INSTITUTE FOR THE FUTURE

THE FUTURE'S EDGE FOR CITIES

A 20-Year View of Future Forces Affecting Urban Life 2016–2036

Prepared March 2016
As External Input to Habitat III

UCLG
United Cities
and Local Governments

About the …

INSTITUTE FOR THE FUTURE

Institute for the Future (IFTF) is an independent, nonprofit strategic research group with 48 years of forecasting experience.

The core of our work is identifying emerging trends and discontinuities that will transform global society and the global marketplace. We provide our members with insights into business strategy, design process, innovation, and social dilemmas. Our research spans a broad territory of deeply transformative trends, from health and health care to technology, the workplace, and human identity.

The Institute for the Future is located in Palo Alto, California. | **www.iftf.org**

UCLG: THE GLOBAL NETWORK OF CITIES AND LOCAL, METROPOLITAN, AND REGIONAL GOVERNMENTS

United Cities and Local Governments (UCLG) is the world organization of local and regional governments and their associations, representing and defending their interests on the world stage. UCLG's network of members represents 70% of the world's total population and is present in all world regions: Africa, Asia-Pacific, Europe, Eurasia, Latin America, the Middle East and West Asia, and North America; organized into 7 regional sections, 1 metropolitan section and 1 Forum of regions. This network includes over 240,000 towns, cities, regions and metropolises, and over 175 associations of local and regional governments in 140 countries. Among UCLG's key areas of political interest are: local democracy, climate change and environmental protection, the achievement of the Sustainable Development Goals, local finance, urban development and city diplomacy in peace building. | **www.uclg.org**

CONTENTS

EXECUTIVE SUMMARY

This memo presents a 20-year view of the future context and future forces that will impact urban life in the coming decades, prepared as external input to two key global conversations: First, the United Cities and Local Governments Congress in Bogota, Columbia from October 12-15, 2016. Local and regional leaders will convene around the theme "Local Voices for a Better World." Second, the United Nations Conference on Housing and Sustainable Urban Development, Habitat III in Quito, Ecuador from October 17-20, 2016. This rare gathering is on a bi-decennial cycle and has previously met in 1976 and 1996. What follows is research by Institute for the Future, informed by an expert workshop with Laboratorio para la Ciudad and United Cities and Local Governments at the Ford Foundation in New York in January 2016. Workshop participants are described in detail in the appendix. Here is the high-level view of shape of this transformation regarding the future of cities:

Research Methodology

A signal of change is a small or local innovation with the potential to disrupt the status quo by growing in scale, size, or geography. Taken together, a pattern of signals serves as an early indicator of change. Each future force describes one such pattern.

Future Context

Seven Economy Future | Seven economies operate all at once over the next 10 years: corporate, consumer, collaborative, creative, civil, criminal, and crypto.

Workable Future | Automation, on-demand platforms, and task-routing practices rapidly disrupt the workforce and transform the landscape of labor economics.

Future Forces

Governance Futures | The relationship between people and their governments gets reinvented to prepare for an age of planetary challenges and human responsibility.

Learning Cities | Cities as learning platforms build out skill-sharing as a critical new urban infrastructure.

Vehicle Energy Systems | Electric vehicles reinvent the grids that distribute renewable energy from solar and wind sources across the urban landscape.

Open Innovation Cities | Open innovation emerges as a go-to strategy for urban development and redevelopment around the world.

Criminal Innovation Zones | New blends of the digital-physical world intersect with a growing social precariat to create a perfect storm for criminal innovation.

Microbial Health Economy | Microbiotic lifestyles flood the marketplace while microbiotic medicine begins to transform health care and urban design.

FUTURE CONTEXT:
SEVEN ECONOMY FUTURE

Seven economies operate all at once over the next 10 years: corporate, consumer, collaborative, creative, civil, criminal, and crypto. These set the context for all of the foresights to follow.

In a world of 8 billion people, we won't be surprised to find that there is no single mainstream economy. Instead, we'll discover at least seven distinctive economies. Each is evolving according to its own internal set of rules. Each is responding in its unique way to a fragmented ecosystem of both new and familiar drivers. All are intersecting to create the socioeconomic underpinnings of the coming decade.

1 | Corporate Economy

The corporate economy draws its strength from legitimacy and scale. Canonized by corporate law and international trade agreements, the largest of the world's corporations outperform the GDP of entire countries. Yet both large and small corporations are increasingly subject to shocks: Declining return on both assets and investments. Assets, stranded by both innovation and policy, that can't be converted to profit. Slower growth of international trade along traditional supply chains as digital supply webs rewrite the geographies of trade. Shrinking full-time employment as robotic technologies and algorithmic management drive people to other platforms to earn a living. These create the conditions for a volatile corporate decade.

2 | Consumer Economy

The consumer economy is the flip side of the corporate economy. Built on the spending of households, it powers the corporate economy with its purchases. But households aren't what they used to be. Millennials are going into debt, not for cars and homes, but for education, tech, and travel. They're blurring the lines between domestic and commercial as they turn their gaze from corporate offerings of both jobs and goods to the emerging collaborative economy. They're investing in new identities that come with new living arrangements, new workstyles, and even new gender assignments. All the while, the growing hunger for instant gratification drives a so-called stalker economy of advertisers committed to feeding that hunger.

3 | Collaborative Economy

The collaborative economy shifts production, trade, and finance from legitimatized corporations to legitimatized individuals. It balances the decline of return on corporate assets with the growth of return on individual assets. It trumpets crowdsourcing and crowdfunding. But while promising decentralization of production and services, the big challenge of the collaborative economy as it defines itself over the coming decade is whether it will adopt architectures of aggregation and enclosure—über-platforms like, well, Uber—or truly decentralized architectures that are owned in common by the crowd that brings them to life. Will it become a platform for scarcity or abundance?

