. The other is the baseline beneath them, indifferent to a single human life. I find myself drawn to the seam where the two meet and set the field trip up accordingly.

My trip was never going to be an objective observation. Every choice I had made up to that point decided what I pointed my camera at and what I left out of frame, and then a second set of choices decided what entered this report. Informed by the futuring and scenario explorations, I went looking for the vernacular: the everyday use of land and resource, and the forms of self-reliance it might already contain. What follows is my reading of the laws and values that govern land use here.



Bucket of salt with
bags of rice



Men in boat with bucket of fish (left)
fish on smoker (right)



Take what you need

Crossing the river into the coastal mangrove, the fishing identity is undeniable. One might argue about the size of the catch, few fish of any formidable scale crossed my path, but never about the quantity. What struck me was the artisanal heritage still alive. The only industrial-grade vessels I saw were two Chinese trawlers, stranded and neglected at the docks. Elsewhere, I stood among people chiselling vast hulls from local hardwood, the kind of timber that would make even a mechanised chainsaw nervous.

Fish are available year-round here, restricted only by closed legal seasons and the mercy of the weather. For the lean stretches, smoking is the widespread means of preservation. There is a lesson in this that I keep returning to: industrial upgrades and cross-global imports look almost redundant when you can take what you need for most of the year and preserve the rest. The economy I was looking for was not waiting to be built, much of it was already here.

Sufficiency hravesting | Seasonal preservation | Self-provisioning



Concious use of soil
Crossing the coastal floodplain, I walked a thin elevated dike that ran for kilometres, holding a safe passage open through low and high tide alike. Along the way I came upon these funnels that caught my eye. They turned out to be instruments of salt extraction: saline soil is gathered and filtered through the funnels to draw out the salt.

What stayed with me was what happens next. The spent soil is not discarded but pressed back into the dike, reinforcing the very road that brought them there. Nothing should be treated as finished after a single use. It taught me that there is rarely only one purpose held in a material, least of all in soil.

Mulit-functional materials | Closed-loop reuse | Zero-waste extraction



Disposed funnel in coastal tidalscape (right)
and active funnels filled with situated soil (left)



Scorched field and rice bags (left)
and car infront of scorched field (right)



[dietary] Monoculture

Further up the river I came across broad scorched fields, cleared and waiting for rice. The method is slash-and-burn, and it divides opinion. Its defenders point to the carbon left behind by the burning, which can enrich the soil; its critics point to what comes after. Soon this ground will carry a single crop, stripped of the ecological variety it once held.

The monoculture does not end in the soil. As I moved inland I began to notice more people, especially children, showing signs of kwashiorkor, sometimes known as "rice belly": a swelling that follows a diet high in calories but starved of protein. I struggled to reconcile it with what I have seen downstream: the abundance of fish along the coast, the cashew trees lining the rivers. Rice, it seems, is simply easier to come by, whether one measures ease in effort or in money. The lesson stayed with me. Abundance, even when it surrounds you, does not guarantee access to it.

Access to resource | Ecological and dietary monoculture | Protein gap



Momentary abundance

I visited at the height of the dry season with the rains planned to begin the day that we left. What I had imagined as a season of scarcity turned out to be the opposite. Large trees were in full flourish, and mangoes were everywhere; too many to eat, so much so that they paved the ground wherever I walked.

It was explained to me that many fruits and crops do not yield in the wet months, just like fishing which turns dangerous in the stormy weather. The rains are when the nutrients are drawn in; the flowering comes after. The pineapples for instance, also common here, flower only as a last resort, a survival measure when sustenance runs low.

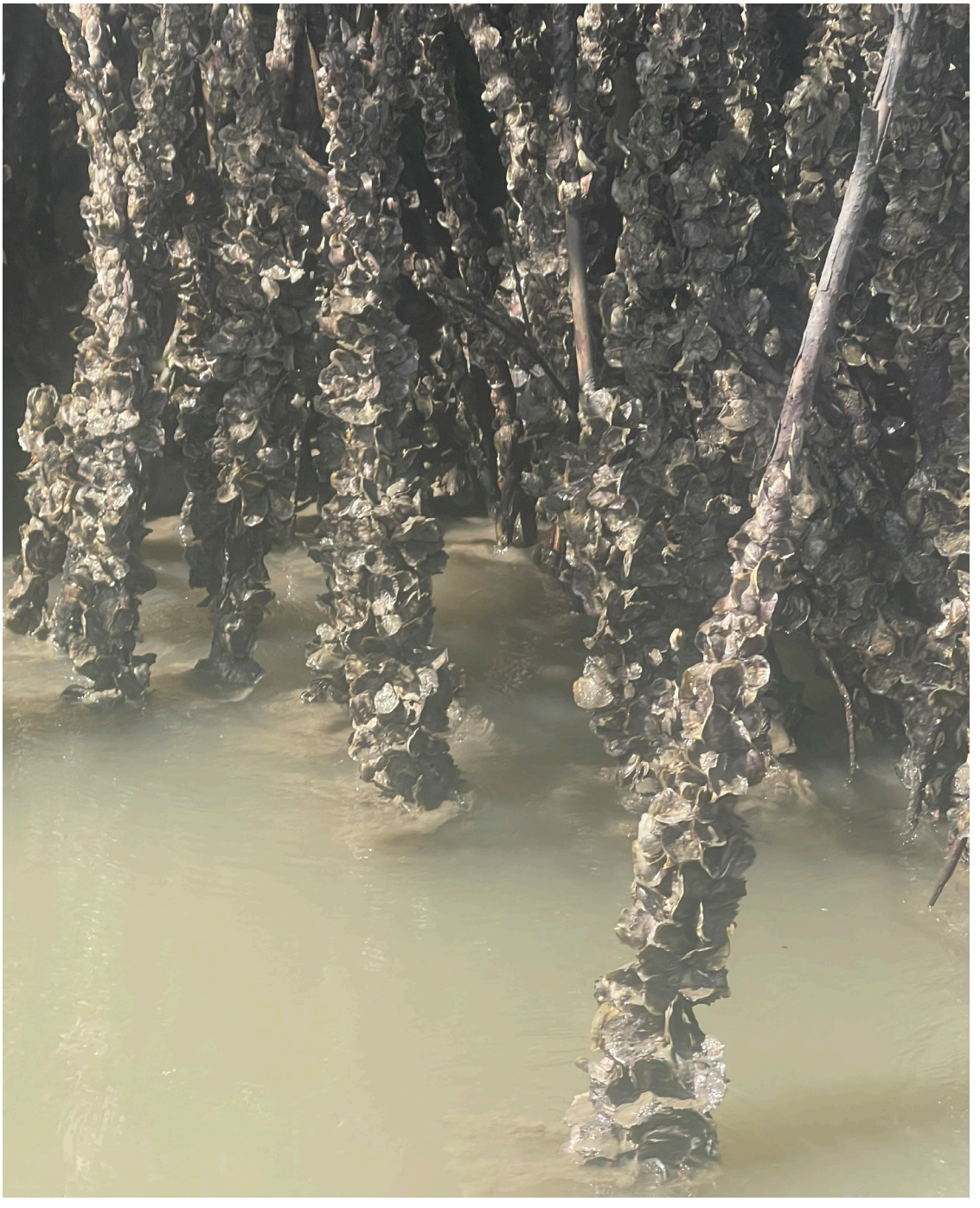
What puzzled me was the absence of preservation. Fish here is smoked and stored against the barren stretches, but fruit, I was told, is not. Looking at the sheer volume on the ground, I found myself calculating: dried or candied, this yield could supply the region across seasons. Yet no such practice exists. The abundance is left to a brief window of flowering, and most of it falls and rots before the window closes.

I left with a sense of unfulfilled potential, but I am wary of assuming the explanation is simply that no one thought of it. My assumption is that it is a accessibility issue; the result of inadequate cold storage infrastructure, poor rural road networks, and a lack of processing facilities.

Preservation gap | Unrealised potential | Seasonal surplus



Mango tree (right) and
women carrying palm fruits (left)



Shellfish attached to mangrove roots in estuary (left)
and heap of disposed oyster shells (right)



Slumbering potentials

This may have been the most exciting find of the trip, partly because I already encountered it in the earliest historical accounts I traced during my research. Even so, I had expected shellfish to occupy a larger place in the regional identity. They never appeared on the inland menus where fish and crustaceans were plentiful. I assume their reach is limited by the same constraints as the mango, since shellfish must be eaten or cooled the day they are harvested.

Reaching a coastal village took the better part of my day: manoeuvring through harbour infrastructure, across the estuary by gondola, and an hour on foot over the tidal flats. There I found heaps of discarded oyster shells. Nevertheless, people passed regularly carrying mango and fish to sell inland, but never shellfish. The shell-heaps read to me as a sign of purely local consumption.

What I cannot stop thinking about is what those shells represent. Beyond being a premium protein that could help counter the deficiency I had seen inland, their calcium-rich shells can be upcycled into a soil amendment for land depleted by bauxite extraction, reintroducing nutrients and regulating soil acidity. I am aware this is my projection more than the village's intention. But set beside the rotting mangoes, it sketches the same picture: a region fragmented into isolated pockets of plenty, each able to amplify the others if produce could move more freely between them.

