Technopolis to Gaiapolis

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Fellows of the TANDO Institute hold diverse and sometimes opposing opinions. How wonderful! The opinions expressed here by Fellows are their own, and are not necessarily an official stance of TANDO Institute.

'Some see things as they are and say why, I dream things that never were and say, why not' – George Bernard Shaw (1856–1950)

Summary

The Global Fellows of the TANDO Institute amassed the knowledge base, and for decades conducted training, on *technopolis* – metro-area knowledge-intensive and high-tech economies. Thirty-plus years and a changing world have uncovered the technopolis concept's gaps and tatters. The Global Fellows now put forth a next-generation design for 21st-century cities. *Gaiapolis* supports environmental innovation, human fulfillment, and a quality life for everyone. This White Paper summarizes the Gaiapolis concept and outlines an implementation plan. It presents a vision of a 21st century urban Bio Renaissance, involving fundamental shifts in values and thinking.

The back-story

Around 1980, it became evident to policy makers in Japan, the U.S. and other countries that advances in computation, internet, and biomedicine would proliferate. These advances would open doors to job creation, economic development, exports, and enhanced national security. How to ensure that these benefits would materialize?

Keys would include the fostering of entrepreneurship; giving entrepreneurs easy access to university centers of excellence, venture funding, business know-how, and community support; encouraging large tech companies to establish operations locally; and strengthening the "mittelstand" of local small and medium enterprises (SMEs). A university turning out large numbers of excellent engineering graduates would help. Growing networks of knowledge and trust would require short travel times for face-to-face meetings. Thus, the "technopoles" would have to be born in metropolitan areas of a certain size and character.

The increasing mobility of the U.S. population, and of the younger generations in other countries, appeared to make it possible to assemble the needed talent and services, especially if the metro area in question featured the quality of life and cultural amenities that attract knowledge workers. The world had seen this happen more or less organically in Silicon Valley in California. How could it be *made to happen* elsewhere?

And could it best happen in a near-greenfield[1] project, or by transforming an existing community? Japan attempted the former, building a science city called

[1] Denoting or relating to previously undeveloped sites for commercial development or exploitation. Note this typically involved conversion of farmland to commercial and residential development.

Tsukuba a short distance outside Tokyo. Concatenating two Greek word fragments, the Japanese called Tsukuba and their other planned science/technology/research cities technopolis(es). Sheridan Tatsuno's 1986 book on the technopolis phenomenon informed projects already in progress in Austin, Texas. These ultimately showed that an existing community could be transformed into a technopolis through local government initiatives and public-private partnerships. Austin, previously a sleepy university and state government town, became a leading first-generation echo of Silicon Valley.

The Global Fellows and the Austin technopolis

The nerve center for Austin's transformation was the IC² Institute at the University of Texas established in 1977. Led by a pioneering techno-entrepreneur, the Global Fellows of the IC² Institute assembled the pieces described above. The Fellows authored or edited nearly all the early documentation and theory of the technopolis.[2] These writings, as well as Austin's demonstrated success, established the IC² Institute as the premier authority on technopolis. Many international delegations visited the Institute or sent visiting scholars to study Austin's strategy.[3]

The Global Fellows are experts in science, engineering, technology transfer and commercialization, finance/economics, and entrepreneurship. They launched early university courses in entrepreneurship, new product development, and other topics key to technopolis development. They gifted these courses to UT-Austin's rather traditional business school, enabling it to deal with an increasingly entrepreneurial and high-tech business environment. The Fellows' guiding philosophies are that ideology and technology jointly drive social change; and that innovation happens in cities or metro areas.

The Global Fellows have since separated from the University of Texas. In 2020, 80 of the Fellows incorporated as the independent non-profit TANDO Institute, dedicated to maintaining and updating the IC² Institute founder's vision and works.

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[2] IC² publications included the first edited collection on technopolis (Kozmetsky, Gibson, Smilor, 1988). The "Austin Miracle" is documented in Phillips (2006) *The Technopolis Columns.* Several other IC² Institute technopolis appear in the present article's bibliography.

