

## REGENERATIVE URBANISM – A SYNOPSIS

### *Inventing the Platform for Sustainability Success*<sup>1</sup>

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### ABSTRACT

This paper describes humanity’s sustainability predicament and the new approach needed over the 10-15 years remaining to reverse course and accomplish key milestones. It identifies a promising response emerging from innovation occurring across our planning, designing, and building practices at this moment of global environmental, economic, and social reckoning: *strategic regenerative systems sustainability* or *regenerative urbanism*. Three cases illustrate the approach and suggest the district as the best strategic scale. Descriptions of its characteristics enable recognition, understanding, and use. Emerging initiatives pursue certifications such as Living Community Challenge, EcoDistricts, and LEED-ND, which are society’s most evolved codifications of regenerative sustainability and urbanism. This response is a work in progress that requires global recognition, acceleration, and scaling. It is the beacon for 21st century urbanism being the antidote for our dual climate and sustainability challenges. The built environment-economy connection reveals how regenerative urbanism could catalyze the only complete solution; that is, the transition to a regenerative circular ecological global economy of inclusive prosperity within one generation for 9 billion people by 2050 and up to 12 billion by 2100. That solution would simultaneously mitigate climate change, establish the economic basis for inclusive prosperity, and defend against the extreme economic conditions that will intensify during the 100-year-or-more period of climate recalibration. As a bonus, solving the climate crisis with regenerative systems sustainability would cost no more than the climate solution itself and would create the only basis for climate cooperation. Regenerative urbanism creates a compelling new value proposition and new role for planning and design professionals.

**Keywords:** Regenerative, Planning, Design, Ecological, Development, Urban, Region, Climate, Sustainability

### INTRODUCTION

Humanity faces a dilemma after our 30-year sustainability response since the Earth Summit launched sustainability onto the world stage in 1992 (the UN Conference on Environment & Development, Rio, Brazil). We appear to be winning battles but losing the war. Is our current approach successful if it only slows the rate of natural systems destruction and the pollution of our economic and social systems? Does it allow us to mitigate climate change in time (the most visible challenge), and also to address sustainability’s more fundamental challenge: creating an economy that does not destroy itself and nature while ensuring a viable future for all? If not, what must we do differently?

The paper begins with an introduction to the dilemma, challenge, and emerging response of strategic regenerative systems sustainability and urbanism (referred to in this paper as *regenerative urbanism*). It then presents three cases that illustrate different approaches. The final two sections describe the principles, imperatives, and core concepts useful as the basis for wider recognition, use, and advancing this new regenerative whole systems sustainability practice.

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Humanity's predicament is that our current approach is ineffective and failing—and most importantly, time is running out. We need decision makers at society's "levers" of sustainability with an accurate understanding of the challenge and the means to address it. The goal of this paper is to be one starting point.

The root of the problem is humanity's piece-meal greening approach to sustainability. It simply reduces the magnitude of incremental impacts, but total impacts continue to increase albeit at a slightly slower rate. It does not reverse the accumulating destruction. More fundamentally, humanity's response focuses on making sustainable components (parts) of the system (buildings, cars, energy, consumption, etc.) not on making systems sustainability. Thus, our current approach is incapable of producing sustainability. The sustainability we need is systems sustainability, not simply "environmental friendliness," or components that are "less bad." Sustainability is a system "state," not a continuum of "badness" and "goodness" with an acceptable zone in the middle. A system is either sustainable or it is not.

The urgency demonstrated in the Intergovernmental Panel on Climate Change's (IPCC) recent AR6 Report<sup>1</sup> and the current phase of the rural-urban transition<sup>2</sup> underlines the need for regenerative sustainability and urbanism. The IPCC estimates a closing window of opportunity with only 10-20 years remaining for humanity to respond effectively to climate change: weaning the global economy off fossil fuel and fully transitioning to a renewable energy economy, mostly solar. However, not included in the IPCC report is the need to accomplish climate mitigation in the context of (1) adding two billion more people to the planet (2000-2050), (2) providing everyone with sufficient resources, and (3) accommodating more people in urban areas. About 68% of the global population will live in urban areas by 2050, up from 46% in 2000 and 55% in 2020 (the urban transition from rural to urban settlements).

Much of that growth will reside in cities and neighborhoods that have yet to be planned, designed, and developed, with the main question being will we develop regenerative cities or traditional degenerative ones? We cannot develop traditionally because that method is part of the larger approach that has brought the world to the brink of the stark reality of climate change and unsustainability. Thus, we only have one option for success: inventing and producing regenerative global city-region economies (socio-economic-environmental systems). But what would this option entail, and how do we accomplish it, let alone accomplish it in time?

Regenerative urbanism uses the integrated processes of living systems (its principles of planning, design, and economic policy) to produce the urban and regional systems innovation and performance needed for success. This approach includes shifting from our current economy's linear "take, make, waste" metabolism to one of a circular urban-regional metabolism. Such innovation adds more total value than total cost while accounting for externalities (costs typically left out of decisions over whether, how, and how much to produce). It creates better urban neighborhoods and districts that are attractive and healthy places compared to those that traditional development produces. However, and more importantly, it is also a new program and framework for innovation & investment. This program will produce a circular ecological economy with tenfold greater production capacity and the inclusive prosperity required to support a global population of 9 billion by 2050 and up to 12 billion by 2100 with only positive environmental impacts. It would fully mitigate climate change by creating a circular ecological economy that would not violate the regenerative life support principles of nature. Thus, it would not deplete living systems with its production processes. It would reduce GHG emissions quickly enough to limit global warming to the "red-zone" maximum of 1.5C degrees or less (in the early IPCC days, the red zone began at 1C!). This program is the minimum "design brief" for climate and sustainability success required to reverse accelerating cataclysmic climate change and unsustainability trends more generally, thereby creating the long-stalled promise of development around the world.