4 | Creative Economy

Though a small contributor to global GDP, the creative economy of artists, gamers, entertainers, and innovators is a critical lynch pin of economic health for the next decade. In fact, creatives and innovators have historically been a buffer in times of economic volatility as well as the essential seeds of growth in an economy that depends on innovation for expansion. Creatives and innovators are also the pioneers of the collaborative economy. And as we enter the era of fabbing and small-scale manufacturing, they may be at the forefront of the transformation. But the creative economy has traditionally suffered from what some call "the missing middle." With relatively few capital investors and a tightly centralized distribution channels, only a few of the broad base of potential contributors to the creative economy typically manage financial success. Building this missing middle is their central task over the coming decade.

5 | Civil Economy

Broadly speaking, the civil economy is the economy of people acting as citizens, whether through governmental or nongovernmental organizations. It is the economy where we encode our values as a community, a city, or a nation-state. Over the past decade, the city has become a locus of rapid innovation in the civil economy, often by opening civic data to public use. Over the coming decade, all the other economies will seek to build on this innovation, often with very different goals and models. Which models succeed will, in turn, determine whether the civil economy emerges as a strong force for reconstituting our values or alternatively declines into a world of fragile states.

6 | Criminal Economy

In a world of liberalized trade and growing inequality, organized crime has staked its claim as an equal partner in the world economies. Crime has its own parallel institutions—banks, law firms, brokers, collaborative platforms, and all the other fortifications of a legitimate corporate economy. Crime also has its own agenda for innovation, and in many areas, it's innovating faster than its competitors in government and corporations. It has become the leader in decentralized operations that can leverage geographic borders and limited legal jurisdictions to its advantage. Over the next decade, crime will use the tools and value flows of all the other economies to implant itself inexorably at the core of human life.

7 | Crypto Economy

A series of seemingly simple technical innovations has launched the crypto economy into a potential paradigm shift in the way we trade, the way we organize our institutions, and even the way we build human trust. End-to-end public key encryption, multi-signature transactions, and open ledgers lay the foundation for everything from personal, purpose-built currencies to self-managing and even self-owning objects. Ultimately, the crypto-economy promises to re-architect all our economic and perhaps social platforms as radically decentralized paths to value creation.

FUTURE CONTEXT:
WORKABLE FUTURES

Automation, on-demand platforms, and task-routing practices rapidly disrupt the workforce and transform the landscape of labor economics

A social, economic, and technological revolution is changing the way we work. This revolution stretches far beyond disruptive innovations in taxi services like Uber or freelancing platforms like UpWork. The way we create value is changing. Whether it's building parts for electrical vehicles or building out the infrastructure for an Internet of Things, whether it's providing care to aging parents or combating extreme weather events, we're reinventing work and the workforce.

Often, when we think of digital platforms for work, we think of the nuts and bolts: the user interfaces, the APIs we'll create and the ones we'll plug into, the algorithms that will sometimes make our platforms smarter than any individual human, and of course, the entire infrastructure of data storage and communication in the cloud. These are necessary components of positive platforms, but we need to think beyond the technical and business model innovations that are driving this to a revolution in the workplace to build truly positive platforms.

We need to think of the upstream and downstream implications of individual features, rules, and policies of platforms and the combined functionality they offer. We need to understand how information will flow not only from one platform to another but also through other socio-economic structures like corporate and government institutions. We need to anticipate how people will interact with these flows of information and how we will use them to shape new lifestyles, innovative economies, new kinds of communities, and novel forms of governance.

These ten strategies invite us to consider both the technical details and the broad policy questions that will help us build a workable future:

1. Combine the best of investor-owned and commons-based platform models

In their position as leading edge innovators, platform designers can discover and prototype new options along the market to commons continuum, but can social inventors also create the market and policy environments where these prototypes can take root?

2. Solve for both transparency and privacy

Positive platforms have the potential to inject much greater intelligence into our global economy with transparency, but how will they balance that transparency with privacy?

3. Integrate marginalized workers in a sustainable economy

Positive platforms can help reclassify jobs, revalue them to reflect their true social value, and make sure everyone has access, but how can labor policy and communications policy alike support this reinvention of work at the margins?

4. Ensure opportunities for workers to advance outside of traditional organizational hierarchies

We are shifting from organizationally-driven career paths to more fluid work patterns in which people work across multiple platforms and teams, often performing different roles and building complex work portfolios. How can positive platforms help workers make choices and invest in personal brand-building in a way that enhances the capacity of the human workforce?

5. Support worker-owned identities

Positive platforms can support workers in managing their distributed identities to their own advantage, but how do we assure that workers know how to make the most of their data to build and share prosperous identities?

6. Create ways for workers to bring their voices together

Positive platforms can intentionally create ways for workers to bring their voices together, but can such platforms help workers gain the power to get employers and power brokers to say YES when they want to say NO?

7. Reinvent benefits to follow workers everywhere

Federally-provided or portable benefits have been used as a flexible solution to support flexible workers, and positive platforms can create the economies of scale and cross-boundary reach that such benefits require. But how will these benefits be redesigned and accessed in a mobile global workforce—and what role can positive platforms play in their successful deployment?

8. Integrate learning and work

Positive platforms could turn learning into earning, and pay learners to do real-world tasks as they learn. But how will we rethink work tasks as learning tasks and vice versa to create these virtuous cycles of learning and earning?