[3] The Fellows who drove Austin's technopolis movement – or who became Fellows due to their outstanding leadership in technopoleis elsewhere – include Len Denton, David Gibson, Manuel Heitor, Michael Hough, George Kozmetsky, Deog-Seong Oh, Fred Phillips, Tim Raines, Nikolay Rogalev, Ray Smilor, and Sheridan Tatsuno.

TANDO Institute Fellows guided technopolis development worldwide

The first authored book on technopolis (Tatsuno, 1986) served as a guidebook for technopolis efforts in many quarters of the world. "Innovation Ecosystems," a 2016 paper by Global Fellows Oh, Phillips and Park, is one of the most highly cited articles ever published in the journal *Technovation*.

The Fellows carried Austin's success factors domestically to Portland, Cincinnati, and San Diego, among others; and internationally to Korea, Poland, Mexico, Hungary, Russia, and India. The World Technopolis Association (WTA), founded by Fellow D.S. Oh and carried forward by Oh and Fellows D. Gibson and F. Phillips, brought hundreds of officials from developing nations to yearly training sessions in Daejeon, South Korea (another technopolis that has worked with the Global Fellows) from 2009 to 2020. The WTA published a journal, *World Technopolis Review*, in those years.

Record of successful technopolis-building

The Fellows' technopolis-building mechanisms included publications; hosting visiting scholars and delegations; Fellow David Gibson's ICTPI conference series, held in many cities around the world; the WTA; seeding alumni throughout the world; advisory missions to, e.g., Costa Rica, Mongolia, Indonesia, and Poland; and on-site longer-term consultations. Among the latter were the design and launch of a water tech cluster for Cincinnati and the Ohio River Valley, still vital twelve years later; and an education tech cluster for Portland, Oregon, which has metastasized to encompass the U.S. northwest and has thrived for 20 years.

Testimonials as to the training's effectiveness include this from a Malaysian participant:, "It's been an amazing learning experience working with you. Will always cherish this."

What's next?

The Global Fellows' technopolis battle has been won. Studies of – and initiatives for – "regional innovation ecosystems" are now well established. Almost all universities now teach entrepreneurship. New business incubators abound.

The technopolis - a metro economy driven by knowledge industries and advanced technologies - was what was wanted in the 1990s and beyond, when every locale wished for its own Silicon Valley.

Now, they're not so sure. Each aspirant city has seen some of the benefits and troubles detailed in Table 1. The Global Fellows have seen all those listed, in their various client locations.

Moreover, the world has changed dramatically. Climate disasters, the loss of biodiversity, war, energy and food shortages, global supply chain problems, anti-global localism and nationalism, the rise of China, India and the Global South, rapid digital transformation during Covid-19, megacities, droughts, water shortages and many other challenges face all nations today. We need to revise our thinking, policies and decision-making processes.

Table 1. Benefits and eventually visible downsides of the technopolis movement

The Technopolis Strategy: What the more successful cities…	
…enjoyed	**…suffered**
Family-wage jobs	Traffic jams
Knowledge base	Higher rents
Tax revenue*	Exodus of artists, musicians, blue-collar workers
International profile	Closure of music venues
Growth in exports	Cyclic economy
Refreshed academic curricula	National security scrutiny
	Destruction of traditional and ethnic neighborhoods
	Urban sprawl
	*Poorly designed relocation incentive programs
	Social polarization

Tax revenue and incentive programs are linked by asterisks (*) in Table 1 because tax revenue is lost when rebates to firms are too generous, unnecessary, or are abused by the recipient companies. See Phillips and Sheikh (2020).

Role of Crisis

Austin's technopolis transformation was in part attributable to simultaneous crashes, around 1980, of markets for Texas' traditional sources of wealth: oil, cattle, and real estate. Texans finally attended to high-tech investment.

The March, 2023 crash of Silicon Valley Bank signals a similar opportunity for moving on from turn-of-the-century style tech business, toward a new way of benefiting from tech. "Techlash" – consumer and government discontent with the tech industry's misbehavior – also contributes to the crisis flavor of this third decade of the 21st century. Remote work triggered by Covid-19 social distancing policies have emptied major cities' central business districts, especially technopoles like Seattle, San Francisco, and New York City, which face growing budget deficits and are desperately seeking new industries to fill their empty downtown offices. People want better work-life balance, quality of life, parks, cultural life, and walkable cities, especially with rapid aging in the Global North.