In summary, society's new regenerative urbanism planning and design brief would accomplish the following:

- restore damaged nature (the natural capital assets of regenerative life support processes),
- reverse climate change in time and re-establish the relatively benign pre-1990 climate conditions,
- expand human AND natural system productivity (carrying capacity) to the point of inclusive prosperity (for a global population of 9B by 2050 and 12B by 2100).

Fortunately, this solution does not need to be invented anew. It is arising from innovation occurring across the planning, design, and building professions and sustainability practice around the world. However, society must

nurture, advance, accelerate, and scale it quickly enough to achieve global sustainability success. It holds the promise of expanding the carrying capacity of the human economy and biosphere substantially. Tactically, this approach would allow us to harden the economy and society now. Doing so is an essential defensive economic move in response to climate change with or without mitigation success. It would allow us to maintain and expand economic production during the 100-300 years of the climate system's slow recalibration to pre-1990 conditions if mitigation is successful, or for increasingly hostile conditions if mitigation is unsuccessful. Extreme environmental conditions will make economic production increasingly difficult and costly; they will likely slow or reverse economic growth and human prospects unless climate defense is successful.

It is this integrative regenerative systems sustainability approach to the built environment and economic activity that is required for success. Leading and advancing it is the new role and larger value proposition for professional planners, designers, and urban, regional, and economic policy makers. Creating regenerative built environments (both new and existing) also creates a core component of the needed regenerative economy, which in turn is a primary catalyst for system-wide sustainability. No longer is the built environment providing a simple shelter function with aesthetic or transportation and economic efficiency value. The built environment delivers substantial economic value as a core component of sustainability performance (or unsustainability). It stimulates (or prevents) moves to economy-wide sustainability. The need for and capacity to deliver that value is unprecedented historically, and crucial for global society's survival.

Furthermore, regenerative urbanism is likely the only antidote to climate change that can command the full global attention and collaboration needed for success, from people to world leaders and from the developed to the developing world. This is true because the real solution for climate change is not "simply" GHG emissions reduction. Success requires achieving that reduction by also creating a global economy of perpetual inclusive prosperity within one generation or sooner for a growing population. That economy and its urban and regional spatial configuration (built environment) would not simultaneously self-destruct and destroy nature. This is the "win/win" move required to inspire, motivate, and justify the global collaboration needed for success. In the face of our current challenges, there are no win/lose moves remaining. We all survive and thrive or suffer and perish. The day of ecological, economic, and social reckoning has arrived. We have only a small window of opportunity to unite the leaders and people of the world in a massive Marshall-type plan for a regenerative global economy (i.e., the Plan that reconstructed Europe after World War II). The key component of success is the spatial configurations of regenerative urbanism (built environment), whose processes create, maintain, and enhance regenerative human systems sustainability for perpetual inclusive prosperity. Such a proposal may seem idealistic, naïve, even impossible. Yet, it is the hand humanity has dealt itself and it can be a winning hand if it's played with accurate understanding and an effective response.

The discussion of the three cases reveals the principles and concepts of regenerative urbanism in action. The Kashiwa case reveals the potential to invent new governance entities for systems sustainability entrepreneurship. The San Francisco case shows how one can respond with existing tools, services, budgets, and planned investments to create regenerative instead of degenerative districts. The Portland Albina Neighborhood case illuminates how regenerative urbanism can build community capacity for both climate change resiliency and restorative justice in disadvantaged communities.

### **Call to Action**

This paper proposes embracing the emerging regenerative systems sustainability approach as the necessary guide for 21st century sustainability and urbanism. It is the only antidote to climate change because it eliminates GHG emissions by correcting a self-destructing economy and associated destruction of nature (our irreplaceable regenerative life support system) and replacing it with one of inclusive prosperity. However, only the first chapter of that guidebook has been written. It is enough to begin quickly and then we can write the rest of it as we invent the balance of the approach in practice. Realizing our regenerative approach's potential given its incipient state will require that we recognize the innovation, understand it, and advance its use quickly in practice with the education, research, innovation needed for sustainability success in time.

This synopsis illuminates key characteristics for that purpose. The emerging approach of regenerative sustainability and urbanism described poses a question to us all: what can and should each of us do to secure climate and sustainability success? The answer is to integrate this knowledge into our lives, economic decisions, political support, and activism. For planning and design professionals, a few additional steps are clear. They are our call to action: *learn, make the market, deliver the value*. Please join the [Sustainability 2030 Institute](#), [Green Urban Design](#), and [ZGF Architects](#) in contributing to building an effective and powerful community of learning practitioners. That growing community is trying to advance strategic regenerative systems sustainability and urbanism at the scale and speed needed for sustainability success in time.

### THREE CASES

The three cases in Kashiwa Japan, San Francisco California USA, and Portland Oregon USA are instructive. They illustrate three different approaches to regenerative urbanism (respectively: governance, infrastructure, and equity). They work at the district scale to shift the built environment and economy from a degenerative to regenerative systems state. These projects are pursuing certifications such as the Living Community Challenge, EcoDistricts, the C-40 Climate Program, and LEED ND. They illuminate the necessary characteristics for 21st century urbanism being the only antidote to the dual challenges of accelerating climate change and unsustainability.