9. Prepare youth for "the hustle"

Positive platforms can help young people safely prepare for the rough and tumble world of the platform economy and entrepreneurial innovation, but how will we shift the measures of academic success to gauge the readiness of students to participant in an emergent, on-demand labor economy?

10. Champion a good work code

Positive platforms and protocols can set the trajectory for worker well-being by designing software and processes to meet a code of good work, but how will we champion these basic principles across a diverse worker ecosystem and operationalize them in the next all-important decade?

FUTURE FORCES

Signals and disruptions that will reshape the future landscape in the next two decades.

These future forces are intended to be provocative without turning people off, and familiar enough without sounding like the same old thing. They are disruptions—breaks in the patterns of the past that will reshape the future landscape.

All these future forces—Governance Futures, Learning Cities, Vehicle Energy Systems, Open Innovation Cities, Criminal Innovation Zones, Microbial Health Economy—are self-contained stories from the future that inform the present.

Each future force is supported by a range of signals that bring the forecast to life. These are early indicators that point to a critical direction of change—even in the face of great uncertainty. As science fiction author William Gibson said, "The future is already here, it's just unevenly distributed."

FUTURE FORCE
GOVERNANCE FUTURES

The relationship between people and their governments gets reinvented to prepare for an age of planetary challenges and human responsibility.

Today's governments are using 18th century tools to solve 21st century problems. These failures not only perpetuate suffering today, but also ripple through time, constraining choices for generations to come. But while governments remain stuck, people are evolving.

Signals of Change

Democracy Earth

WHAT: Democracy Earth is a global governance toolkit to leverage open-source software, peer-to-peer networks, and smart contracts in order to make decisions together—from budgeting to beliefs. As blockchain technology begins to enable new kinds of identity verification

SO WHAT: These blockchain-based approaches allow for decentralized governance for any kind of organization. Think of it as a new operating system for democracy.

Loomio

WHAT: Loomio is a New Zealand-based decision-making software to help groups govern themselves through collaborative decision-making. It was originally inspired by the hand signals from the Occupy Movement, and has been used by city councils such as the Wellington, NZ City Council to aid in municipal decision-making.

SO WHAT: This is one among a slew of decision-making tools for the Internet Era. Importantly, it's open source, so is widely accessible for prototyping new forms of decision-making.

Participatory Budgeting Project

WHAT: A not-for-profit organization that represents the larger movement toward empowering people to think together about how to spend money. Already in the United States and Canada, it has had an impact of over $170,000,000 of money that has been budgeted in this way across 500 local projects.

SO WHAT: Cultural shifts like these engage greater numbers of citizens in the democratic process, and bring elected officials closer to their constituents.

In the next 20 years, expect to see blockchain and other decentralized modes of identity verification and governance to proliferate. As cities become instrumented with the Internet of Things, we will have many more data inputs for collective decision-making. So-called "Liquid Democracy" will join the ranks of direct and representative democracy, as a form of governance that is made for the Internet era.

Habitat III Policy Implications:

» **Social Cohesion |** Inclusivity will be important not just in the geographically defined locality of a city, but also in virtual communities, defined by non-geographical boundaries.

» **Urban Frameworks |** Thriving municipalities will be those who develop capacities in participatory budgeting.

» **Urban Ecology and Environment |** Global governance models will become increasingly important for urban resilience in the face of climate change disasters over the coming decade.

FUTURE FORCE
LEARNING CITIES

Cities as learning platforms build out skill-sharing as a critical new urban infrastructure

As learning moves off school campuses and into the world of everyday life, communities will develop new tools and processes for peer-to-peer learning. Cities seeking to develop both their communities and their economies will tap this bottom-up movement to begin systematically developing themselves as learning platforms. Where school systems once defined the best neighborhoods, urban learning platforms will define the best cities. Over the next decade, these learning cities will emerge as leaders in 21st century urban development.

Signals of Change

Learn.pgh

WHAT: Pittsburgh is launching the Learn.pgh platform as a directory of learning experiences, with a focus on helping citizens earn credentials (learning verification) by addressing local challenges.

SO WHAT: Urban citizens build their personal identities by building or rebuilding the communities where they live. In effect, these serve as new citizenship credentials.

Human Library

WHAT: The Human Library is in 11 cities worldwide, bringing "people on loan" into neighborhoods to promote dialog and reduce prejudice. Imagine borrowing a person from a library just as you might a book.

SO WHAT: Learning across urban silos fosters creativity and cooperation in cities, not only strengthening community but also local economies. As communities struggle to integrate diverse populations, learning cities create opportunities for these populations to learn from one another.

Dow Day

WHAT: Dow Day is a so-called situated (geo-locatively based) documentary about a two-day protest in 1967 in Madison, Wisconsin, designed to give a first-hand experience of the event in the spot where it happened.

SO WHAT: Every moment becomes a teaching moment in the city, which changes peoples' relationship to the built environment.

While not ubiquitous, learning cities will proliferate in the next 20 years. With an emphasis on resilience, they adopt citywide skill-sharing as a new part of civic infrastructure. Local civic, neighborhood, and even personal projects provide not only alternative paths for urban development, but also a primary path for building a broad base of personal skills that can be converted to income streams via microwork platforms. Large companies set up recruiting relationships with cities the way they have traditionally recruited from colleges. In fact, many companies base their creative operations in those cities with strong "learning city" profiles. Urban learning platforms create a virtuous cycle as learners extend and amplify the platforms from which they learn.

Habitat III Policy Implications:

- » **Urban Frameworks |** Learning platforms for skill-sharing becomes a critical new urban infrastructure.

