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## **Building a Planetary Solution: Regenerative Design and Construction for the Future of Human Settlement**

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Today (and increasingly since the dawn of the industrial revolution) few geo-physical,—chemical, or—biological systems on the planet remain undisturbed by human activity. The lifecycle of the built environment—the production, operation, and ultimately disposal of buildings and infrastructure (and their aggregation as towns and cities)—currently accounts for nearly half of all anthropogenic greenhouse gas emissions, more than half of solid waste generation, and nearly three quarters of energy consumption (as well as a host of other more remote and less readily visible forms of impact to our global ecosystems and their land and marinescapes.) But these statistics fail to capture the range of systemic challenges we face because of our species' unique but ubiquitous capacity to produce and consume the innumerable artifacts of our industriousness.

Our most populous cities represent the world's

largest stockpiles of human-made material; most of it is extracted from geologic seams deep within the earth's lithosphere, shaped and refined through fossil energy-intensive industrial processes and distributed via global transport networks. As of the beginning of this decade, in aggregate and measured globally, the weight of that material we have produced has now surpassed the weight of all terrestrial biomass. Over the next three decades (by 2050), we will add 2.3 billion new inhabitants to the planet's cities. In doing so, we will double current building stocks and, if we continue to build as we do—on greenfield sites with low spatial density—we will triple the land area covered by our constructed environments.

The eco-systemic sources (soil and marine biomes; our forests and wetlands) from which—or through which—we draw virgin raw material for building (and which we encroach upon with our continual

expansion of human settlement) are receding and weakening, increasingly unable to supply the ecosystem services (clean air and water, habitat, food-stuffs) that are critical to our and our fellow species' survival. Despite such massive physical investment and environmental impact, we have been largely unsuccessful in meeting the basic need for safe and secure shelter and convivial living conditions for broad swaths of humanity. As we approach this critical planetary threshold, what scientists describe as a "climate tipping point," how can we, as architects (and with our colleagues in the building sector) mitigate or even reverse the ecological and atmospheric impacts of our work? These are challenges that we must inevitably face as we conduct our work as architects in the 21st century.

What if, instead of continuing to deplete and degrade our planet's natural ecosystem—its forests, peatlands, wetlands—the making of global buildings and cities could become a force to incentivize their restoration, reverse climate change, and enhance biodiversity? Advocates for the adoption of biogenic material (particularly the version of engineered wood known as mass timber) call for its broad scale substitution, wherever feasible, for the cementitious, metallurgical classes of material that are the current structural ingredients of dense urban building. They point to a range of putative environmental benefits that might stem the inexorable consumption of emissions-intensive materials by global builders. These benefits include the reduction of manufacturing emissions, the potential for urban buildings to serve as massive and durable storage reservoirs of biogenic carbon, the real but often unrealized renewability of wood through sustainable cycles of forest harvest and regrowth, the incentivization of investment in forest restoration and expansion due to the increased demand for and resulting value of wood products.

The scientific and policymaking communities, however, lack consensus about the potential benefits of a bio-material transition, citing concerns over land-use conflict, ongoing technical challenges, the sunk costs of past industrial investment, and insufficient scientific evidence. The building sector, from product manufacturers and builders to real estate developers remain hesitant to change their practices, behaviors, and financial models. As a matter of popular support, social license for the renewed

utilization of forests for industrial purposes is understandably lacking, given that past examples of global deforestation, driven almost entirely by the demands of a growing human population, have been one of history's purest examples of economic extractivism.

As compelling counterfactual, might our crafting of environmental and industrial policy, our governance of the Commons, and our demand for the materials, means, and methods that give physical form to our expanding cityscapes, be orchestrated to create a climate restorative, eco-systemically regenerative course of planetary action? As ecosystem science and evidence-based environmental management techniques such as sustainable silviculture evolve, concurrent innovations in circular and bio-based construction materials and technologies and associated impact assessment methods offer the possibility for a new and powerful symbiosis between the terrestrial biosphere and our need for convivial urban growth. In an era of big data and artificial intelligence, potential bioregional synergies can be analyzed and predicted through extrapolative methodologies using broad datasets and powerful computational models. But they must also be explored, tested, and implemented through empirical means, simultaneously in regional forests and in the growing cities that call on them for material resources.

To achieve and sustain a regional synergy and symbiosis between the forest and the city and a metabolic (rather than extractive) relationship between sustainable, renewable material supply and urban construction demand, building designers (or, more comprehensively, all the actors and sectors that touch the building value chain and the urban life cycle) must begin to acknowledge that the systemic consequences of our work have to this point fallen outside of the artificial and dangerously narrow analytical boundaries of the building sector's techno-economic assessments of cost and return. And we must seek to understand and instrumentalize both new and neglected forms of knowledge that can inform the actions we will now take to mitigate and, ideally, reverse climate change and its deleterious effects on the planet's geo-chemical, biological, and physical systems. Therein lies our agency as architects as we seek to meet the demands for new housing and infrastructure for a burgeoning and

rapidly urbanizing global population.

### **Bio**

Alan Organschi is a principal and partner at GOA, an architectural practice in New Haven, Connecticut recognized internationally for its integration of design, construction, and environmental research in work that spans in scale from small demonstration projects in micro-housing to global environmental analysis. In April 2021, Mr. Organschi was appointed Director of the Innovation Labs at the Bauhaus Earth an interdisciplinary initiative based in Berlin, Germany focused on the transformation of buildings and infrastructure from a major source of anthropogenic environmental impact and social inequity into a climate restorative and ecologically regenerative means to meet the housing and infrastructural needs of a rapidly urbanizing global population. Mr. Organschi continues as a senior member of the faculty at the Yale School of Architecture where he has taught architectural design and building science for two decades and now directs the Yale Building Lab. He has written and lectured extensively on the carbon storage benefits of biogenic material substitution and circular economic strategies in urban building. He is a co-author of the recently published book *Carbon: A Field Manual For Building Designers* and the scientific paper "Buildings as a Global Carbon Sink" published in the journal *Nature Sustainability* in January 2020 and winner of the Aquila Capital Transformation Award for contributions to the decarbonization of Europe. In addition to their firm's national and regional awards for a range of architectural projects, Mr. Organschi and his partner Elizabeth Gray were honored for their work with an Arts and Letters Award in Architecture by the American Academy of Arts and Letters.