#### Kashiwa, Japan -- Urban Design Centers for Systems Sustainability

The Kashiwa Smart City <sup>3</sup> in Chiba Prefecture, Japan, 18 miles north of Tokyo, is an example of a district that began in 2008 as an innovative focused transit-oriented development plan that evolved into a comprehensive transformational plan. It shifted focus to address the core planning challenges underlying the transit function, such as an aging community, population decline, economic shocks, and resilience. It became a powerful expansive plan to create a district capable of tackling the local dimension of national social, economic, and resiliency challenges. Innovation included a new governance approach with its Urban Design Center (UDC): a new business, government, and academic coordinating entity working with the community to shape the built environment and manage district-wide sustainability. This can be seen as an example of creating the new urban development capacity of sustainability systems entrepreneurship required to build sustainable communities.

Establishing the Urban Design Center Kashiwa-no-ha (UDCK) in November 2006 was the first step in implementing the Kashiwa-no-ha International Campus Town Initiative in March 2008. The initiative describes its objective as follows: “. . . to realize an international academic city in which cutting-edge knowledge, industry, and culture can be developed and bring about a next-generational environmental city where people coexist in harmony with a rich natural environment and healthy, high-quality living and working environments in a creative setting that integrates the campus and town through partnerships among the government, private industry, and academia.”

This transformed district has become the largest smart city to earn a LEED ND Plan Platinum rating. Its deployment of energy, water, and material use building strategies along with strategic urban design decisions has changed the mix of uses in the area. It changed how rainwater is reused and how the natural environment provides settings for business and community activities in a network of outdoor spaces that unify the district. The Kashiwa project creates a resilient 111-acre/45-hectare district that aims to resolve social, environmental, and economic issues common to existing global cities. Through the effective use of real-time technology and data delivery, Kashiwa-no-ha Smart City connects residents to each other and to the built environment, enabling them to make the



Figure 1. Model of Kashiwa-no-ha Smart City Plan, ZGF/Nikken Sekkei-Photo/design Aqua Terrace, Nikken Sekkei.

best choices for themselves to increase comfort and productivity and for their environment to eliminate pollution, use solar energy, water, and other resources efficiently.

Kashiwa’s economic, sustainability-focused governance innovation of the UDC is rapidly expanding across Japan as a powerful new vehicle to cultivate built environments that form new settings for sustainable living. *“Urban Design Center (UDC) is defined as new community-building organizations and hubs that go beyond the conventional framework of administrative urban design and community building; in UDC, various local community groups collaborate with one another, while urban design professionals also take part from an objective standpoint. Empirical research on UDCs is being conducted in conjunction with developing a network throughout the country.”*

In Kashiwa, the powerful innovation of UDCK has transformed project goals. One project began as a conversation about the need for a regional water detention basin and expanded into a multi-use civic space called The Aqua Terrace. Another UDCK innovation created site and building performance guidelines that specified how individual buildings and open spaces could be configured to meet not only local and prefectural goals, but also to achieve national sustainability priorities and systems sustainability. This expansive planning canvas is atypical of traditional planning, yet it is required to address the complexity and needs of 21<sup>st</sup> century urbanism and sustainability.

### San Francisco, California, USA—District Foundation for Regenerative Urbanism

In 2017, as part of its city sustainability program, San Francisco Planning conducted a small pilot test of regenerative sustainability and urbanism.<sup>4</sup> SF Planning conducted the *Regenerative City Assessment* to consider the potential value of using a regenerative urbanism approach in the Central SoMa Area Plan for a rapidly developing mixed-use district. The pilot study assessed the performance of a regenerative approach against the traditional land use planning and environmental sustainability proposals already developed in the Draft Area Plan. The regenerative approach developed four integrated system-wide components that comprise the infrastructural foundation for producing regenerative systems performance district wide.

1. Installing district water and heat/cooling exchange infrastructure to reuse existing water and energy that would be lost otherwise.
2. Developing a system of blue-green, biophilic city infrastructure to create a high health-performance human community and natural environment that both mitigates and defends against global warming.
3. Connecting and integrating the built environment across scales (district, building, occupant) required to easily share resources and costs for a more efficient lower cost circular metabolism, built environment, and economy.
4. Developing integrative metabolic centers for circular material, water, and energy treatment and production that turns traditional municipal utility costs into a revenue generation with outputs of treated water, hydrogen, electricity, recyclable materials, heat, and food production.

Preliminary testing of these regenerative sustainability system planning and design concepts suggest that regenerative design and infrastructure may cost roughly 10 percent more than traditional development but yield approximately 50 percent more value. This order-of-magnitude estimate indicates that benefit likely exceeds cost. In addition to offering critical climate benefits, the investment would create more attractive places that people want and need: vibrant, vital, attractive, engaging, healthy places in our urbanizing world.

Though in a different context, the *Central SoMa Regenerative City Assessment* discovered the same need for a new governance entity as the



Figure 2. Concept for a regenerative community, Regensia/ZGF

case of Kashiwa. A new “district- or city-sustainability-developer-champion” actor is needed to assume responsibility for producing the full regenerative system performance of a district or city. This new governance entity enables working across the sectors, scales, and phases of development beyond what any one partner could accomplish alone. It also stretches across the on-going innovation in planning, designing, financing, building, and management required to overcome the many barriers to creating regenerative sustainability at the neighborhood or city scale, i.e., regenerative urbanism. This approach would integrate government, private, and civic functions in new partnerships to create the capacity to produce regenerative urbanism. This coordination is essential for securing, increasing, and optimizing the multiple benefits and success that regenerative urbanism can produce.