- » **Spatial Development |** Cities will use augmented reality using digital overlays to layer learning on top of the built environment, creating a new "space."

- » **Urban Economy |** City-based learning platforms will increase resilience in the face of economic instability, underemployment, and local climate-driven disasters.

FUTURE FORCE
VEHICLE ENERGY SYSTEMS

Electric vehicles reinvent the grids that distribute renewable energy from solar and wind sources across the urban landscape.

Over the next decade, the shift to electric vehicles will create new models of energy storage that have as big an impact on the way cities manage their energy grid as on their urban transportation systems. At the core of this disruption is the rapidly growing capability of batteries with both much longer lives and denser energy profiles. As cars and trucks become not only energy users but also mobile energy sources, they will begin to reinvent the grids that distribute renewable energy from solar and wind sources across the urban landscape. The result is a more resilient, sustainable, and even mobile platform for both energy management and transportation of goods and people.

Signals of Change

OpenIDEO

WHAT: OpenIDEO proposes a peer-to-peer platform for distributed energy resource that allows individuals to directly sell excess electricity production from renewable energy.

SO WHAT: Building on home solar generation with vehicle storage devices, P2P grids begin to break down the centralized model for energy distribution.
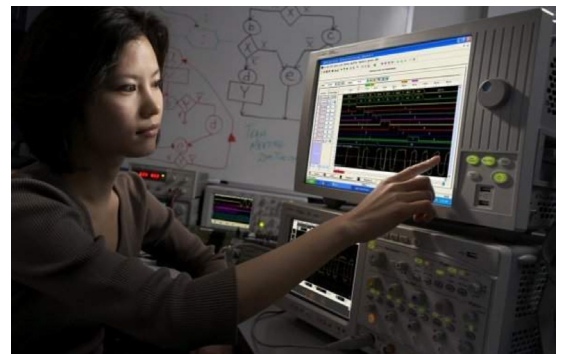
Solar E. Technology

WHAT: Solar E. Technology offers nano-grid solutions (at the scale of a building or smaller) that capture renewable energy in the daytime, switching to stored energy at nighttime, using mobile-enabled meters with mobile payment options.

SO WHAT: Nanogrid development as an urban response to disaster preparedness catalyzes standards for nanogrid connections and control devices.
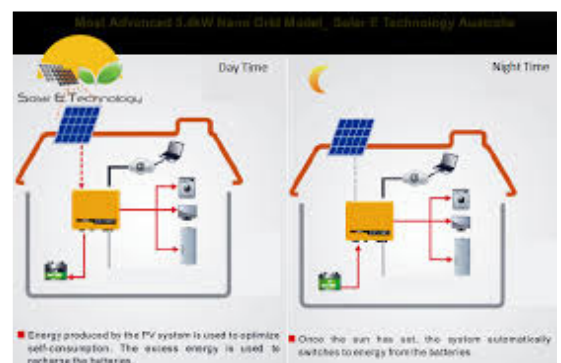
SAV Fleet

WHAT: A University of Texas study finds that using a Shared Autonomous Vehicle (SAV) fleet, one SAV could replace nine conventional vehicles with an average user wait time of one minute.

SO WHAT: Autonomous vehicles create a more sustainable infrastructure for transportation and energy.
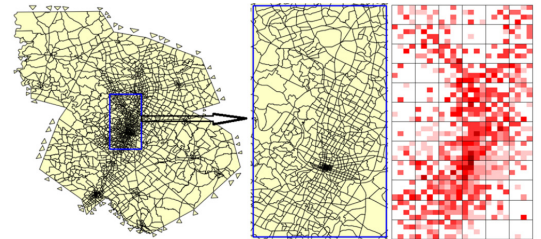
By 2036, communities around the world are experimenting with three distinct models for deploying vehicle energy systems. The first is vehicular energy for disaster zones, including both household backup energy and taxi fleets that can be deployed to disaster zones when needed. The second is the off-grid solution, where households or neighborhoods integrate electric vehicles into nano- or even microgrids as a way to support a resilient hyper-local (household-scale) energy economy. Third is city-scale urban vehicle fleets, algorithmically pre-programmed to load-balance demand for both transportation and energy across the city, successfully reducing the carbon footprint of automobile transportation while providing sustainable regional transportation and energy. All three rethink the relationship between energy and transportation as society moves from fossil fuels to renewable electric power.

Habitat III Policy Implications:

» **Spatial Development |** Companies and cities partner to experiment with shared autonomous vehicle zones.

» **Urban Ecology & Environment |** Increased instability in city power grids drives demand for off-grid power that is not subject to municipal controls.

» **Urban Housing & Basic Services |** Expect to see development of a standard home charger that can be set to pull power from electric cars.

FUTURE FORCE
OPEN INNOVATION CITIES

Open innovation emerges as a go-to strategy for urban development and redevelopment around the world.

Around the world, cities are working to jump-start an urban culture of open innovation. In the corporate economy, the concept of open innovation has been a response to the mandate for continuous economic growth. But over the next decade and beyond, cities will adopt this as a strategy to improve the quality of urban life as they cope with population growth, creating distinctive local ecosystems of social innovation and entrepreneurship alongside economic growth.

Signals of Change

Shenzhen Makers

WHAT: The city of Shenzhen is reinventing itself as an open manufacturing center with such initiatives as its Open Innovation Lab and Shenzhen Maker Week.

SO WHAT: Local manufacturing ecosystems develop distinctive innovation zones of advantage to rapidly propagate new products and processes through global digital supply webs.