Gaiapolis – Eco-City that Cares for the World

Seeds of gaiapolis thinking appeared during the technopolis transformation, e.g., in stories of CEOs of polluting hardware companies moving from California to start clean software companies in Austin. The surprisingly helpful role of the arts in helping businesspeople prepare for international commerce in tech made the Fellows early advocates of expanding STEM to STEAM.

In the intervening years, climate change awareness grew, and the United Nations devised the Sustainable Development Goals (SDGs). On the technology side, we saw inventions like the blockchain; on the social side, pandemic-related work disruptions led people to re-examine their lives, values and priorities.

It's now clear that what is needed for the 2020s and beyond is Gaiapolis, the "eco-city with heart," prioritizing technologies for climate action, biodiversity, human wellness, and ethical – even evolutionary – relations among citizens, corporations, and governments. Cities are people, not just smart buildings.

Unlike Uber, AirBnB, Facebook, and Theranos, firms doing business in gaiapolises will reject blanket philosophies of "grow fast and break things" and "fake it 'til you make it." Instead, they will promote sustainability, regenerativity, integrity, compassion, generosity, kindness, diversity, social inclusion and climate and environmental justice. As cities and tech hubs become more global, they require new

progressive and evolutionary values in order to meet today's many difficult challenges.[4]

Gaiapolis: A menu of features

Gaiapolis initiatives worldwide will strive toward the qualities and values listed in Table 2. The list is partial, and indicates directions cities strive to move toward. It is not expected that all cities will check off every item. It is expected that they will communicate and help each other achieve and check off significant numbers of the items.

Table 2. Gaiapolis characteristics and values

Quality over quantity: Heart, as well as head and hands	Wean from fossil fuels
Climate and pandemic resilience	ESG (Environmental & Social Governance)
Attract and grow enterprises that embrace newer values	Create jobs around renewable resources, healthcare and wellness
Emphasize public health, sanitation	Demand-side reduction of fossil fuel use
Knowledge exchange with indigenous peoples	15-minute city
Circular economy	Respect for grassroots initiatives
Healthy, educated population	Cultural renaissance
Currencies that reward sustain-ability, rather than penalize it.	Constant information exchange with other gaiapoleis
Sustainable innovation, leading to advances in one or more SDGs without degrading other SDGs.	Advanced simulation and wise interaction with Gaia-A.I. (artificial intelligence)
Sponge Bioregions	AI pandemic monitoring
Gaiapolis collaboration platform	Optical fiber network

[4] Julian Gresser's just published autobiography defines evolutionary values as those values that will help individuals, communities, and the planet survive, as opposed to the present dominant ethic of "might makes right." See Gresser (2023) and justclick.earth.

Climate finance platforms	Innovation for peace and peaceful application.
Love as the most powerful energy source that when connected to anything instantly produces a Positive Resilience Multiplier Effect	Other measures laid out in Tatsuno's 2022 book *Gaiapolis Strategy(2002),* Gresser's *How the Leopard Changed Its Spots (202*3), and Oh, Phillips and Mohan's *Smart City 2.0* (2023)

In short, technopolis is the old 1980s industrial paradigm based on fossil fuels and on tech that promotes design over nature values and thinking, and rapid quantitative economic growth which is causing environmental pollution, climate change, child labor, and other negative (and tragic) externalities. That paradigm is now shifting toward sustainability, regenerativity and true quality of life. Gaiapolis is a nature-based (integrating micro and macrobiology) approach that promotes design with nature in the biomimetic, biophilic and bionic cities of the future.

Our vision: A Bio Renaissance in the 21st century with massive, fundamental shifts in values and thinking.

Why 'Polis,' i.e. cities?

City officials are close to their constituents. This enables city governments to move quickly. Relatively compact metro areas afford learning opportunities through proximity, and collocation opportunities for industrial cluster development. Importantly, most city governments are not in thrall to big oil, the telecommunications, and pharmaceutical industries, or the domination of top down authority and control. Gaiapoloeis champion local ownership, operations, empowerment, financing, and control over the power-communications infrastructure driven by public/private alliances and partnerships.