### **Portland, Oregon, USA—Regenerative Urbanism for Restorative Justice**

The Oregon Department of Transportation’s (ODOT) Independent Highway Cover Assessment of the I-5 Rose Quarter Improvement Project in Portland Oregon combined the project’s objective of covering a section of Interstate 5 in downtown Portland with the residents’ goal of regenerating community in the historically disinvested area once divided by the freeway, i.e., Portland’s Historic Black Albina Community.<sup>5</sup>

The project team sought to understand stakeholder interests, formulate potential highway cover scenarios, and assess their impacts and benefits. Engagement occurred through a series of virtual work sessions, surveys, and online public comments. It helped the project team understand how the highway cover could best be configured to create the greatest potential for restorative justice outcomes for the Black Historic Albina community: creating a diverse, inclusive, and accessible neighborhood. The heart of Albina—and the project location—was a commercial, institutional and social spine for the community.



*Figure 3. Regenerative District, Albina Neighborhood, ODOT/ZGF*

Historically, the walkable neighborhood was dominated by small-scale streets and community services were distributed throughout. The cover project design could provide the physical basis for restoring the area as a crossroads to and from Black community land uses, its institutions, churches, community centers, places of work and living. This neighborhood is the location of burgeoning activity led by members of Portland's Black community. It can serve as one part of a larger community effort to reestablish Lower Albina as a center of Black identity and culture in Portland. The project concept is to create a highway cover that can support the Black community’s desire for self-determination and structure it so the Black community can build it, own it, and benefit from it into the future. This project proposed using a new governing entity, like the UDC in Kashiwa, with land use decision-making and development authority over all aspects of the project. With this governance entity, the community shall be able to reconfigure the built environment and its economy to improve community wealth, health, and cohesion for themselves.

### **PRINCIPLES & IMPERATIVES**

Understanding the principles and imperatives of regenerative systems sustainability and urbanism is essential for understanding how to achieve sustainability success and why our current approach is the problem.<sup>6</sup> The imperatives of systems sustainability define the needed performance. Taking a strategic approach allows us to understand the gap between current reality and the needed future state. This design problem in turn becomes the frame for sustainability plans and projects project decisions at the smallest scale of urban development that support larger scale outcomes for the planet. Our current economic processes are based on principles and imperatives that destroy nature, its products, its species, its natural capital, and its regenerative life support capacity. Without understanding this point, we are surprised that we produce such results. During the 20<sup>th</sup> century, the “footprint” of human impact has expanded from the local to regional to global scale. Similarly, the risk of failure has expanded from city to region

to the whole global economy and nature. For the first time in human history, we now face planetary life support system insecurity, and ultimately, destruction if we do not reverse trends.

There is no better and legitimate rationale for market policy intervention than the ultimate market failure we now face. The policy intervention would replace the existing degenerative principles and imperatives at the heart of our economy, society, and legal system with a new set of regenerative ones. These new regenerative principles and imperatives do not replace existing urban planning goals; they are added to them as the highest-level context. They are a new set of first-order system-design principles and imperatives that produce systems sustainability. They define and illuminate the terrain within which all activity can occur without destroying our economy and nature, without negative effect, with net positive or restorative and regenerative effect. They define the needed performance of local projects or plans so they produce systems sustainability, not simply smaller negative incremental impacts.

On this point of system – or context -- design, it is important to note that the defining difference between the twin climate change and sustainability challenge compared to all other challenges humanity has faced. That difference is the challenge of systems – or context -- design, not individual component design. This challenge of designing systems context is new. Society does not yet have those skills, procedures, and expertise. Society has little if any experience designing systems, from the economy to community to culture to society. Typically, we take context (government, economy, laws, etc.) as given, and design the parts within and consistent with those systems (e.g., the built environment). Thus, we need to invent the new systems design capacity for our professional practices, for all of society's professional practices.

The shift to using sustainability systems performance imperatives instead of traditional planning goals is the way to specify, require, and achieve whole systems sustainability. Ultimately, this shift would reverse current trends and create global life-support system security and inclusive prosperity. The primary regenerative systems sustainability imperatives include:

- No net destruction of nature (natural capital) -- only enhancement
- Renewable energy economy (100% solar and wind)
- Continuous cycling of all materials by design for deconstruction and materials cycling and reuse
- No pollution – no waste – by design (materials and process of a circular metabolism)
- Only organic food production (plant and animal)
- Open biological economic loops for material cycling in nature that are not toxic or otherwise harmful
- Closed technical economic loops for toxic materials harmful to natural systems (only temporary)
- Decisions based on full-cost accounting that includes externalities (either precise or qualitative)
- Land use and built environment performance that reinforces regenerative systems sustainability.

There are other regenerative systems performance imperatives. However, this list illustrates how they define the field of action within which activity can occur without destroying the human economy or nature. In the first instance, they are a set of system design and planning guidelines and regulations. However, they would depend on a higher-order set of laws and policy to support the regenerative systems change. Continuous innovation in technology, guidelines, regulations, policy, and laws is needed and used to achieve regenerative systems sustainability performance and then to expand productivity (the system's "carrying capacity"). No matter at which scale one is working, even down to the smallest component of an urban space, these principles inform the design and functioning of the component to produce only net positive economic, environmental, and social *systems* sustainability.