Kakao Taxi

WHAT: Seoul recently banned Uber, developing their own similar platform, Kakao Taxi, in partnership with the popular app Kakao Talk and local taxi companies.

SO WHAT: Cities tap into the data provided by their own open urban platforms to meet policy goals such as maintaining a viable workforce and public funding streams.
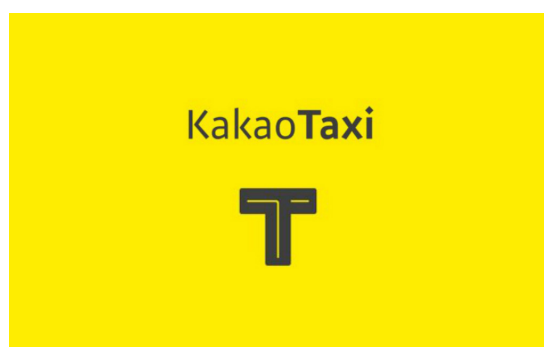
Barcelona 5.0

WHAT: Barcelona 5.0 is an initiative to reorient city hall from managing PITO to facilitating DIDO—that is, from products in/ trash out to data in/data out.

SO WHAT: Visionary cities conceive of the objects, people, and environments within their borders as nodes that can be better connected to increase social value and enhance self-sufficiency. City Hall = API (Application Programming Interface).

From Fab Cities to Fab World
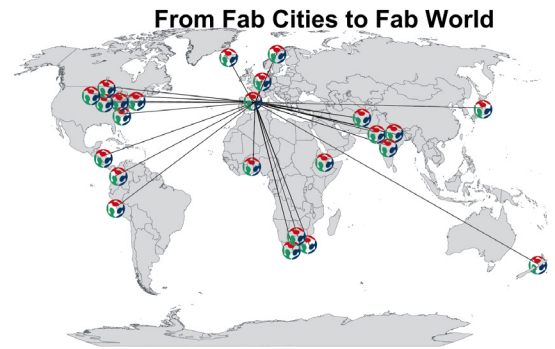
Two decades from now, the open innovation cultures of individual cities are connected in city-to-city networks that drive rapid adoption of new models for sharing data, skills, and profits. City-to-city co-production initiatives compete with traditional corporate supply chains to share profits—and capacities—across national boundaries. In cities that have depended on mass manufacturing in the past decades, workforces are redeployed and reeducated for more agile production and service models that blend private and public platforms. Cities with their own microwork platforms have experienced a measurable drop in unemployment. A few cities are exploring the frontiers of distributed collaborative organizations and open innovation election platforms as a way out of systemic corruption.

Habitat III Policy Implications:

» **Social Cohesion & Equity |** Urban matchmaking services will lower transaction costs of connecting.

» **Urban Frameworks |** City Halls will begin to function as APIs.

» **Urban Economy |** Open-source hardware & software (freely available for modification and use) will be a critical post-industrial development strategy.

FUTURE FORCE
CRIMINAL INNOVATION ZONES

New blends of the digital-physical world intersect with a growing social precariat to create a perfect storm for criminal innovation.

Over the next decades, organized crime will continue to build a worldwide economy by exploiting the borders and boundaries between both physical and digital jurisdictions, by attacking the weak points in physical pathways as well as digital protocols, and by amplifying their crimes in physical hubs and digital platforms. But in addition, the criminal class will use its growing prowess in both physical and digital domains to innovate at the new intersections of a blended world, where physical and digital blur.

Signals of Change

Drone Delivery

WHAT: In January 2015, a drone carrying methamphetamine crashed in a grocery store parking lot near the U.S.-Mexico border.

SO WHAT: Drone delivery of all kinds of goods creates both efficient systems of delivery for illicit goods and opportunities for criminal networks to hijack those systems. Traditional geographic and jurisdictional boundaries will be challenged.

Local Infrastructures

WHAT: Already in 2006, the Zeta drug cartel had built out an undercover solar-powered, computerized mesh radio infrastructure through most of Mexico and parts of Guatemala.

SO WHAT: Locally-maintained secure and resilient infrastructures for communication begin to permeate impoverished regions around the world via criminal networks.

UCLG

Small-scale Smart Transport

WHAT: Drug runners in the Caribbean build sophisticated semi-submersible smart submarines that can self-sink when pursued—with a price tag of about $1 million.

SO WHAT: Criminal networks create small-scale smart transportation systems, often at a fraction of the cost of traditional military contractors.

Two decades from now, organized crime takes advantage of its proficiencies in cross-jurisdictional arbitrage and its so-called dark webs of digital communication to amplify criminal activity in the hot spots of blended physical-digital life. Tapping efficient distributed infrastructures for both innovation and dissemination of innovation, organized crime grows in scale and scope. New classes of crimes emerge as society sets new rules for acceptable behavior in blended physical-digital space, ranging from rules for wearing augmented reality lenses in public settings to hacking smart connected objects. In fact, it's the proliferation of new rules that creates many of the opportunities for new crimes as society figures out how to manage these vulnerable new realities.

Habitat III Policy Implications:

» **Urban Frameworks |** Illegitimate actors will increasingly challenge traditional jurisdictions like cities or nation-states.

» **Urban Economy |** Upskilling through crime will be a path gaining employable skills which can then be put to use in the legitimate economy.

» **Urban Housing & Basic Services |** Expect to see more attacks on smart objects such as cars and smart home systems, creating a new sense of vulnerability.

FUTURE FORCE
MICROBIAL HEALTH ECONOMY

New microbiotic lifestyles flood the marketplace while microbiotic medicine slowly begins to transform health care and urban design.