National governments appear to be preoccupied with some matters (either trivial, like drag shows, or momentous, such as the war in Ukraine) and paralyzed by other matters (the debt ceiling) – leaving a clear field for cities to decide and quickly act on matters of day-to-day importance to their residents.

The three major impending existential dangers to humanity are pandemic, climate change, and a renewed threat of nuclear war. Cities can take meaningful roles in defusing the first two of these, if not the third.

The technopolis movement proved that metro areas can be fonts of innovation and technology valorization.

For all these reasons, we believe the next beneficial step, the gaiapolis, should have a city and bioregional focus. We do not foresee the world devolving into a collection of city-states. On the contrary, cities will take responsibility for diffusing innovations to their surrounding rural bioregions, and will learn from those nearby areas, and share best practices with cities around the world. Many responsibilities will still rely on state and national governments, especially for climate policymaking and financing.

What roles, then, for state/provincial and national governments?

State bodies will deal with multi-city projects, like the California water tunnel, and perhaps continue to negotiate collective energy purchasing. State governments can pursue fair representation by reforming gerrymandered voting districts.

National governments can push innovation in industry via technology forcing mechanisms like the Clean Air Act. Nations will engage in foreign policy, of course, and formulate transportation and Internet policy. They will proceed, via policies, "from decolonization to decarbonization" and provide financing to implement these programs.

International and multilateral agencies will negotiate matters such as atmospheric geo-engineering, refugee policies and aid, and so on.

The above does not substitute for a full civics text, but rather illustrates by example that cities will continue to co-exist and interact with several layers of political and civic bodies.

What about "smart cities"?

Tatsuno (2022) mentions green city and eco-city movements. These architectural concepts help advance ecological efficiency in urban life, but they do not address the full range of social innovation and human potential considerations we advocate for gaiapolis.

Another currently popular notion is the "smart city." As a top-down, supply-driven concept with unfortunate overtones of intrusive "total" surveillance, smart city also contrasts with the grass-roots, bottom-up collaborations that characterize gaiapolis.

Greenfield technopolis efforts share some characteristics with the smart city; see Table 3. Just as the greenfield technopolis was to some extent driven by construction companies eager to pour concrete, the smart city was pushed by IT and telecom concerns eager to lay fiber and cable, mainly to support increasingly densified wireless cell-WiFi towers.

Table 3: Tsukuba technopolis and Songdo smart city, compared

Tsukuba 1980	Songdo 2012
New science city from greenfield	High-tax "smart" surveillance city from landfill
Sterile buildings and streets	People want to live there, but turn off Alexa.
People didn't want to live there.	Growth businesses don't want to start there.
What eventually happened:	*What eventually happened:*
Public art, village-like amenities installed.	Songdo became a hub for international agencies.

Both Tsukuba (Japan) and Songdo (S. Korea) got off to false starts. Tsukuba modified its original, very un-Japanese city design, to make life there tolerable for its intended residents. It continues to serve its intended purpose as a science city. Songdo, intended as a technopolis and eco-city, achieved neither. High rents and poor location prevented tech firms from locating in Songdo, and pretensions to environmental sensitivity were vitiated by emissions from the hundreds of truckloads of fill material brought in to reclaim land from the sea. Families did invest in apartments in Songdo, and Seoul families brought their children to Songdo's splendid parks on weekends to enjoy the fresh sea air. Ultimately it was international agencies – United Nations offices and the like – that populate Songdo's office towers.

Both of the kinds of initiatives exemplified in Table 3 illustrate mistakes to be avoided as we develop Gaiapolis.

Rolling out the Gaiapolis initiative

The keys to Gaiapolis success will rely on local leadership, wisdom and evolutionary values, training, STREAM education,[5] demonstration projects, funding, tech platforms and tools, AI analytics and global collaboration.

Leadership

The GAIAPOLIS team has assembled a world class network of thought leaders and experts in AI, ICT, city planning, climate change law, and a wide range of core business

[5] Science, technology, resilience, engineering, arts, and mathematics.

skills and competencies. This group will secure federal, state, and local private and public funding, and significant investment from venture philanthropists.

Demonstration cities

MOUs with selected demonstration cities' business, political, and foundation leadership will be key to securing seed funding from benefactors and foundation grants.