## **CORE CONCEPTS**

This final section introduces the primary concepts operative in a strategic regenerative systems approach to sustainability practice, or regenerative urbanism. Formulating a systematic methodology for practice is an upcoming task and will use these concepts as a foundation and starting point. However, the ideas described in this section should be sufficient for practitioners to recognize the emerging approach, and then learn it, begin practicing it, or

accelerate use of it in one’s existing practice. The applications will be different depending on scale, sector, jurisdiction, but the ideas will be the same.

**Redefine Sustainability**

One key characteristic of regenerative sustainability and urbanism is redefining sustainability around biological regeneration instead of incremental environmental impact reduction. Such a redefinition connects the human economy and society to the biosphere’s living systems at the foundational level of operating principles. This definitional shift illuminates the many necessary shifts in sustainability practice as shown in Table 1, principally: from components to the system, from environment to economy, from problem solving to future designing.

**Table 1: Shifts in Practice When Regeneration is the Core Principle of Sustainability**

From stocks TO processes	From static parts TO dynamic systems
From linear TO circular material flows	From the environment TO the economy
From non-renewable TO renewable energy	From buildings TO city-region systems
From subsystem TO whole system optimization	From topical goals TO systems imperatives
From content TO context	From economies oblivious to the environment TO economies using regenerative principles
From symptoms TO sources of problems	
From impact reduction TO impact elimination	From problem solving TO future designing
From net negative TO net positive impact	

**Embrace the Emerging Innovation**

Fortunately, we do not need to invent a new approach. It is emerging from the spontaneous innovation arising across our planning, design, and building professions over the past 10-15 years in particular. It is responding to the challenges of accelerating climate change and unsustainability and to the limits of traditional design and environmentalism extended to sustainability practice. It is a new regenerative, *living systems* approach to sustainability. It has the potential for success before time runs out over the next 10-20 years. Understanding this potential is essential. Simply put, regenerative urbanism is urban development that “makes” more than it “takes.” Regenerative city-regions of inclusive prosperity are the necessary innovation required to scale sustainability to the level of environmental, economic, and social health performance needed for success. Pioneers include EcoCity Builders, The Natural Step, the International Living Future Institute, EcoDistricts, the Biophilic Cities Network, Climate Positive Development (C-40), the World Resources Institute, the Systems Change Lab, the American Institute of Architects, and the American Planning Association.

Our professions’ leading-edge sustainability initiatives are forging and applying the principles of regenerative urbanism as follows.

- **Planning:** formulating the policies and rules for designing and building high-performance regenerative settlements and places (Eco-Districts, Eco-Cities, Eco-Regions).
- **Urban design:** adding water and habitat (biophilia) to the urban design palette to create high-performance regenerative living places with the urban metabolism of living systems.
- **Architecture:** shifting to energy efficient buildings that enable the renewable energy economy; using biophilia to create healthy living open spaces, places, buildings, walls, and roofs.
- **Landscape Architecture:** shifting from aesthetics to habitat creation for biodiversity and human health in living city-regions with the use of biophilic planning and design.
- **Utilities:** expanding from gray to include green urban infrastructure with nature-based solutions and ecosystem-services to create living urban and regional metabolism.

Scaling regenerative systems sustainability and urbanism to a formal global practice, or “main-streaming” it, will require recognizing, understanding, mastering, and advancing it with innovative practice. Over the past 10+ years, the center of innovation for sustainability has shifted from the academy to cities as the following examples illustrate.



- Burnaby, BC: *Full strategic integration planning for a regenerative city*
- Vancouver, BC: *100 percent renewable energy supply for stationary and mobile uses*
- Sydney: *Net positive water reuse*
- Amsterdam: *Circular local economic development*
- Shanghai: *Public realm vertical farming systems*
- Kashiwa, Japan: *New governance & smart regenerative city development*
- Vienna, Helsinki, and Palo Alto: *Automobile-eliminating emissions-free transit*
- Singapore: *Integrating wild nature into the city with biophilic city planning and design*
- Chicago: *Managing urban development to achieve health for all*
- Copenhagen: *Redevelopment for the regenerative city*

### **Begin at the District Scale**

The three cases discussed above suggest the district as the best strategic scale for delivering regenerative urbanism. The EcoDistricts Movement uses a community's districts as the starting point for sustainability initiatives. Districts are locally defined sub-city areas of land use function and community identity, such as a residential neighborhood or a mixed-use district. Districts are the scale where people live and work. It is also the scale where most of the physical change is implemented and seen. It is the scale where citizen support can be best galvanized because the benefits are visible. Yet, delivering sustainability requires policy and planning at every spatial scale and across sectors and jurisdictions. For instance, attempting to share water or energy use across parcel lot lines and buildings to improve efficiency requires regulatory changes at the city, county, state levels and/or private utilities. In some cases, the district may also be the scale for efficient service delivery. For these reasons, the district can be considered the strategic scale of sustainability practice—a starting point to formulate the comprehensive cross-scale, -jurisdiction, and -sector solutions. The place to build understanding and support.