Waste-as-resource | Upcycling | Latent value by-products



Mindful consumption
Something that stayed with me throughout the trip was the conscious use of materials. The red bricks you see here are dried from a particular soil, that of termite mounds. The mix of earth and termite saliva, I was told, makes the material unusually sturdy.

Then I was told something that shifted my perspective entirely. Local custom holds that a termite mound must not be destroyed unless it will be built with; to break one for nothing would curse the land. What a planner might file under superstition struck me as something deeper, encoded as belief: do not be wasteful. Once I had seen it, I saw it everywhere. In equipment, vehicles, and homes kept and used to the very end of their usefulness.

Non-waste | Licycle use | Material restraint ethics



Man hoisting car (right) and
red brick construction (left)



Concrete hollow blocks (left) and
men and women gathering seashells (right)



Situated building blocks

The photograph above shows people gathering shells from the beach. They are used, I was told, to strengthen the concrete from which homes are built. This I read as a metaphor for the region itself: the the building blocks for situated post-extraction futurues are already here. Why, then, does the country remain so reliant on imports and are mining sites left without a future?

Across all I had seen - the salt pressed back into the dike, the termite bricks, the smoked fish held against the lean season - the same signal kept returning. This is a region that needs remarkably little external input. The materials, the practices, the knowledge are already present. One could only argue that they need to find one another.

Material self-sufficiency | Latent reagional capacity







Seafood platters at fishmarket (top), market gathering near trainstop (middle)
and women selling agricultural products at the side of the road (bottom)

Exchange

"An exchange is the act of giving or transferring something in return for something equivalent — a reciprocal trade, a return, a marketplace, or ... a brief conversation"

Trans-physical boundaries

So how does exchange happen at present? From what I have seen, less by choice than by infrastructure. People exchange either close to the source or along the corridors that connect places, and how much they can exchange depends entirely on their access to those corridors. Without formal, reachable places to meet, situated materials and knowledge stay bound to where they happen to be.

The infrastructure I observed serves an extractive logic: roads built to carry ore from mine to harbour, not to connect a village with its neighbour. This, I think, is the quiet mechanism behind everything I observed. Fragmentation here is not a failure of local ingenuity. A more diversified infrastructure would not create the region's potential, it would simply let what is already there begin to move.

Commune

"A commune is a group of people — families or individuals — who live together, sharing property, wealth, household responsibilities, and labour."

Relationships

The logic of exchange also shaped how I understood the forms of gathering. The countryside is dense with villages of every size, and from what I was told, people generally prefer to live in these strong rural communities. I was told, many work to earn the means to buy a plot and build their own home; those who can keep buying, invite family and the families of friends, so that a settlement thickens over time into a tightly knit whole.

From what I gathered, four typologies recur. The first is introverted: a single household set apart, choosing quiet and closeness to nature over the bustle. The second is communal: one or several extended families, varying widely in size with the means available to acquire land. Both of these hold a tight relation to their land, which provides at once their home and the means of production. The third is the worker settlement: extraction labourers and their families housed close to the mines, where the only bond to the land is shelter and proximity to economic potential. What the women and children do there while the men are at the mines, I couldn't observe during my short trip. The fourth is the regional centre, an urban agglomeration where whatever produce can reach it is exchanged, and where local people and economic migrants mix into larger, diverse communities.

What separates these is not culture but the kind of relationship each holds to the land: as belonging, as production, as mere shelter, or as marketplace.









(from top to bottom) Women carrying rice into house, houses in forest, mineworker housing-complex and town near extraction site

Incursion – Bauxite and Enterprise

"An incursion is a sudden, often brief, or unwanted entry into a territory, domain, or activity. It typically refers to a hostile or unauthorized crossing of a border, but it can also refer to a sudden expansion or involvement in a new area."

A momentary blip

In settling on how to read Guinea's bauxite industry, I arrived at the word *incursion* for three distinct reasons. The first is temporal. In the historical analysis I felt how thin a slice of situated time the bauxite enterprise actually occupies. Set against the vast history of its locale, the practice registers as a momentary blip. The second is directional: the global operation of critical minerals is something entering Guinea's situated reality, not emerging from it, spreading into new territory to sustain a global process. The third is that, in so short a span, it has already crossed borders of consequence: those of the planetary boundaries, and those of one-sided development trajectories that take far more than they return.

The earlier chapters have already exposed much of this, and my trip largely confirmed it. Still, I want to hold space here for how I experienced the disparity of development on the ground as something experienced rather than argued.



Bauxite treadmill and
road disappearing in countryside



Disparity of water

These images show the contradiction at the heart of the mining corporations' relationship to water. In one, water-security infrastructure is seen, clustered around a mining core. The phrase on it reads, in translation, "*Security, above all else.*" Then, in the other image, a truck sprays down the haul road that carries bauxite from mine to harbour, suppressing the dust and compressing the road. I saw the water for this being drawn from local river branches, depleting and polluting them in the process.

The asymmetry I saw is plain. Those in the urban cores draw on secured sources, rural communities near the extraction sites must travel for theirs. I watched people cross vast stretches of a mined landscape carrying containers in search of water. Many have no motorised transport and depend on infrequent buses or on walking. For this, they traverse roads dominated by bauxite trucks paid by the load and driven, by that logic, to their limit. With no formal crossings and no lighting after dark, the danger is constant. During my short time in the region, I saw two overturned trucks and heard accounts of protests after pedestrians had been struck and killed, during which communities blocked the road and set trucks on fire.

Resource asymmetry | Mobility division | Situated depletion



Truck spraying water on road (left),
water tower behind trees (right)



Houses near extraction site (top) and
houses near the port of Kamsar (right)



Disparity of benefit

This same logic carries into other domains of development. I did see a clear imprint of mining capital on the region, but I saw as well that it was concentrated rather than evenly spread. In one image, housing built by the mining corporations near the harbour: clean, ordered, planned. In the other, homes at the frontier of extraction: dusty, makeshift, worn.

I do not want to dismiss the benefit. Capital has arrived, and its positive effects are real and deserve acknowledgement. But alongside them I have to record what I felt at every scale I observed: that access to those benefits was profoundly uneven, settling close to the points of export and thinning with every kilometre toward the people on whose land the extraction depends.



Thrash in front of traintracks (left) and
man walking on tracks (right)



Disparity of opportunity

I want to return one last time to the influence of one-sided infrastructural development. I witnessed corridors of state-of-the-art rail being laid by the mining corporations, built for the movement of ore. There was some public use, but it was minimal, and confined to the route that best served extraction.

I want to state the consequence plainly, as I did before: I believe that infrastructure of this kind does not open the region, it channels it. Built to carry resource outward along a single line, it leaves the lateral connections. Village to village, produce to market and knowledge to knowledge exactly as absent as before. The most advanced infrastructure I saw in Guinea was, in the end, not built for Guinea.

One-sided infrastructure | Export channel vs. lateral connection


V

Part V. Design



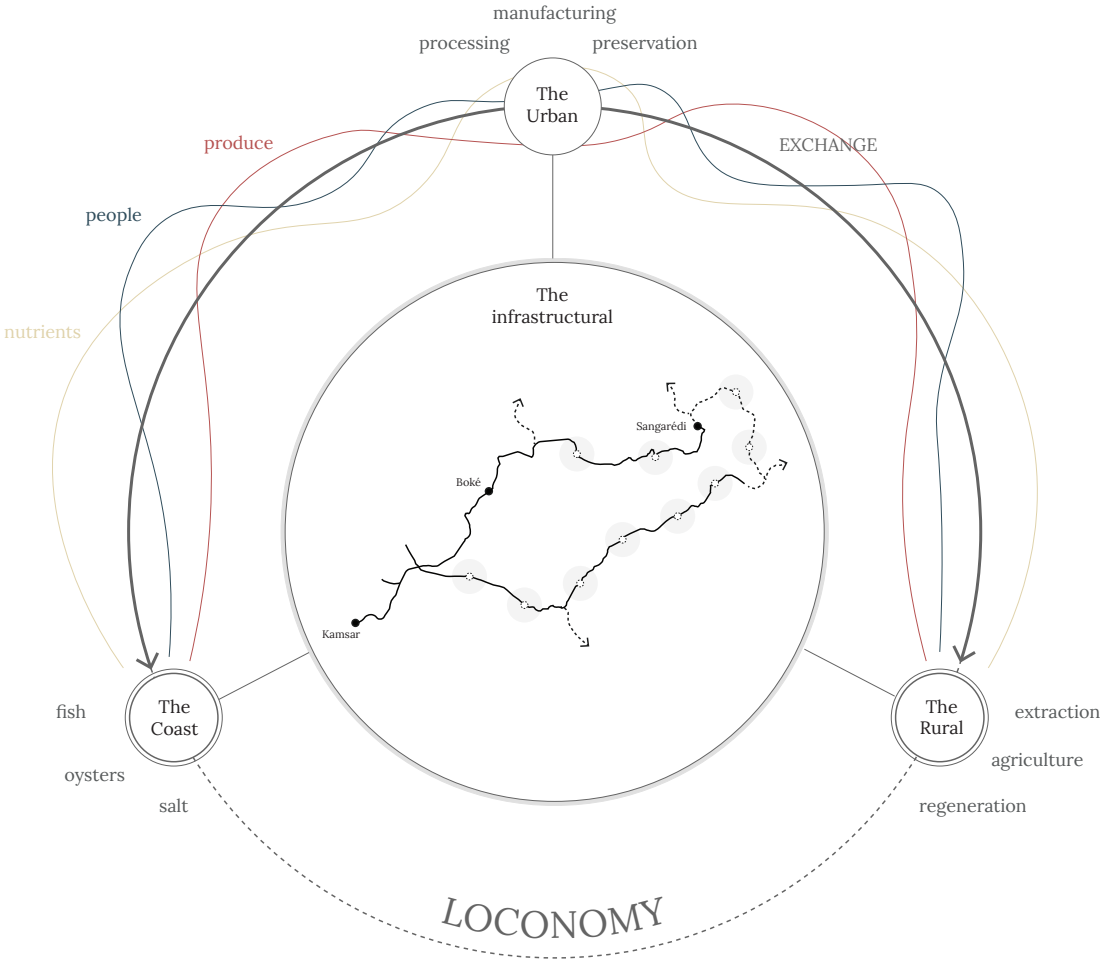
system thinking
loconomy - the coast
loconomy- the urban
loconomy - the infrastructural
loconomy - the rural
backcasting