Funding leads to a 3-month Feasibility Study and Action Plan for each demonstration city. The Feasibility Study will document and reflect Evolutionary Conversations that will begin at all levels of a collaborating city. These Conversations will carefully listen to and document the vision, passions, and concerns of a wide cross section of citizens in these communities.

Demonstration cities will have a unique opportunity to reclaim ownership, control, and financing of their critical power and communications infrastructure, as part of an important evolutionary shift.

Training

GAIAPOLIS will host a Training Academy, drawing upon the advanced skills of the new GAIAPOLIS organization's experienced International Advisors and TANDO's International Fellows Network. Next steps are to begin first training programs and educational webinars, conduct interviews with thought leaders, and commence training of demonstration city officials, young leaders, and other change agents. Training will present current best-practices of cities worldwide,[6] as well as additional gaiapolis principles.

Tools

Many precursors and/or core components of additional gaiapolis construction tools are already available to the GAIAPOLIS Team, via licensing from corporate partnerships and contacts. These include powerful artificial reality software and artificial intelligence (AI). The team will adapt the AI to emphasize wisdom for city administration and urban citizenship. It will incorporate The Artful Navigator, an early expert system to support wise negotiators based on encoded wisdom of great figures in history and literature.

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[6] For example: San Jose, California's Go Green program; Stockholm's integrating tech with sustainability; India's green hydrogen industry incentive program; Italy's public investment fund for projects on sustainability, circular economy, decarbonization, climate change mitigation; Portugal's Açao Plan for public awareness of resource management; and Taiwan's exemplary civil society and urban mobility.

The ”base layer” Gaiapolis asset is an intelligent interactive portal for knowledge sharing. Gaia-AI will ultimately help guide cities to the most appropriate complementary knowledge held by other cities, and suggest modes of reciprocation.

Maturity

Participants in GAIAPOLIS 10,000 cities who are dedicated to cultivating wisdom and Evolutionary Values will be called “owners.” They will be an extraordinary driver for accelerating effective adoption and innovation around the GAIA- AI-based Collaborative Learning Platform.

- Cities then deploy solar microgrid and other sustainable engineering solutions.
- GAIAPOLIS Institute continues its public interest educational and research programs.
- By 2025 Gaiapolis Institute is established as a global leader in GAIA-AI applications for sustainable cities around the world.

Gresser (2023) remarks that current complexes of world problems have induced malaise and reduced trust among many. This puts us in the position of Diogenes peering through lantern light in search of ten thousand optimistic, trusting city change agents. We are confident we can find 10,000 cities and more. One potential partner is MayorsForPeace.org, which has 8,900 member mayors and aims for 10,000 members.

This White Paper concludes with a Roadmap (Table 4) to the Bionic Gaiapolises of 2030.

Table 4. Gaiapolis Strategy: From Smart Cities to Bionic cities

Urban Design	Smart Cities	Smart Ecocities	Bionic Cities
Timeline	Phase 1: 2022-2024	Phase 2: 2025-2027	Phase 3: 2028-2030
Gaiapolis Cities	UN 100 cities	1,000 cities	10,000 cities and towns
Goals	Establish goals, policies, frameworks & metrics	Global rollout	Exponential scaling
Cultural Values	Global North leads	Global North and South	Global South leads
Economy	Linear economy Neoliberal economics	Mixed economy Doughnut economics	Circular economy Doughnut economics
Industries	Software Clean tech	Green industries Climate tech	Bio-industries Bionic tech

Urban Design	Smart Cities	Smart Ecocities	Bionic Cities
Energy	Natural gas & renewables Urban electrification	Solar/wind grids Regional electrification	Renewable storage grids. Bioregional electrification
Technologies	Smart cities Metaverse 3.1	Smart sustainable cities Metaverse 3.2	Exponential bionic cities Metaverse 3.3
Climate strategies	Adaptation, disaster preparedness	Mitigation, sustainability	Drawdown, regenerativity
Governance	Government, corporate, wealthy (1%), UN SDGs	Inclusion (top 50%)	All public & private sectors (99%)
Financing	ESG funds, PE	Climate funds	Climate markets
Education	STREAM frameworks (STEM+Arts +Resilience)	STREAM gamification	STREAM public worlds & private franchises

Source: *The Gaiapolis Strategy*, Sheridan Tatsuno, 2022

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