### **Start Now—Make the Market**

As professionals and decision makers, we can begin practicing regenerative urbanism now, without waiting until it is fully formed. In doing so, we advance its development by using existing regenerative technology and planning services for all maintenance, repair, and replacement decisions faced in municipal or private operations and in planning for renewal and growth. However, to do so, we need to know that it exists for purchase in the market as a routine practice, not as a risky leading-edge innovation. Thus, policy leaders need to inform themselves and professional practitioners need to make the market for this new practice, which is not yet fully formed or functioning, and which is one of the current barriers.

Vote with our expenditures! We can pay for regenerative urbanism now with existing budgets and already planned investments, or by including it in upcoming budgets. We can begin easily and quickly by simply purchasing the regenerative instead of the degenerative option, thereby shifting our built environments' performance from degenerative to regenerative.

### **Lead with the New Value**

Regenerative urbanism proposes a new value proposition (economic, environmental, and equity success), and therefore presents professionals with a new leadership role. They can use the new approach to configure the built environment to not only create great places, but to generate the systems sustainability performance and the productivity needed to mitigate climate change, eliminate poverty, restore nature, and expand the human economy for inclusive prosperity. Thus, regenerative urbanism extends beyond the traditional scope of land use to the economics, resource flows, and other urban, societal, and environmental systems that create system sustainability performance.

### **Shift to Regenerative Urbanism**

A strategic regenerative systems approach is critical for sustainability success.<sup>7</sup> It defines the field of the problem as the gap between needed performance and the performance of current reality, not simply between current reality and performance viewed as acceptable and attainable under current conditions (practical, feasible, political,

technological, budget). Doing so addresses the whole problem which needs a complete solution, not simply the easy partial one.

If a regenerative systems sustainability approach is the answer, how do we do it? Shifting to it is accomplished in two ways. First, change the focus from making sustainable components (the individual elements –parts–of the larger system, the buildings, vehicles, roads, parks) to making sustainable systems. The latter includes the former, but not vice versa. For planning and design, this means shifting from a project focus to the performance of neighborhood systems and the larger urban-regional systems. Second, change the definition of the problem from the symptoms of environmental degradation to the root cause: current economic tools, processes, and accounting. These two changes shift the focus of our problem solving, innovation, regulation, and planning from components to the system. We must reconfigure, reinvent, and respecify the economic machinery, processes, and practices that are destroying the environmental system.

Regenerative urbanism requires expanding the focus of urban sustainability planning from a project-to-project approach to a systems approach that reconfigures our nested and interconnected districts, cities, and regions to achieve true system sustainability performance. At the center of this shift is the concept of “biosystemsmimicry!” The term biosystemsmimicry extends biomimicry’s key insight of following the fundamental principles of nature’s “systems” success arising over 3.8 billion years of evolution to the design and functioning of our built environment and economy.<sup>8</sup> The net result would be systems-level sustainability in our urban and regional settlement systems and economy more generally. Getting there requires a strategic approach that assesses the gap between desired performance and current reality, formulates the best path to achieve the performance desired, and changes practice to produce it.

A critical premise of regenerative urbanism is the need to configure the built environment so that it integrates nature and human behavior to produce systems sustainability. Such planning and design will create circular resource flows that produce more value for both humans and nature than the current human economy. It also must address the challenges of communities with limited access to capital and disadvantaged from historical inequities that limits their resilience to climate change. The connection between climate change and its impact on disinvested communities establishes a moral and ethical challenge beyond traditional goals of planning, natural resource conservation, and eliminating greenhouse gas emissions. Thus, engagement with the stakeholders of historically marginalized communities to co-create neighborhoods that are adaptive and resilient to climate change is an important part of regenerative urbanism.

### **Invent New Governance Entities for Systems Sustainability Entrepreneurship**

A change in the governance of the free-market economy is needed to resolve the institutional incapacities that generate the market failures leading to the dual climate and unsustainability crises and other unintended impacts. Such a market failure can only be corrected with a governance system that harnesses the free market so that it delivers its socially legitimizing effect—producing for maximum public good through private market competition, not producing maximum private good for maximum system-wide collapse.

In addition, the benefits of regenerative systems sustainability do not accrue in enough magnitude to any one market or municipal function (water, land use, transportation, etc.) to exceed the current market benefits of unsustainability. If they did, we would see a big market shift to sustainability. Furthermore, unsustainable practices are protected by many existing laws and generated by many public subsidies. Conversely, current laws make many sustainability practices illegal. In other cases, market failure renders them uncompetitive. Finally, citizens are focused on immediate needs. Thus, existing actors (government, developers, business, citizens) and the existing market will never pursue regenerative sustainability and urbanism nor generate its big value. As a result, communities interested in regenerative outcomes need a new governance entity – a sustainability champion enabled to play the long-game of ultimate regenerative sustainability systems success, and quickly in response to the closing 10–15-year window of opportunity to make sufficient progress. The new champion needs to generate and coordinate the regulations and investment that create a regenerative built environment, which in turn, creates sustainable urban economies and communities. The case summary above on Kashiwa (Japan), describes such an innovation.