14. System architecture Loconomy

Through the lens of Loconomy, the design proposes an alternative to the current bipolar development trajectory in Boké. Grounded in the situated fieldwork and drawing on the imaginaries developed in the previous chapter, it takes shape not as a masterplan but as a systemic metabolism: a network of processes and of material and immaterial relations among human and more-than-human actants. The following pages trace how these relations are configured across the critical typologies.

The design shows how development, when attentive to situated potentials, strengths, and demands, can foster symbiotic relationships and emancipation rather than reproduce a one-sided trajectory or a capitalist spatial fix. It is offered as a proposition to the governments and authorities responsible for regional development: an invitation to re-evaluate their methods and to open their perspective to the possibility that progress and resilience need not depend on ever-expanding industry and ever-extending spatial claim. Once the situated social, ecological, and industrial values of a territory are recognised, much of what is sought through expansion can be put in place by other means, prioritising long-term systemic sustainability over short-term cycles of expansion and contraction.

Figure 42. *Systemic diagram Loconomy*


manufacturing
processing
preservation
The Urban
produce
EXCHANGE
people
nutrients
The infrastructural
Sangarédi
Boké
Kamsar
fish
The Coast
oysters
salt
The Rural
extraction
agriculture
regeneration
LOCONOMY

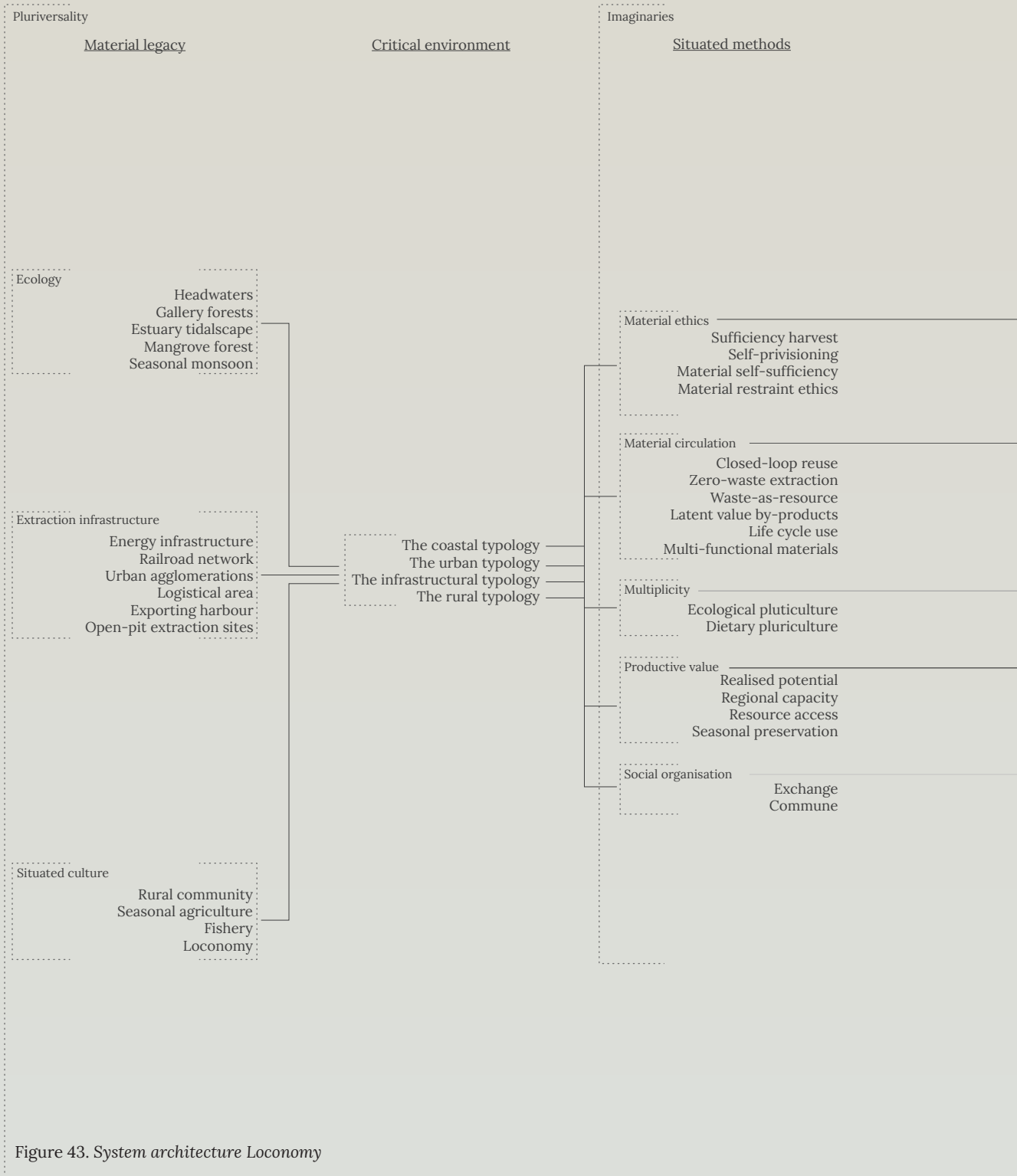
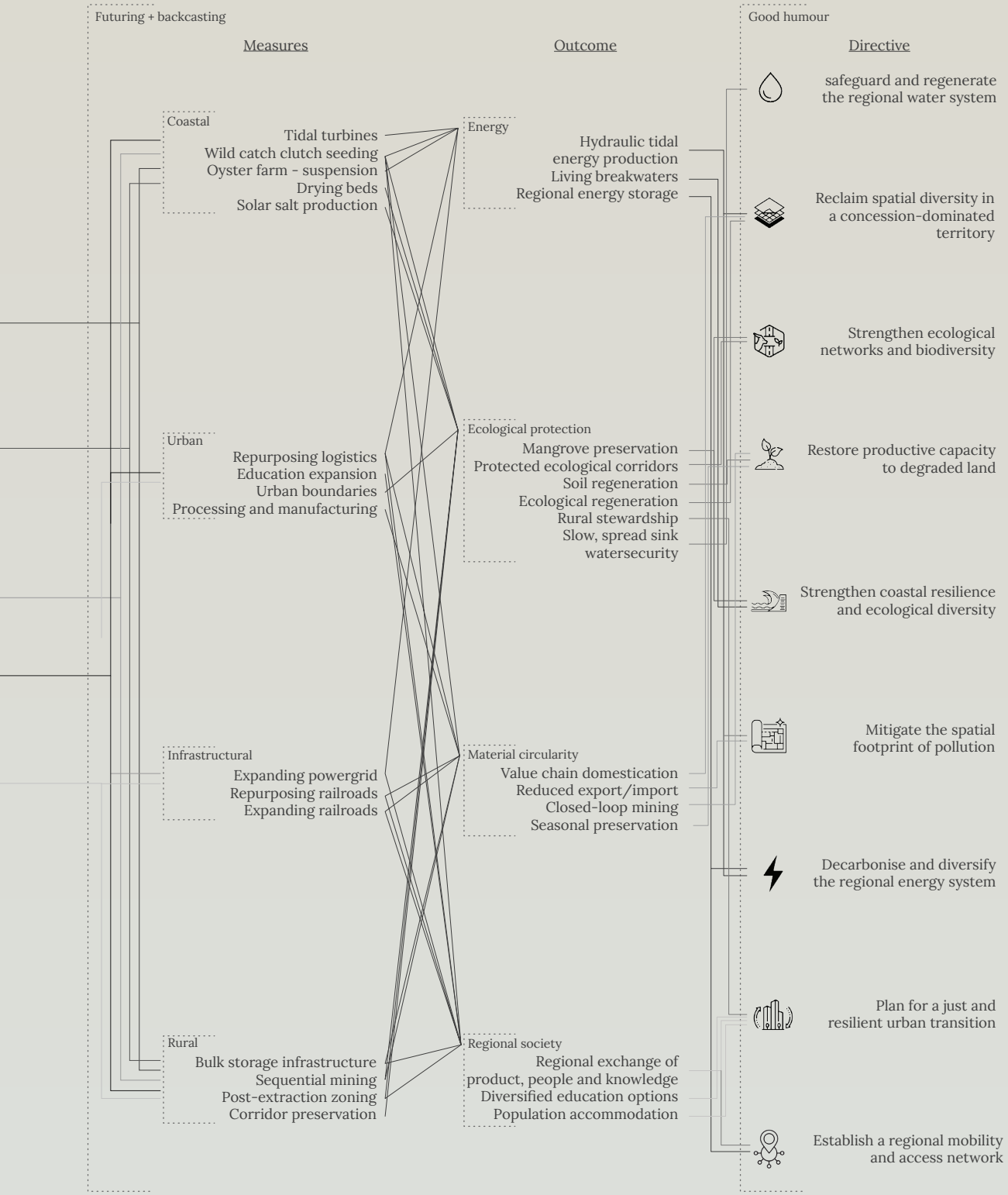


