How to surmount the Use-Revenue Dependency of Infrastructure Investment:

With a vehicle that carries an investment in infrastructure space into a zone of easier profits by building and growing over the strata of development between infrastructure space and the scalar niche

The specific technical problem confronting the geochemical geostrategists working in Paris is how to make a Long-Term Global Infrastructure Investment that meets the prerequisites of pension and sovereign wealth funds.

The chief economist at the World Bank and the head of the UK pension fund ask it: How can we engineer something to bridge the \$2 trillion yearly gap between the prerequisites of investment and the projects we need to happen around the world from flooding UK coasts to sewer pipes in Bangladesh and Solar seas in India, Saudi Arabia and China?

How can we engineer these urgent pipelines of projects to meet the pension funds' requirements?

How can a great pool of western pension funds and government money benefit from economies and securities of scale and make their secure return while accomplishing the infrastructure to stave off global calamity and realize global prosperity?

The economic benefits of doing it right are clearly laid out in reports from NASA, Lord Stern, World Bank, UN, etc.: to avoid a 25% loss of economic activity by the end of the century. We will save allot of money if we quickly raise humanity—and Life itself—up onto the prerequisites of dynamic carbon-negative global prosperity.

The last time engineers attempted such a scheme—richer people investing in poorer people's housing mortgages on a grand scale in the west—we provoked a financial crisis. The engineering in abstract territories had no leverage in actual granular material reality until the substrate of house prices fell away and the leverage expulsed millions from their homes. These vehicles were crudely engineered aggregation power forays to scalar economies that tranched and squandered the symbolic value of the assets, and then helped to destroy them. We need a much better engineered investment apparatus if we are to conquer Infrastructure Space with aggregation power.

Our current cul-de-sac of infrastructure investment is a dead end in terms of the global engineering challenge. Current models of Infrastructure Investment are dependent on use-revenue (or geo-politically leveraged wealth transfers). Applied to any but the most wealthy parts of the most wealthy nations, Infrastructure Investment dependent on use-revenue...

 \rightarrow diminishes the development-value or multiplier effect of the asset to its host: by charging for use when it is only through heavy use that infrastructure can provoke prosperity.

 \rightarrow diminishes the attractive security of infrastructure as an investment by depending on revenue from poor countries with shifty currencies that are justifiably tempted to nationalize the infrastructure asset.

Use-revenue dependent models of infrastructure investment cannot provide the answer.

A realistic replacement for the apparatus of use-revenue dependency must provide **I) A global pool of projects and investment with a 20-year term 2) An ascendant machine** to allow the investment to build and climb-up the physical *strata of development out of infrastructure space*—to a large and painless return amidst the prosperity it supported.

For a glimpse of the end condition of an ascendant machine we can look at the Hong Kong subway system funding model. It developed and takes profits from the chunks of elaborate city it owns above its train tracks.

To elaborate this model *end condition* into a global *process* with wildly different starting conditions, we need a general model of a vehicle for carrying an investment in infrastructure out of infrastructure space into a zone of easier profits. We need a metabolism of building and growing over the strata of development.

I approach this engineering problem three-dimensionally and stratiographically and with recourse to templates drawn from nonnative data sets. Templates drawn from biochemistry make clear that while the circle cannot be squared, the sphere can be stratified and metabolically engineered.

The spherical strata of the artificial ecology we want to make in infrastructure space corresponds to the historical elaboration of the global ecology and also to the prerequisites of full human dignity and to the strata of biochemistry: Stratum 1) infrastructures with geochemical realism like solar fields and water desalination and filtration intakes and plants Stratum 2) systems of distribution like smart grids and water grids Stratum 3) the economies and ecologies that prosper upon systems Stratum 4) the consumables and experiences to be had in the gardens and cities atop these strata.

The mode of transferring the investment between the strata elaborates the logic of reinvesting in the success of an accomplished asset. It provides for a contractual right to this reinvestment opportunity. Accomplishing the solar field gives its investors the right to invest in the smart grid. Accomplishing the smart grid gives its investors the right to invest in the cars, cities and universities. These are steps that can be mounted from the starting point of any global infrastructural prerequisite.