Over the next decade, humans will seek well-being at the scale of microbes. Forsaking germophobia for germophilia, we will invent new microbial products for everything from cosmetics and mood enhancement to soil maintenance. Gone are the days in which we will anesthetize every surface due to fear of the germs that inhabit them. Environmental microbial science will open the door to the design of public and private spaces for microbial health. New biomolecular tools will seek to control the behavior of microbes in and around us. Although our inventive imagination will outpace microbial science, the next decade will lay the tracks for new microbiotic lifestyles and a new microbiotic medicine.

Signals of Change

Pathomap

WHAT: Pathomap is a research project to create a molecular portrait of New York City. Now in 16 cities worldwide via MetaSUB.

SO WHAT: Cities and built environments will be managed as microbial ecosystems. Imagine urban designers exploring the microbially-optimized commute and health experts monitoring pathogen "weather maps."

AO+ mist

WHAT: AOBiome's AO+ mist claims to be the first live probiotic for the skin, promising to restore and maintain beneficial bacteria on the skin.

SO WHAT: A vanguard of offerings range from minimalist, do-no-harm products to personalized microbial solutions for individual well-being.

MEET THE AO+ MIST
The first live probiotic for the skin. Restore harmony and enrich your skin's natural biome.
SHOP AO+ MIST

Prebiotics

WHAT: Building on early studies that show probiotics can reduce anxiety, a 2014 Oxford study found that ingesting prebiotics can suppress stress and increase a positive focus on life.

SO WHAT: The medical community and regulatory agencies collide with microbial entrepreneurs and early adopters as the basic premises of mental health begin to shift.
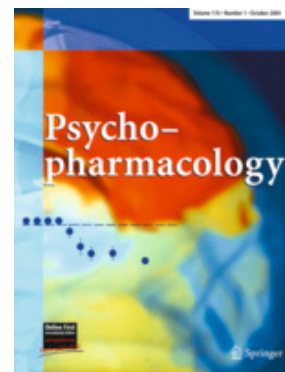
After two decades of early adopters and polarized debates, in 2036 microbiotic lifestyles have reached an inflection point where public health officials, regulatory agencies, and consumer opinion all begin a rapid shift to embrace microbial diversity and reject germophobic strategies for health, disease, and overall well-being. The shift, however, extends well beyond replacing antibiotics with probiotics and prebiotics: we're rethinking the basics of how our bodies do their work, with growing attention to the chronobiology of bacteria, to specific molecules that activate and block bacterial functions, and to synthetic versions of those molecules (or even entire bacteria), all of which are rapidly changing the landscape of health and well-being products. Expect the rise of the microbial health economy, where cities are managed as microbial ecosystems.

Habitat III Policy Implications:

» **Urban Frameworks |** Governments will begin to use personal microbial signatures for bio-identification of citizens.

» **Urban Economy |** Cities will develop microbial tourism as an economic development strategy. Distinctive foods and beverages have always been linked to local soil. Think of this as Terroir 2.0.

» **Urban Housing & Basic Services |** People will seek to optimize the built environment for microbial health—from bus routes to office buildings.

APPENDIX

January 2016 Workshop

In preparation for this analysis, Institute for the Future teamed with Laboratorio para la Ciudad, and United Cities and Local Governments for an expert workshop at the Ford Foundation in New York City.

We can rarely see our cities at high resolution. Focused on our daily lives, urban dwellers are often unaware of the paradigm shifts affecting us—from the microbial to the virtual cloud scale—that are quietly grinding in the background to make modern life both incredible and challenging. In many ways, the cities of the next decade will be the testing ground for the grandest human experiments—in biology, in social physics, and in public imagination.

Through the workshop, we explored stories lurking just below the surface of our cities that can help us sense our future directions:

» the network effects of new tools like Blockchain

» the new possibilities of bio-materials for architecting buildings and settlements

» the quest for workable futures in the midst of the microwork economy, with all of its algorithmic synchronicity

» the churning boundaries of privacy, identity and governance in an age of graph IDs and genetic rights management

» the new frontier of managing our cities as microbial health ecosystems, with all of its implications on food and water battles

Following are the biographies of the participants whose insights informed this work. We thank them for their time and for sharing their work with us.

Paola Antonelli

Senior Curator of Architecture & Design and Director of R&D
Museum of Modern Art (MoMA)

Twitter @curiousoctopus

Paola Antonelli is an Italian-born curator at the Museum of Modern Art in New York and one of the world's foremost experts on contemporary architecture and design. She received her MA in Architecture from Milan Polytechnic in 1990, and worked at the design magazines *Domus* and *Abitare* before coming to MoMA in 1994. At MoMA, where serves as curator for the Department of Architecture and Design, Antonelli has been a strong of advocate of treating design as art: she's written that "everything is designed, one way or another." Antonelli is known for her eclecticism, and has curated well-received shows such as Workspheres (2001), devoted to the workplace of the near future. Her recent exhibit SAFE included—among other materials—a UN refugee tarp, camouflage cream, and a baby buggy. Antonelli has taught design history and theory at UCLA and Harvard and is the author of *Humble Masterpieces: Everyday Marvels of Design*, and co-author of 2008 book *Design and the Elastic Mind*.