Figure 43. *System architecture Loconomy*


Futuring + backcasting
Measures
Outcome
Good humour
Directive
Coastal
Tidal turbines
Wild catch clutch seeding
Oyster farm - suspension
Drying beds
Solar salt production
Urban
Repurposing logistics
Education expansion
Urban boundaries
Processing and manufacturing
Infrastructural
Expanding powergrid
Repurposing railroads
Expanding railroads
Rural
Bulk storage infrastructure
Sequential mining
Post-extraction zoning
Corridor preservation
Energy
Hydraulic tidal energy production
Living breakwaters
Regional energy storage
Ecological protection
Mangrove preservation
Protected ecological corridors
Soil regeneration
Ecological regeneration
Rural stewardship
Slow, spread sink watersecurity
Material circularity
Value chain domestication
Reduced export/import
Closed-loop mining
Seasonal preservation
Regional society
Regional exchange of product, people and knowledge
Diversified education options
Population accommodation
safeguard and regenerate the regional water system
Reclaim spatial diversity in a concession-dominated territory
Strengthen ecological networks and biodiversity
Restore productive capacity to degraded land
Strengthen coastal resilience and ecological diversity
Mitigate the spatial footprint of pollution
Decarbonise and diversify the regional energy system
Plan for a just and resilient urban transition
Establish a regional mobility and access network

14.1 Loconomy - the coastal role

The coast is preserved, but put to work. All mangroves are protected, while a coastal sufficiency economy develops around them: fishing, solar-salt production from saline soils, and suspended oyster farming. The oyster system runs as a multifaceted closed loop and acts as a cornerstone of the region. The shells are cleaned, dried, and returned to seed production or sent inland to convert in agricultural fertiliser. The oyster infrastructures double as living breakwaters, shielding the shore from surge and erosion. Through a placing with strategic clearings they concentrate tidal flow through a Venturi effect. Tidal turbines convert the flow and add to the regional energy mix.

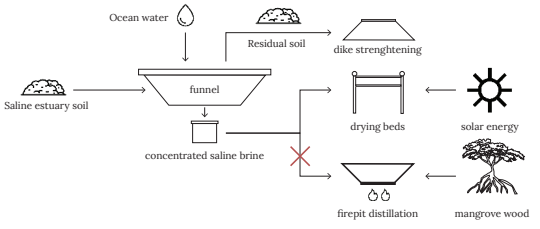


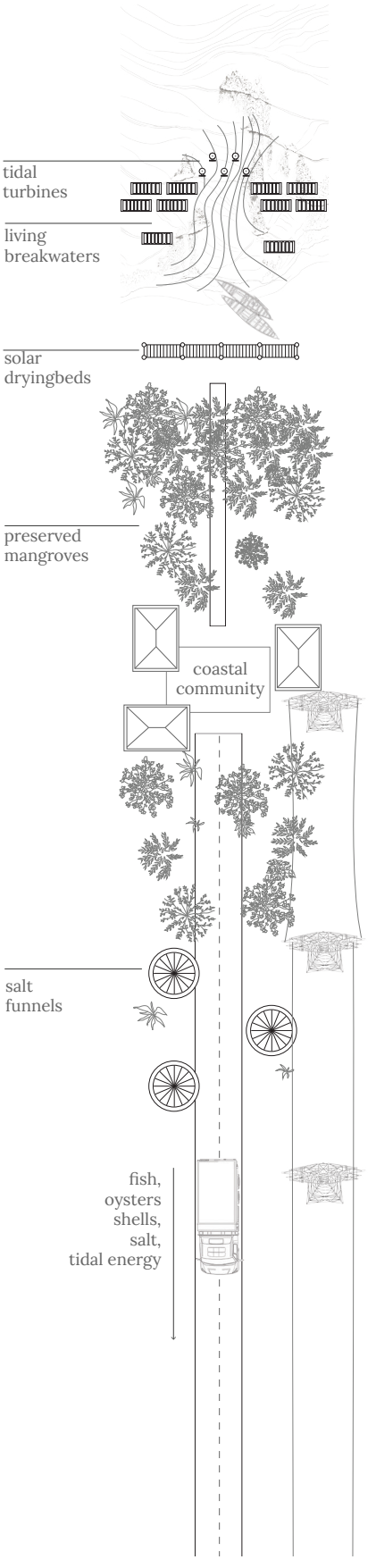
Figure 44. *From soil to salt - Loconomy processing*

Reclaim spatial diversity in a concession-dominated territory
Return of coastal productivty with energy, shellfish and fish.

Strengthen coastal resilience and ecological diversity
Mangrove preservation, coastal strengthening through living breakwaters.

Mitigate the spatial footprint of pollution
Port expansion limit, mangrove protection. Solar-salt production replaces mangrove burning wood.

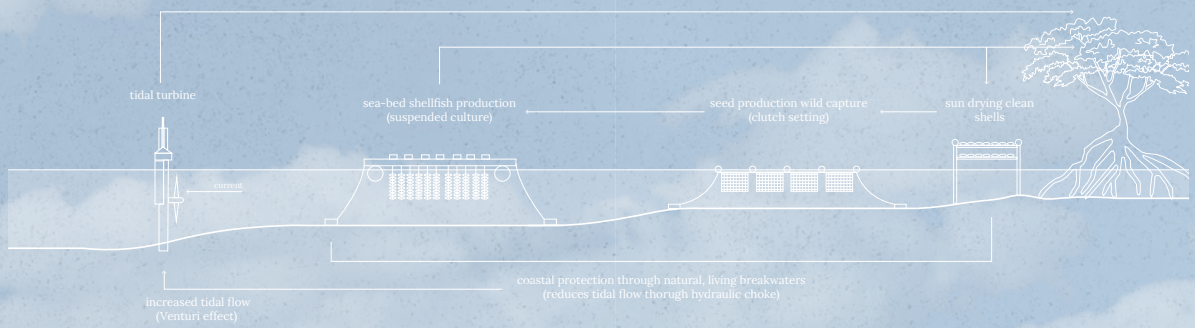
Decarbonise and diversify the regional energy system
Tidal and wind energy replace fuel generation.



Tidal energy potential
$E=\frac{1}{2}\rho g A h^2 \approx 6{,}11 \times 10^{14}$ J
$P=E/t \approx 27{,}5$ GW

E is the potential energy in Joules (J)
P is the potential power in Watt (W)

ρ is the density of seawater in $kg/m^3 = 1025\ kg/m^3$
g is the acceleration due to gravity = 9,81 m/s^2
A is the horizontal surface area of the bay in square meters (m^2) = 4858000000 m^2
source: (Brown, A., & Thieme, M., n.d.)
h is the tidal range in vertical height between low and high tide in meters (m) ≈ aprox. 5 m
t is tidal circulation time in seconds (s) ≈ 6 hours and 10 minutes = 22200 s
source: (Tideschart, n.d.)





14.2 Loconomy - the urban role

Growth is held within existing cores; no new sprawl. Each centre takes on a distinct regional role. Kamsar remains the port for strictly necessary trade, its fuel generator replaced by a green energy station redistributing tidal, wind, and solar power. The former export logistics are repurposed to process coastal products and produce fertilisers from shells, fish scraps, and sea salt. Boké becomes the region's pivot through its exchange market for coastal, agricultural, and social products, and its diversified education centre. Sangarédi, the former mining town, is given a second life as the inland gateway and processing hub for bauxite and agricultural goods.