The mode of liquidating the asset accomplished by the investment so that the money can be reinvested in the next stratum. This is the crux of the problem and it gets an innovative solution from a separate metabolic entity: a central audit power that examines the accomplished assets and assigns them unfalsifiable symbolic value tethered to the exact specifics of its material instance. The high precision and constant updating of the audit is very valuable because it is universal and transparent. The audit is gathered in a transparent and open access web architecture where you can go online survey the asset in its geolocation. From the unfalsifiable reality of the asset an unbreakable filament is drawn into the production of a coin forever tethered to the specifics of the asset (or its negotiated transfer to an equal other). This unfalsifiable symbolic value is sold to the Audit power that issues a correspondent coin for sale to the market. The coin comes in one relational denomination, but its durability denomination is tied to the audited lifespan of the asset—providing an enormous selective pressure for quality. The asset-making long-term investment must present its new assets to the audit before it can sell the symbolic value to the coin-maker. The asset-making long-term investment sells the symbolic value of its unfalsifiable material instance to the audit power that uses it to make a coin it sells to the market, much like a bond.

Further reinforcing this potent unfalsifiability and durability of the symbolic value is the Infrastructure Bank's insurance of the asset and the reinsurance pool of sovereign nations backed by the assets of the hydrocarbon energy infrastructure it is replacing.



Building a working adaptable model

To model a metabolic ecology of infrastructure investment, it is necessary to group all the prerequisites in a single design space to allow a pallet of transversal solutions to be developed for the particularities of Earth's Infrastructure Space.

To build an adaptable *working* model, where one can respond to further questions, challenges, and opportunities by tuning and elaborating the components of the metabolic ecology, One needs to make a design space that is also a computer. That can calculate the full effects of a proposed elaboration.

Done well, such an apparatus would allow humanity to deploy the biological strategy of conquest in infrastructure space. To get ahead of climate change and ascend to

colonization of what biology should call a 'scalar niche'—the next absolute scale of complexity—a world body.

There are quantum and classical elements to the problem of modeling humanity's conquest of infrastructure space and ascent to the scalar niche. Two types of solutions are needed.

The quanta are questions like "how do we get money invested in infrastructure?" The classical are questions like "how do we get a picture of the whole operational ecology, so that we can work on it more effectively and cooperatively?"

They must help each other, while allowing a bit of slippage, because quanta must be retain its error-correcting function to the classical visions in which humans work best; we humans want a model of the whole caboodle that we can hold present to our minds. This demands some slippage between the exact quanta and the vernacular. The question is that the slippages not violate the quanta, but rather, hold its consolidated bodies in manageable relation to other of its consolidated bodies. So that we can work on them both: go in to update the quanta of the model, but also accomplish the larger arrangements only possible with a classical model of the whole. With space to arrange, Humanity is capable of building very complex *and* elegant phrases. Such technical scripts could function like DNA to allow us to colonize these two territories that are beyond the reach of genetic scripts.

The Quantum and the classical aspects of the model have very different relationships to knowledge. The quanta must be able to check its name for the state of affairs against all other knowledge. It is hyper specific to the actual conditions. The classical is very uncomfortable there. It seeks to open a space of arrangement that a human can hold in their mind and work with. It wants above all to allow operational immanence in a complex arrangement.

If Quanta are power, Classical is empowerment.

The classical wants a set of metaphors that translate knowledge into a kind of lens on the world and the potential for one's agency in it. It must have a consistency to the ancestral sensual apparatus of a human being. It must be navigable, operational, adjustable, consensual, adaptable, and above all, rigorously connected to the quanta.

The Classical must allow us to compose consolidated bodies of Quanta into more fruitful arrangements.

And it must be fun to use.

To make such a computational metabolic ecology and trajectory transparent—to explain it to dear reader—demands a rigorous and pleasurable vernacular language to take you on a linear procession through a spatial arrangement of its functions.

Please come with me on a procession through a landscape computer, it's a theatre, scenery and a story.