### **Solve the Economic AND the Environmental Problem Simultaneously—the New Value**

Cities and the built environment are a slow-to-change spatial dimension of our economy. How we plan, design, manage, renew, and reweave the built environment now fundamentally determines urban, regional, and global sustainability (or unsustainability) performance for the next 50 to 100 years or more. As a result, the added value of regenerative urbanism changes profoundly for society from being perceived as simply a nice-to-have optional aesthetic practice of urban and regional planning to being an essential economic practice. The choice is no longer the binary one between jobs or the environment, but the unitary choice of both jobs and the environment. It also reveals the falseness of the binary choice. The “jobs” of the binary choice are presented as the only job option when in fact that job option is only a short-term job option that kills the environment and then the economy. This realization reveals the real choice society faces: (1) short-term jobs that damage or destroy the economy and the environment or (2) long-term jobs that expand the life regenerating capacity of the human economy and environment. Getting from the first to the second type of jobs will require inventing effective and innovative sustainability transition policies and financing—a key aspect of the sustainability challenge.

### **Leverage the Built Environment–Economy Connection**

Cities are the greatest technology humans have invented. In addition, they are the mediating bridge between the human economy and nature, for either positive or negative effect. How professionals plan and develop the built environment “locks in” sustainability or unsustainability performance for the long run. Thus, how we plan new city-regions and renew existing ones becomes one of the critical sustainability planning responses to the closing window of opportunity from accelerating cataclysmic climate change and unsustainability. Furthermore, recognizing the built environment as part of the economy reveals the formative role it plays in catalyzing the full sustainability response: creating the new circular ecological sustainability economy of inclusive abundance. Embracing this new value, role, and approach will usher in the new practice of urban and regional regenerative systems sustainability planning, design, and management.

### **Expand Carrying Capacity by Design--Generate Perpetual Inclusive Prosperity**

The linear flows of the current economy will eventually exhaust the biosphere’s raw material inputs to the human economy. At that time, it will be too late to solve the problem. Such limits are intrinsic to our current linear approach to resource use. With it, we account only for the harvest from nature and not the harvesting’s destruction of nature’s regenerative capacity (natural capital). According to the best information available, we are reaching the limits of a linear approach in this century. The effects will exclude us all, ultimately, which is likely later this century if trends continue.

In contrast, a regenerative approach (1) mimics the self-organizing regenerative principles and processes of nature; (2) steps into the infinite loop of cycling materials in production, deconstruction, and reuse of nature’s material in subsequent rounds of production; and (3) harnesses human creativity and innovation to amplify nature’s principles and processes that expand the life support (carrying) capacity for both nature and the human economy. The ultimate result would be a human economy that produces inclusive prosperity for all in perpetuity, while also expanding the richness of nature without damaging nature. This shift creates the foundation for perpetual inclusive prosperity, with expanding productivity being the determining factor for meeting everyone’s needs. The solution is designing for infinite material cycling in the human economy without adverse effect on nature. Doing so using the principles and practices of regenerative biosystems mimicry, is the only way to expand substantially the carrying capacity of the human and environmental systems to achieve inclusive prosperity. The nature economy allows for production in perpetuity through resource cycling and design for non-toxicity and deconstruction and reuse. Regenerative sustainability would use these principles as planning and design imperatives for the human economy, including the built environment.

### **Solve the Climate and Sustainability Crises Simultaneously, Including a Defensive Move**

The source of the climate crisis is not GHG production per se, nor is the solution simply any method of GHG elimination by 2050 at the latest. The source is the economic machinery, processes, and accounting that produce GHGs now and for which there are no other options for the short run, nor until recently, for the long run. Another

aspect is the unequal distribution of the economy from local to global scales. Those living outside the benefits of that economy are increasingly laying claim to participation. It is those claims and the absence of a win/win positive-sum framing that are undermining climate negotiations and the collective formulation and embrace of the needed massive, lightning-fast response—the invention of a fully formed regenerative economy and society positively connected to nature.

To survive and thrive, humanity must shift to an ecological, regenerative, circular sustainability economy that is “hardened” against the increasingly hostile conditions of the 100+ year period of climate recalibration. Such an approach creates the basis for inclusive prosperity for a global population of 9 billion by 2050 and up to 12B by 2100. It is the primary strategy and mechanism for fully mitigating climate change and is the only approach that will likely gain the support of world leaders needed for climate success. Thus, we can and must solve the climate crisis with regenerative sustainability, thereby solving both crises simultaneously.

Finally, the climate and sustainability challenges are only partly ones of innovation, invention, and diffusion of the new regenerative economic machinery, processes, and accounting. It is also a problem of financing the transition; that is, structuring the investment needed now to be repaid from future revenues. We have the technology and know enough about the first round of investments to begin. We simply need to formulate the work plan and financing plan for the rest of the work that will achieve success within the limited time remaining.

### **Use the New Urban Systems Planning & Design Practice**

Since 2010, with the advent of powerful systems modeling information technology, the planning, design, and building professions are on the cusp of a new generation of a “systems” practice. Shifting to 2D-3D digital geospatial systems planning and design tools creates the potential for a new powerful practice: digital, object-oriented, urban and regional systems planning, design, and management.<sup>9</sup> The four pillars of this new practice are (1) 3D city base maps, (2) rule-based procedural modeling and planning, (3) interconnected WebGIS, and (4) easy automation with object-oriented programming, non-coding tools, and lite-scripting tools. These four pillars have ushered in a new world of software development. Previously, organizations would hire a group of software experts to create customized software to solve organizational problems. Now, software companies are building new platforms that streamline entire workflows, such as urban planning, with new tools: ArcGIS Urban, ArcGIS CityEngine, ArcGIS HUB, ArcGIS Indoors, ArcGIS GeoBIM, and UrbanSim. These new tools enable complex technical skills and workflows in the back end for use via simple web browsers.