Figure 45. *Contemporary urban grain - low density sprawl*

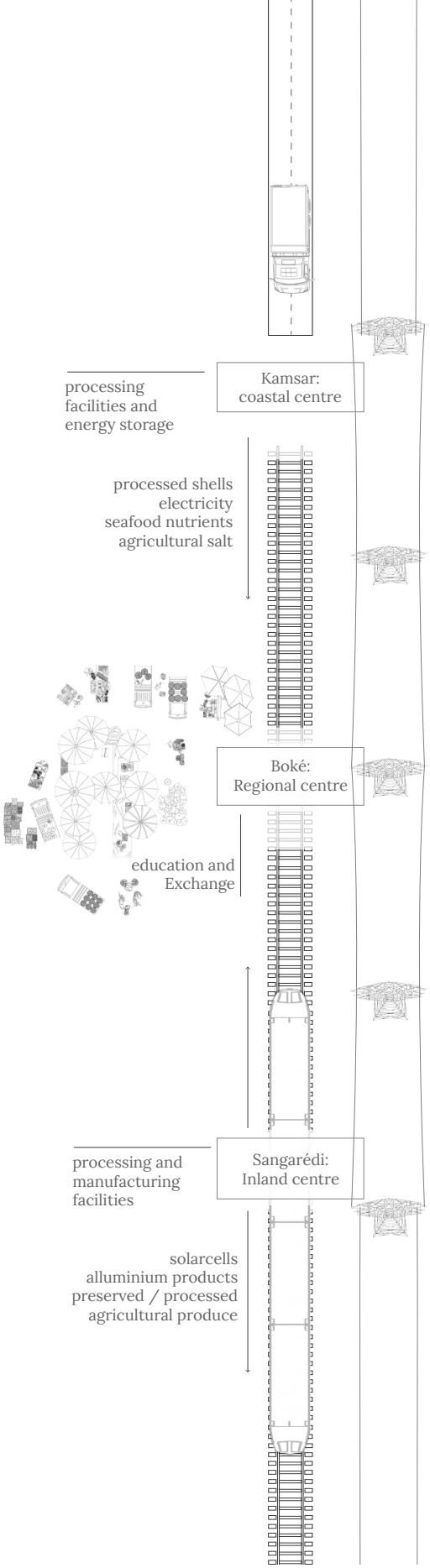


Figure 46. *Densifying potential on same soil*

Strengthen ecological networks and biodiversity
No-go zones, densification instead of sprawl leaves space for ecological land use.

Plan for a just and resilient urban transition
Education beyond mining sector, opportunity of formal regional exchange, processing and manufacture.

Establish a regional mobility and access network
Urban cores as accesible center points.





14.3 Loconomy - the infrastructural role

Movement binds the region together. The railway, once dedicated to bauxite, is expanded and opened to people and produce, linking village to village to urban core, with frequent shaded stations that double as sub-regional points of first aid, gathering, and exchange. All ore now travels by rail, clearing the roads of heavy polluting truck traffic, while rural roads are strengthened, lit, and made safe. The lighting draws on an expansive rural energy network carrying tidal, wind, and solar power to every corner of the countryside. Connectivity becomes the condition for exchanging goods, knowledge, and social life.

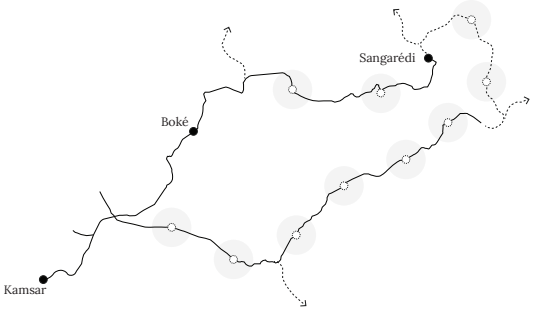


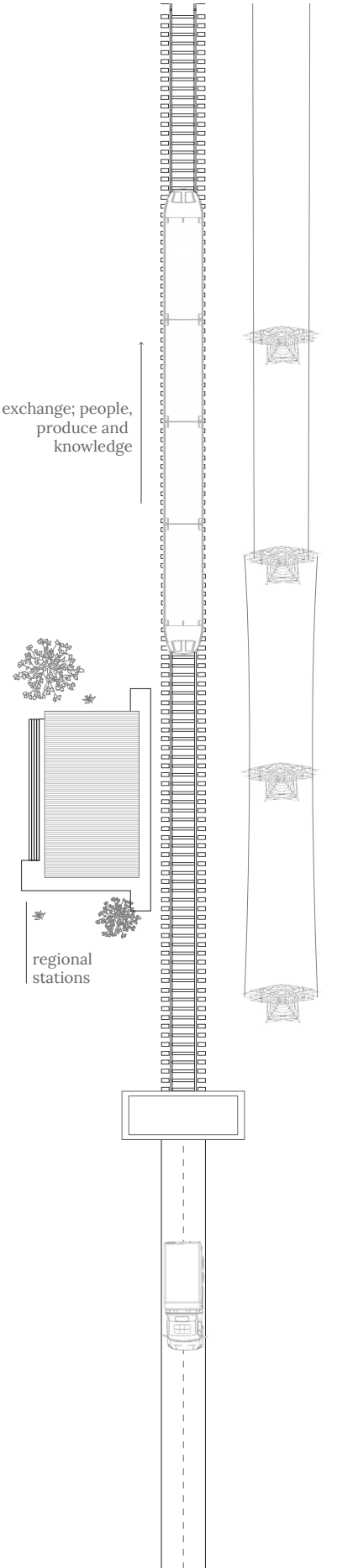
Figure 47. *Regional exchange potential*

Strengthen ecological networks and biodiversity
Reduced mining traffic results in less environmental pollution. Green, centralised alternative.

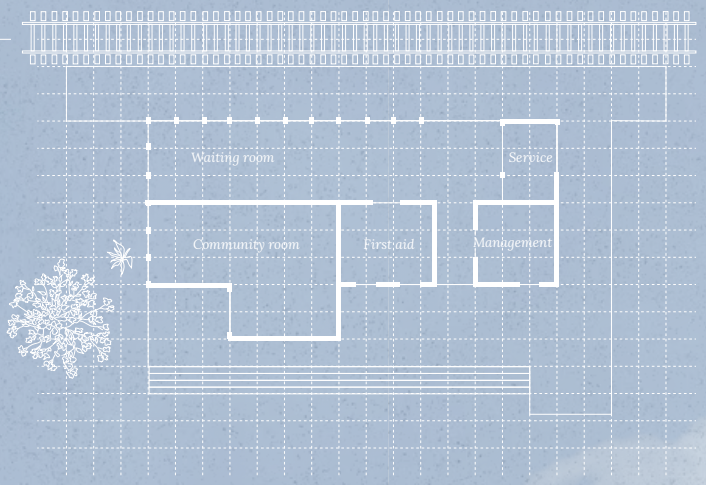
Mitigate the spatial footprint of pollution
Reduced mining traffic results in less environmental pollution. Green, centralised alternative.

Decarbonise and diversify the regional energy system
Transition to green transportation and energy infrastructure.

Establish a regional mobility and access network
A connective public transport network that links rural and urban communities to exchange diversified services, education, and non-extractive economic opportunities.



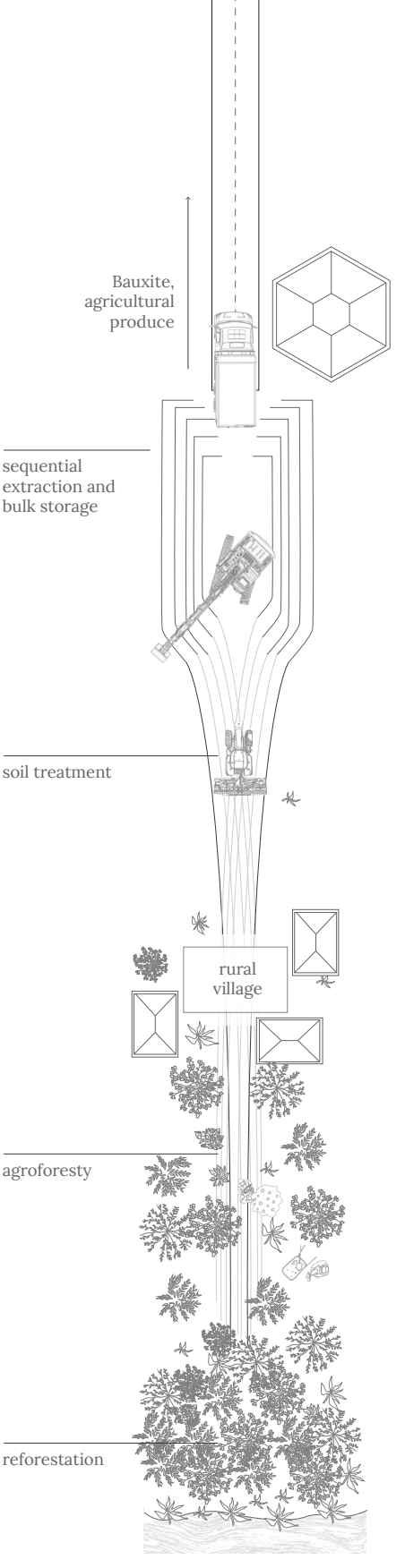
1.people
2.produce
3.bauxite
in that order...