Rachel Armstrong

Professor of Experimental Architecture
University of Newcastle

rachel.armstrong@ucl.ac.uk
Twitter @livingarchitect

Rachel Armstrong innovates and designs sustainable solutions for the built and natural environment using advanced new technologies such as Synthetic Biology—the rational engineering of living systems—and smart chemistry. Her research prompts a reevaluation of how we think about our homes and cities and raises questions about sustainable development of the built environment. She creates open innovation platforms for academia and industry to address environmental challenges such as carbon capture and recycling, smart 'living' materials and sustainable design. Her award winning research underpins her bold approach to the way that she challenges perceptions, presumptions and established principles related to scientific concepts and the building blocks of life and society. She embodies and promotes new transferrable ways of thinking 'outside of the box' and enables others to also develop innovative environmental solutions.

Isabel Behncke Izquierdo

Primatologist

isabel.beagle@mac.com
Twitter @IsabelBehncke

Behncke was born and raised in Chile, educated in animal behaviour and evolutionary anthropology in Cambridge and Oxford. For her PhD work, she studied the social behaviour (and play behaviour in particular) of wild bonobos in DR Congo. Bonobos are, together with chimpanzees, our living closest relatives; however we know very little about them—mostly through captive work. In Wamba, a most remote jungle location, she observed unique aspects of bonobo lives (from imaginary play and laughter to inter-group encounters to accidents and death) that challenge and illuminate our understanding of human evolution.

Jamais Cascio

Distinguished Fellow
Institute for the Future

cascio@openthefuture.com
Twitter @cascio

Selected by *Foreign Policy* magazine as one of their Top 100 Global Thinkers, IFTF Research Fellow Jamais Cascio writes about the intersection of emerging technologies, environmental dilemmas, and cultural transformation, specializing in the design and creation of plausible scenarios of the future. His work focuses on the importance of long-term, systemic thinking, emphasizing the power of openness, transparency and flexibility as catalysts for building a more resilient society. Cascio's work appears in publications as diverse as *Metropolis*, the *Atlantic Monthly*, *The Wall Street Journal*, and *Foreign Policy*. He has been featured in multiple television programs discussing foresight and environmental issues, including National Geographic Television's SIX DEGREES, its 2008 documentary on the effects of global warming, the History Channel's SCIENCE IMPOSSIBLE, its 2009 series on emerging technologies, and the 2010 Canadian Broadcasting Company documentary, SURVIVING THE FUTURE.

Felipe Estefan

Associate, Investments | Governance and Citizen Engagement
Omidyar Network

festefan@omidyar.com
Twitter @FelipeEstefan

Felipe structures and manages investments in Latin America as part of Omidyar Network's Governance & Citizen Engagement initiative and supports the firm's efforts to advance open data, fiscal governance, independent media, and civic technology in the region. Before joining Omidyar Network, Felipe was the open government strategist at the World Bank, where he traveled to more than 30 countries advocating for and advancing efforts to make governments more open and to foster collaboration between state and non-state actors for the co-creation of innovative solutions. He was also a founding team member of the Open Contracting Partnership, where he coordinated efforts to increase transparency in public contracting processes around the world. Prior to the World Bank, Felipe was a planning producer at CNN's Washington, DC bureau and was part of the Permanent Mission of Colombia to the United Nations in Switzerland. Felipe has also consulted for private and public sector clients.

Devin Fidler

Research Director
Institute for the Future

dfidler@iftf.org
Twitter @devinfidler

Devin directs the Institute for the Future's Workable Futures Initiative and enjoys regularly working with organizations to lay the foundations today to lead in tomorrow's talent landscape. His interests center on applying foresight to strategy, with an emphasis on the impacts of emerging technologies and shifting approaches to organizational design. He holds a BA in history from the University of Colorado, and an MBA with a focus on innovation in emerging markets from Budapest University of Economics and Institut des Hautes Etudes Economiques et Commerciales in Paris.

Eri Gentry

Research Manager, Technology Horizons
Institute for the Future

egentry@iftf.org
Twitter @erigentry

Eri is an economist-turned-biotech entrepreneur and a White House Champion for Change in Citizen Science. She is a Research Manager for the Technology Horizons Program at IFTF. She is also a co-founder of BioCurious and a co-host of the Bay Area Quantified Self. She was previously VP of Open Innovation at Scanadu, Community Manager at Genomera, and CEO, co-founder of Livly. Livly, a nonprofit cancer research company, started in a Mountain View, California garage and soon attracted a community of both amateurs and professional scientists that completely overwhelmed its capacity to support collaborative work. Hence the need for BioCurious, the world's first hackerspace model for biotechnology, now one of the largest DIY bio organizations in the world.

Gabriella Gómez-Mont

Director
Laboratorio para la Ciudad

gabriella@labcd.mx
Twitter @Gabriella_Lab

With one of the most complex and fascinating cities in the whole world as a playground, Gabriella Gómez-Mont directs Laboratorio para la Ciudad, Mexico City's new creative think-tank and experimental space. Laboratorio is a place to reflect about all things city and to ponder social scripts and urban futures for the largest megalopolis in the western hemisphere. Covering everything from the practical to the outlandish, the Laboratorio both explores immediate solutions for today and also examines the next 100 years of this city's (and others cities') life. As the first government office of its kind in Latin America, Laboratorio's main focus is civic innovation and urban creativity, furthering collaboration among civil society, academia and the private sector—and in this way discovering provocative ways of both thinking and creating city life to inject good ideas into the system with the Mayor's personal support.

Marina Gorbis

Executive Director
Institute for the Future

mgorbis@iftf.org
Twitter @mgorbis

Marina Gorbis is a futurist and social scientist who serves as executive director to the Institute for the Future (IFTF), a Silicon Valley nonprofit research and consulting organization. In her 17 years with IFTF, Marina has brought a futures perspective to hundreds of organizations in business, education, government, and philanthropy to improve innovation capacity, develop strategies, and design new products and services. Marina's current research focuses on how social production is changing the face of major industries, a topic explored in detail in her book, *The Nature of the Future: Dispatches from the Socialstructed World*. She holds a BA in psychology and a master's of public policy from UC Berkeley.