This new digital system planning practice holds the potential to streamline the urban development and planning workflow and to monitor city-region systems performance, such as sustainability, for continuous improvement planning, design, and management. In addition, shifting to procedurally based geospatial systems planning holds the potential to scale the regenerative sustainability approach instantly for quick global diffusion. This is accomplished through the codification of regenerative principles, plans, and designs into programming rules. They are then used to generate procedural representations of form and processes that can be used to quickly test ideas and proposals in a digital twin model by iterating through many configuration scenarios in a fraction of the time it takes with current practice. In addition, those procedural rules that codify whole planning concepts (complete streets) or approaches (regenerative urbanism) can be easily and quickly shared and adapted to local conditions.

### **Build Inclusive Environments**

During the transition to a fully regenerative sustainability economy, there is a fundamental need to connect the larger urban economy with disadvantaged communities in new ways, so they have access to and participate in real wealth generation and accumulation. The changed economy of a regenerative built environment would meet the needs of disadvantaged communities. It would include healthy and service-rich environments focused on education and skills development. A regenerative built environment would increase nature in the neighborhood. Increased new, regenerative economic opportunity and the presence of nature in the built environment would expand well-being, reduce stress, produce community cohesion, and support collective action.

## Manage Resources for Regeneration

Ending linear take-make-waste resource use in designing the built environment and wider economy is the *north star* for managing resources for regeneration. There is no waste in nature. Waste in the human economy is a large unaccounted, invisible, *off-book* cost and inefficiency. Because the human economy violates regenerative principles blindly, the economy does not self-correct its fundamental market failure. Managing resources for regeneration is the correction. This correction would use resources continuously and use renewable solar and wind energy. It would end pollution and waste by reengineering processes and designing products and their life cycles for complete resource cycling and non-toxicity, and supporting those practices with laws and regulations.

## Generate Community Cohesion

Cooperation and community cohesion are both a requirement of regenerative urbanism and a product of it. The are key organizing concepts in politics and urban development planning. The goal of inclusive prosperity cannot be attained with an economy that destroys nature and our planetary life support security. Thus, fixing these economic dynamics with a shift to regenerative urbanism is the first priority, and it includes equity. It will expand the carrying capacity of the economy and nature to the levels of productivity required for the inclusive prosperity of 9-12 billion people by 2050-2100 with only net positive environmental impacts. One question for the equity community that arises from a regenerative systems sustainability approach is whether advocacy work should focus on campaigns to increase participation in and share of an unraveling, increasingly toxic world, or focus on advancing the use of regenerative urbanism and creation of regenerative economies and communities?

## Produce Systems Sustainability—Measure It for Continuous Improvement

A key characteristic of regenerative sustainability and urbanism is shifting from producing the sustainability of individual components (buildings, etc.) to producing systems sustainability. This is what can be termed “*biosystemsmimicry*” in the planning and design of the built environment’s components so that they function collectively to create a regenerative, circular ecological economy locally and beyond. The existing gap from current reality—and closing that gap—need to be illuminated with metrics and will arise from on-going innovation, practicing organizational learning, and continuous improvement of organizational and institutional norms.<sup>10</sup>

## CONCLUSION

This set of principles, imperatives, and core concepts are the key components of the emerging and powerful innovative response to accelerating unsustainability: regenerative systems sustainability and urbanism. They provide the foundation for exploring, testing, and advancing the practice for success. However, they will be applied in different ways across the spectrum of practitioners and settings, from local to international, from city to region, from economic sector to social sphere. They are the basis for the new value, new practice, and new leadership role for planners, designers, and sustainability professionals ushering in sustainability success just in time.

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<sup>1</sup> IPCC, [Sixth Assessment Report](#).

<sup>2</sup> Urban transition: [UN DESA, Our World in Data](#), and [Urban Population](#).

<sup>3</sup> Urban Design Center Kashiwa-no-ha, the new sustainable district development entity of [Kashiwa-no-ha Smart City, Japan](#).

<sup>4</sup> San Francisco Planning Department, [Regenerative San Francisco: Phase 1 - Explorations and Proposal for Action](#), April 2018. See also an earlier path-breaking urban planning study that contributed to the formulation of a regenerative approach: [Living Community Patterns – Exploratory Strategies for A Sustainable San Francisco](#), SF Planning/ILFI, 2015; also the International Living Future Institute is a leader in regenerative design and planning ([Home](#); [Living Community Challenge](#)).

<sup>5</sup> ODOT, [Independent Cover Assessment, I-5 Rose Quarter Improvement Project, Executive Summary](#), July 21, 2021

<sup>6</sup> This formulation is developed most recently in, Mason, Pamela, William C. Clark, Krister Andersson, *Pursuing Sustainability---A Guide to the Science and Practice*, Princeton University Press, 2016; and earlier in a variety of seminal works, including:

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<sup>7</sup> [The Natural Step](#) (TNS), an early proponent and global leader for a strategic systems approach to sustainability.

<sup>8</sup> The [Biomimicry Institute](#). The [Biophilic City Network](#)—Connecting Cities with Nature. Terrapin Green, [14 Patterns](#).

<sup>9</sup> Esri GeoDesign Summit session, *Enabling Sustainability Success with Regional GIS* ([recording](#), [slides](#)), and [resources page](#), 2021.

<sup>10</sup> Peter Senge, [The Fifth Discipline: The Art & Practice of the Learning Organization](#), Crown Business (Penguin), 2006.