14.4 Loconomy - the rural role

The countryside interleaves slowed extraction with ecological recovery. Critical ecological corridors are fixed and kept free of settlement and mining, securing long-term vitality. With global demand reduced, mining expands only as previous sites regenerate, and ore moves by rail on a fixed schedule, buffered by modular bulk storage near loading docks. Regeneration follows a sequential method: scarring compacted soil, building water infrastructure, generating biochar and wood-ash, fertilising with help from coastal inputs, and planting pioneer species. Thereafter, each site is zoned for its future: introverted stewardship, communal agroforestry, or a new rural village. The aftermath of extraction becomes the ground for regenerative rural life.



Safeguard and regenerate the regional water system
Slow, spread, sink and shade. Water infrastructure, canals, aquifer holes.

Reclaim spatial diversity in a concession-dominated territory
Stewardship models return agricultural and ecological functionality.

Reclaim spatial diversity in a concession-dominated territory
No-go zones in relation to ciritcal ecological corridors

Restore productive capacity to degraded land
Sequential mining model results in regenerated fututre proof soils.

Mitigate the spatial footprint of pollution
Bulk storage or produce allow for planned transport replacing trucks.

1 extract

2 scarify

3 slow, spread and sink

4 slash and burn

5 regenerate

6 populate

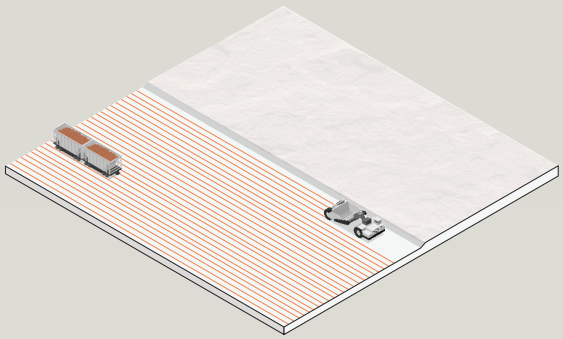
7 zoning



15.4.2 Loconomy - Sequential extraction

Bauxite ore; sent to Sangarédi alluminium and gallium processing and manufacturing facilities

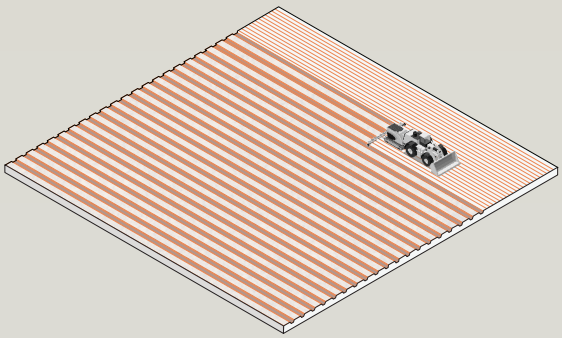
Step 1 - Extract



Effect: Compacted soil with high acidity and nutrient deficiencies

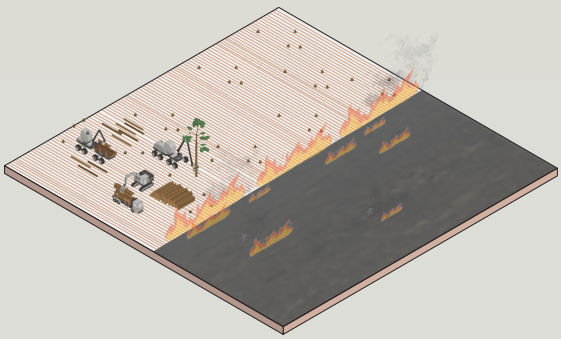
Mining instruments are equiped with plowing attachments at final run

Step 2 - Scarify



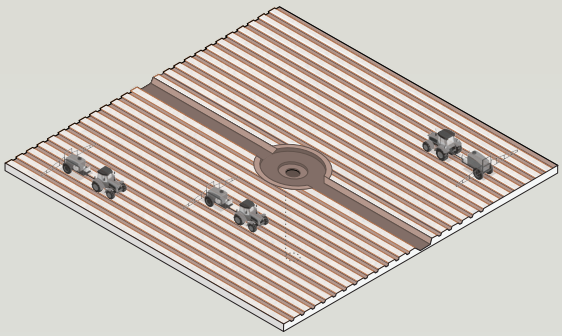
Effect: Increased soil permeability for water and nutrient absorbtion

Step 4 - Slash and burn



Effect: Preperation of new mining plateau. Biomass and topsoil removal.

Step 5 - Regenerate



Effect: Fertalised soil that can hold water and nutrients without rapid leaching (biochar).

Lumber

Atmospheric CO2

Biochar

Woodash: C, K, Ca, Mg, P

C, N, K, Ca, Mg, Na, ph-regulators + P, Biochar

Coastal input

Agricultural salt: Na

Seafood fertaliser: N, K, Mg

Ground oyster shells: ph-regulator, Ca



alluminium roofing
and solar cells

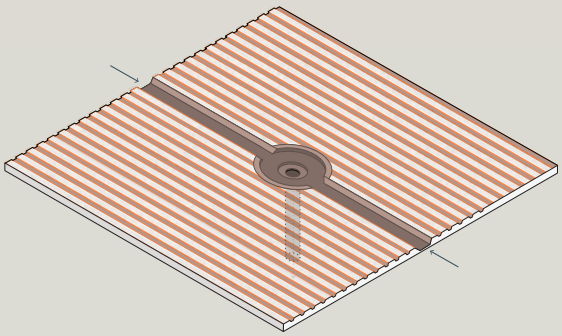


rammed earth
termite bricks

Agricultural input:
cashews, mangoes,
casava, peppers,
aubergines,
pineapples, palms,
bananas, livestock

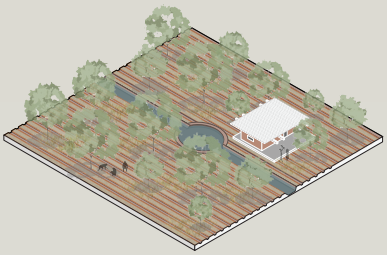
Retention channels with minimal slope
and aquifer holes

Step 3 - Slow, spread and sink

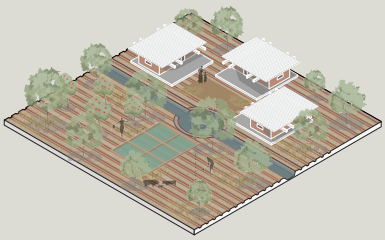


Effect: Water infiltration groundwater restoration and preventing topsoil runoff during heavy rains

Step 7 - Zone

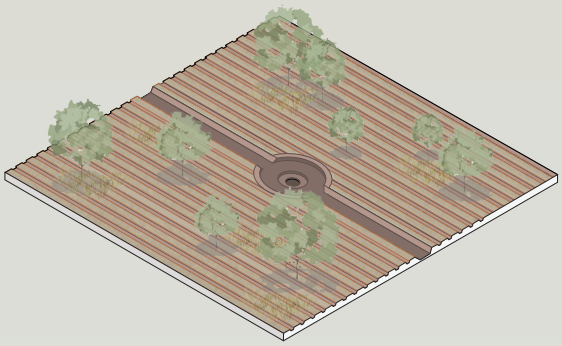


Introverted stewardship:
single household, full reforestation



Communal stewardship:
multi-household, sustainable production

Step 6 - Populate



Effect: Future proof, solidified soil structure preventing topsoil runoff, and nutrient leaching.



Rural village: multi-household,
accomodate population growth

Fast rooting and high carbon sequestration vegetation

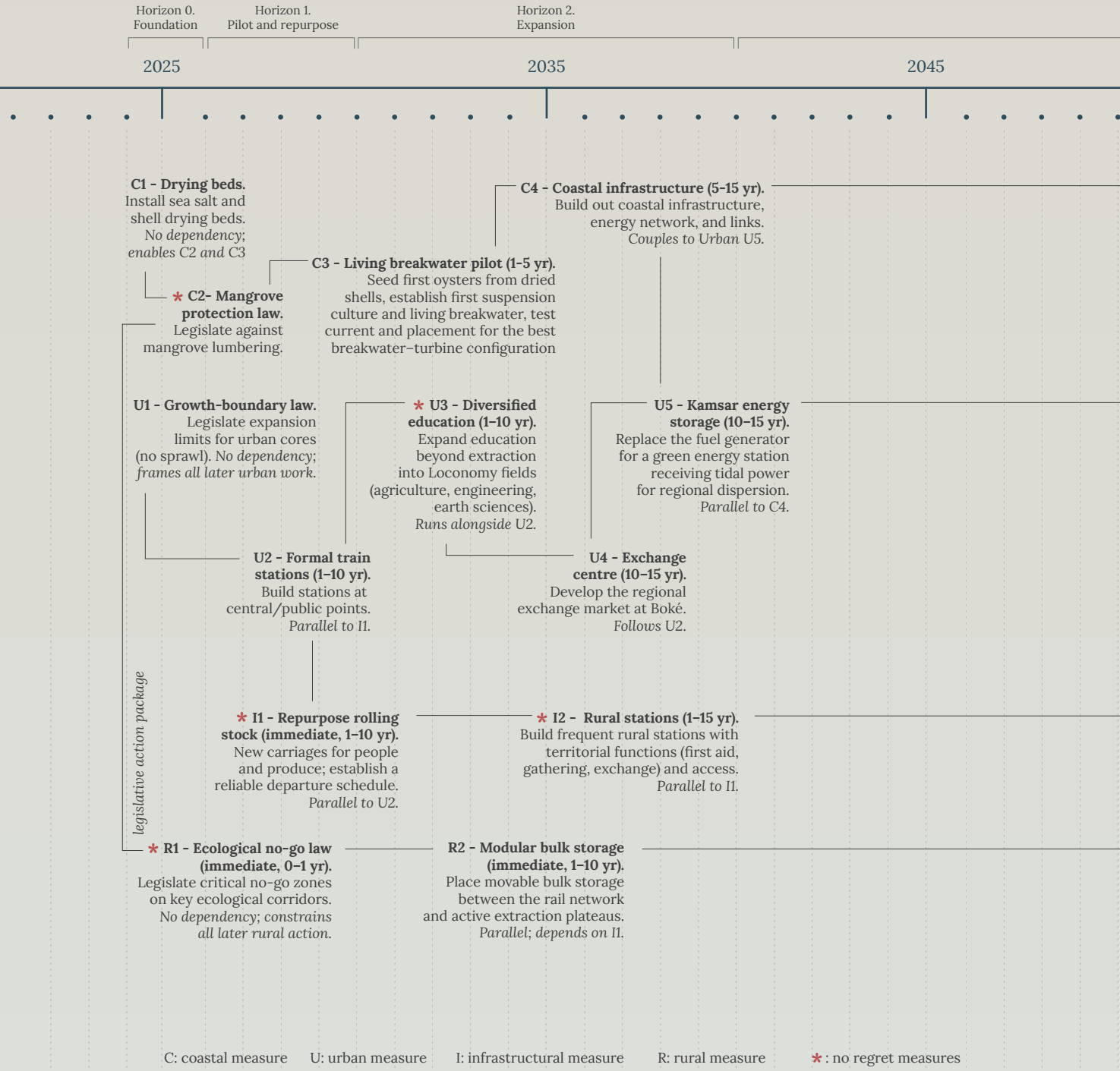
Construction
wood



Locally sourced
cement



15. Backcasting: design roadmap 2075



C: coastal measure U: urban measure I: infrastructural measure R: rural measure *: no regret measures

Horizon 3.
Consolidation

Horizon beyond.

2055

2065

2075

C6 - Install tidal turbines (20–50 yr).
Place turbines at Venturi points.
Parallel to C5; depends on proven pilot configuration.

C5 - Scale up living-breakwater farms (15–40 yr).
Extend oyster/ breakwater farms along the coastline.
Follows C3 pilot.

U7 - Densification (now–50+ yr).
Organic or planned densification of urban morphology within fixed boundaries.
Begins immediately under U1, continues across the whole horizon and beyond.

U6 - Processing & manufacturing (~ 25 yr).
Facilities for bauxite (ore-to-product), coastal and agricultural processing/ preservation at Sangarédi.
Depends on rail and U2 .

I3 - Expand railway (15–50+ yr).
Extend the rail network into (inter) national grid.

R3 - Finish pre-Loconomy plateaus (20–40 yr).
Complete mining operations.
This is the pivot: R4 begins only as each plateau here concludes.

R4 - Sequential mining cycle (20- 40+ yr).
(begins per-plateau as R3 operations end; the cycle below is measured in years from each plateau's "scarification = 0")

+0 - Scarify *the compacted earth (immediate at cycle start).*

<+1 yr - Water infrastructure:
Carve slow/spread/sink retention canals and aquifer holes.

+1-2 yr - Slash and burn:
Lumber denser wood, then burn for ash.

+5 yr - Fertilise *with regional closed-loop materials*

+5 yr - +10 yr — Repopulate to 78% *with fast-growing, deep-rooting, carbon-sequestering pioneers.*

*

Zoning:
Type 3 - Rural village:
Immediately (~+10 yr).
Type 2 - Agroforestry:
at 80% recovery (~+15 yr).
Type 1 - Full reforestation:
100% (~50+ yr)

Conclusion

This thesis set out to imagine a spatially just, post-extractive future for the operational extraction landscapes of West Africa. Working through the Loconomy scenario, it proposes a regional system in which bauxite remains relevant but extraction is slowed to the pace of ecological regeneration, and in which the commons are rebalanced across the coastal, urban, infrastructural, and rural environments. Within this scenario the design holds together: a preserved coast put to productive use, urban cores given distinct roles within fixed limits, a railway reopened to people and produce, and a countryside that interleaves slowed mining with sequential soil regeneration. Each measure reinforces the others, so that localised production sustains a trans-regional balance rather than a single export flow.

Its reach beyond Loconomy is partial but present. The no-regret measures (mangrove protection, diversified education, repurposed rolling stock and rural stations, and ecological no-go zones) would improve conditions under any of the four scenarios, securing a minimum gain for both planetary boundaries and the three pillars of development. Others, such as tidal breakwaters or processing facilities, can be made to serve capitalist trajectories. The soil-regeneration methods remain valuable wherever degraded land must recover, being post extraction under a capitalist model or at the end of extraction due to changing markets. Nevertheless, the sequential mining cycle itself only works in the current proposal, as the method doesn't sustain expanding growth. With this the design is committed to one future but not confined to it.

Placed in its wider context, the work responds to a regional crisis that dominant, positivist response, like the Great Green Wall, treat as a technical problem while leaving the extractive relations of ecological unequal exchange intact. By reading the territory through Pluriversal and situated knowledge rather than abstraction, the thesis reframes degradation as a question of distribution and recognition, showing that a post-extractive landscape can be both ecologically bounded and socially just.

In answering its research questions, the thesis demonstrates, first, that a situated, pluriversal stance makes visible the place-based realities: the uneven access, more-than-human dependencies, lived rhythms that positivist planning abstracts away. Second, that the commons are produced and unequally exchanged through interlocking systems of extraction, energy, and circulation that concentrate value while displacing burdens. Third, that spatial design can mediate these development conflicts by redistributing the commons across the three pillars without exceeding planetary boundaries, provided design acts as a facilitator of situated futures rather than an external imposition.

Recommendations

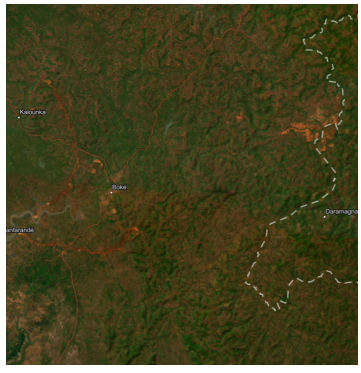
The most transferable finding of this thesis is not a design but a way of working. The no-regret measures show that, whatever future unfolds, certain protective and regenerative actions secure value under every trajectory and should be enacted now; but their deeper significance lies in *how* they were arrived at. Situated methods offer urbanists a way to lend their expertise to contexts unfamiliar to them without imposing upon them. They do not guarantee that the designer will read a place correctly, no method can, but they make the designer's reasoning explicit and located, exposing it to scrutiny rather than presenting it as neutral technical fact. In doing so they replace authoritarian, technocratic projection with something more honest: a position that can be argued with, corrected, and co-authored.

This matters far beyond a single estuary. Extraction is only one of many land-degrading practices reshaping West Africa and the wider world; logging and industrial agriculture follow the same extractive and exclusionary logic across countless situated realities. The specific findings of this thesis cannot and should not be transplanted onto them. They are the direct product of this context and of this researcher, and to generalise them would repeat the very abstraction the thesis critiques. What *can* travel is the approach. If urbanists working in these landscapes adopted situated, boundary-aware methods, each grounded in its own place yet explicit in its reasoning, the accumulated effect of many such projects could begin to shift the planetary mine itself.



Tarkwa



Sekuruwe
Mohlotlo
Ga-Tshaba
Scheming
Ga-Masenya
GaMolekane
Machikiri




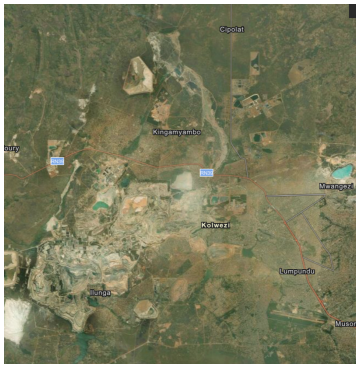

Kintinian



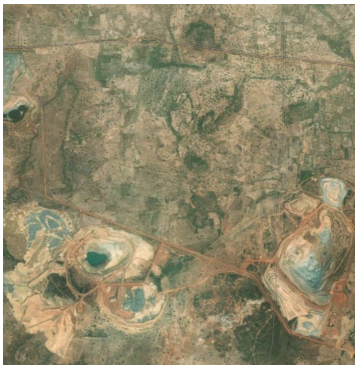




Kwabeng
Atiwa Range
Forest Reserve
Atiwa West
Kibi
Abuakwa
South



Kolwezi
Lumgundu




Kisanfu


Reflection

What is the relation between your graduation project topic, your master track (A, U, BT, LA, MBE), and your master programme (MSc AUBS)?
The project sits within the master track *Urbanism* and the graduation cluster *Critical Environments: Material Ecologies of Care*. The cluster examines the metabolic, extractive, and ecological geographies that underpin urbanisation, and asks how they can be transformed into socially and ecologically just environments through practices of care, repair, and stewardship across human and more-than-human worlds. It rethinks urbanism amid today's overlapping planetary crises. This thesis aligns directly with that brief, locating its work in a bauxite-mining landscape that exists precisely because of urban accumulation elsewhere. Its contribution to urbanism more broadly is methodological: rather than reading the built environment as physical form, it reads that form as the materialisation of metabolic processes now shaped by global operations, and designs the regional operational metabolism rather than the city alone.

How did your research influence your design/ recommendations and how did the design/ recommendations influence your research?
The situated method was instrumental. Difficulty finding reliable data, compounded by the sensitivity of the topic, led me to distrust sources produced by mining companies and international bodies. Situated research became the corrective: fieldwork and located interpretation tested desk findings against the ground, and what that revealed reshaped the design, which in turn sent me back to re-read the territory more carefully. Methodologically, this meant a deliberate shift away from the conventional urbanist move (which I would have pursued otherwise) of overlaying maps and data layers and toward a more qualitative inquiry to explore urban, ecological, and social patterns. That choice produced a richness of material that was at times difficult to translate into visuals, in part because reliable cartographic data was not always available to pin findings onto. The design that emerged is therefore place- and process-oriented rather than spatial-morphological, through a regional system architecture defining relationships and flows rather than a fixed built form.

How do you assess the value of your way of working (your approach, your used methods, used methodology)?
The approach proved valuable precisely because the thesis was full of confrontations. The first was that I did not understand the structures I set out to design with. What began as a port project at the beginning evolved into an operational landscape. The situated method kept me anchored to local reality rather than reproducing the abstraction this thesis critiques; its cost was time, since repositioning myself and situating and diversifying knowledge took a lot of time, leaving less of it for design.

Futuring and backcasting carried the work from analysis into design. Futuring forced me to confront the uncertainty of the future rather than design against a single assumed trajectory: four plausible scenarios surfaced the trade-offs of each, and only by holding them side by side could I justify choosing one to develop. A more conventional trend-extrapolation or single-future projection would have hidden those trade-offs and left the choice unargued. Backcasting disciplined the design by working from a future goal backwards, exposing dependencies and revealing which actions were no-regret across all four scenarios. Combined, the three methods produced not a finished design but a defensible one: situated in its context, transparent about its uncertainty, and explicit about its sequence of action.

How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?
The academic value lies in demonstrating a situated, accountable alternative to positivist planning in a context where abstraction causes harm. This is not a rejection of positivism, which has produced enormous good: sanitation, infrastructure, public health. The value is in matching approach to context. The societal implication is that the people, ecologies, and more-than-human actors of an operational extraction landscape are read as constituents of the territory rather than as variables abstracted into it, which changes what design is willing to ask of the situated reality and is accountable to.

The project also speaks to a live contemporary debate. The 2025 G20 Johannesburg Critical Minerals Framework, recent UN warnings on critical-minerals water insecurity, and Guinea's own move to publish the Simandou project agreements all point in the same direction: a growing recognition that decisions about extraction can no longer be made in distant boardrooms while their consequences are borne locally (United Nations University, 2025; Journal of Democracy, 2026). The polarisation between Global North demand for transition minerals and Global South sovereignty over them is intensifying, and situated methods are one way of holding those worlds together rather than letting the distance between them widen into legitimacy crises.

Ethically, the method's strength is honesty: it makes the designer's reasoning explicit and located, opening it to scrutiny rather than imposing it. Its scope is deliberately modest, one located case rather than a generalisable model, and that modesty is itself ethical

How do you assess the value of the transferability of your project results?

The technical components (living breakwaters, tidal turbines, oyster-shell upcycling) can always be transferred, but with no guarantee they will produce the same effects elsewhere. The results are portable; their success is not. They can only travel responsibly if the situated method travels with them, so that each new context is read on its own terms rather than having this project's findings imposed upon it.

What are the limitations of this project?

The clearest limitation is one of time and sequencing. In my experience, the situated knowledge had to precede design rather than run alongside it, the sheer volume of qualitative reading and located analysis left me a compressed window for research-by-design. I didn't feel comfortable designing before subjecting myself to the context, and the danger that follows is one of regress: you can never know too much, and I would argue you can never know all, even when working in a context you have inherited. A line must therefore be drawn after which design begins. Establishing it earlier is sounder methodologically, but it narrows the perspective from which design proceeds. I felt the fieldwork came too late, leaving little time to design expansively through the new perspective it opened. Yet had I gone earlier, I would have known less of what to look for and almost certainly observed less deeply. Within the scope of the thesis this balance worked out, and the research questions are answered to a meaningful depth. Still, the project ends just as the perspective begins to feel adequate; which is perhaps less a flaw than an invitation to what comes next.

What would you recommend for future research?

Three directions follow from this work. First, the other three scenarios deserve to be designed for, not only assessed: developing parallel design pathways for Extractionscape, Energyscape, and Ecological society would test whether design itself can shift the favourability of a scenario, or surface insights the comparative assessment cannot.

Second, scenario work should remain open: as trends diverge and new conditions emerge, additional scenarios will need to be developed, and the situated findings of this thesis can be re-interpreted within them rather than discarded.

Third, and most concretely, the design itself is a system architecture: it makes regional recommendations that open onto more questions than they close. What does densification of an urban core actually look like, and how is the urban form composed? Which critical ecological areas need corridor protection, and how? How are living breakwaters configured to optimise the Venturi effect for both tidal energy and coastal protection? Each of these could be a thesis or project in its own right. On that note, I want to extend an open invitation to everybody who reads this, go explore!

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Appendix

DATA MANAGEMENT CHECKLIST

Instruction

This checklist is relevant for all graduation projects of the Master AUBS. The form is intended to highlight common aspects of graduation projects that require particular attention with regard to planning the research and data management. Relevant information and supplementary sources regarding each question are provided below each question.

With this checklist, the faculty wants to avoid that students unexpectedly find themselves in complex and stressful situations, in which ethical or privacy matters and/or other laws and regulations become an issue. In projects involving humans, certain types of data processing increase the risks to the human participants: planning such projects requires additional evaluations and advice from university staff before ethical approval can be received and the project can begin. In the case of a graduation project, obtaining additional advice or permits may delay the project with an extra education period or semester. To avoid this, it is recommended that students set up a graduation project with a low level of risk. Therefore, all students have to check their risk, by completing this checklist before their A1.

The first section of the checklist (A) should be completed by all students, together with their supervisor, during the planning of the graduation project, before the A1. It does not need to be submitted to anyone for review or approval. Please consider questions 1 to 3 carefully in relation to the intended graduation project, and answer with 'yes' or 'no'.

The second section of the checklist (B) should only be completed if the graduation project involves working with data from human participants. In that case, the student and their supervisor must apply for and receive ethical approval from the Human Research Ethics Committee (HREC) before the project can begin (see the paragraph 'Explanation and follow-up' after the questions). The student can submit the application to the HREC, but the supervisor is responsible for making sure that the project is compliant with relevant privacy regulations and ethical policies.

Section A. General considerations	yes	no
1. Is the graduation project conducted as part of an internship (at a company), or as part of a research project at TU Delft? If a student's graduation project is conducted at a company or as part of a research project at the university, questions of data ownership and intellectual property rights need to be addressed in a written graduation or internship agreement before the project begins. Students and their supervisor should consult the Intellectual Property Rights of Students webpage. Additional information can also be found in the Extended Personal Research Data Workflow.		✓
2. Does the project involve conducting (part of) the research outside the Netherlands? Students who intend to travel abroad (even to other EU countries) for study, exchange, research, internship, or graduation project purposes need to follow the Travel Safety Protocol. This includes attending a mandatory Travel Safety Training Session: see the Disclaimer.	✓	
3. Will the research involve processing data from humans, such as running a survey, conducting interviews or workshops, collecting data through social media or internet forums, or re-using existing datasets about humans provided by a third party? (If 'yes', see follow-up questions 4 to 13 in Checklist B.) Students who work with data from human participants must complete the next section and apply for and receive ethical approval from the Human Research Ethics Committee (HREC) before conducting the research.	✓	

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