David Evan Harris

Research Director
Institute for the Future

dharris@iftf.org
Twitter @davidevanharris

David brings an international perspective and a deep passion for social justice to his role at IFTF. He works to bring a critical social activist perspective to IFTF's work. David is responsible for strategically identifying and developing collaborations that contribute to IFTF research, with a special focus on social action organizations and initiatives. He also contributes regularly to the Governance Futures Lab, Ten-Year Forecast, Technology Horizons, Health, and Food Futures programs. His research across programs focuses on poverty and inequality, development, geopolitics, political economy, social movements, and new media technology. A cross-disciplinary mediamaker, David founded the Global Lives Project, a growing video library of life experience; wrote and directed newscasts for CurrentTV; and penned articles and shot photos for the BBC, the Guardian, Adbusters, Focus on the Global South, AlterNet, and Grist. David joined IFTF in 2008 and holds a BA in the political economy of development and environment, with a minor in forest science, from UC Berkeley and an MS in sociology from the University of São Paulo.

Rachel Hatch

Research Director, Ten-Year Forecast
Institute for the Future

rhatch@iftf.org
Twitter @rachelkeas

Since 2008, Rachel has brought knowledge, deep curiosity and empathy to dozens of projects at IFTF. She enjoys standing alongside our clients and looking ahead with them to see how IFTF's future forecasts may impact their organization. She is an expert designer and facilitator of workshops that help our clients build insight for their organizations. Rachel is part of the core team that develops large-scale online engagements, and has served as a gamemaster for every IFTF Foresight Engine™ game in the past 7 years, including UCSF2025, Connected Citizens, Future of Hospitals, and more. Rachel's current research is broad by design, with a particular interest in the shift from telepresence to copresence. In her previous role as a research manager with Distinguished Fellow Bob Johansen, she focused on future forces affecting retail, customer relationships, business architecture, consumer insight, and supply chains. Rachel is also co-curator of TEDxRedding. She holds a BA in religion and psychology from St. Olaf College, an MDiv from Yale Divinity School, and an MPhil in ecumenical studies from Trinity College, Dublin, Ireland.

Mitchell Joachim, PhD

Associate Professor of Practice, NYU
Co-Founder, Terreform ONE

mj@terreform.org
Twitter @mitchelljoachim

Mitchell Joachim, PhD is Co-Founder of Terreform ONE and an Associate Professor of Practice at NYU. Formerly, he was an architect at the offices of Frank Gehry and I.M. Pei. He is a TED Senior Fellow and has been awarded fellowships with Moshe Safdie and Martin Society for Sustainability. He was chosen by *Wired* magazine for "The Smart List" and selected by *Rolling Stone* for "The 100 People Who Are Changing America". Mitchell won many awards including; AIA New York Urban Design Merit Award, 1st Place International Architecture Award, Victor Papanek Social Design Award, Zumtobel Group Award for Sustainability, History Channel Infiniti Award for City of the Future, and *Time* magazine's Best Invention with MIT Smart Cities Car. He's featured as "The NOW 99" in Dwell magazine and "50 Under 50 Innovators of the 21st Century" by Images Publishers. He co-authored the books, *Super Cells: Building with Biology* and *Global Design: Elsewhere Envisioned.* His design work has been exhibited at MoMA and the Venice Biennale. He earned: PhD at Massachusetts Institute of Technology, MAUD Harvard University, MArch Columbia University.
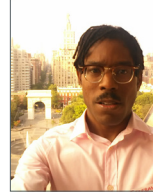
Esteban Kelly

Co-Executive Director
US Federation of Worker Cooperatives

esteban@usworker.coop
Twitter @estebantitos

Esteban Kelly is the Co-Executive Director for the US Federation of Worker Cooperatives, and is an important leader and creative force in solidarity economy and co-op movements. He has served on numerous boards including the USFWC, the US Solidarity Economy Network, the National Cooperative Business Association (NCBA–CLUSA), and the Cooperative Development Foundation (CDF). He is a co-founder and current board President of the cross-sector Philadelphia Area Cooperative Alliance (PACA), and recently worked at the New Economy Coalition as Development Director and then Staff Director. Esteban is a mayoral appointee to the Philadelphia Food Policy Advisory Council, following eight years as a worker–owner at Mariposa Food Co-op institutionalizing its staff collective and expanding food access in West Philly.

Pia Mancini

Co-Founder & Executive Director
Democracy OS

piamancini@gmail.com
Twitter @piamancini

Pia Mancini is the Co-Founder and Executive Director of The DemocracyOS Foundation, a YCombinator backed open-source online debate and voting platform. A political scientist by training, she co-founded the Partido de la Red (The Net Party), a political party headquartered in Argentina that proposes a liquid democracy through internet participation. Pia is a former Chief Advisor to the Deputy Secretary of Political Affairs of the Government of the City of Buenos Aires.
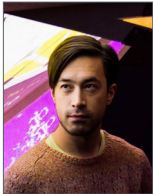
Keiichi Matsuda

Director
Keiichi Matsuda Ltd

k@km.cx
Twitter @keiichiban

Keiichi Matsuda is a designer and film-maker. His research examines the implications of emerging technologies for human perception and the built environment. Keiichi is interested in the dissolving boundaries between virtual and physical, working with video, architecture, and interactive media to propose new perspectives on the city. He has exhibited his work internationally, from London's V&A Museum to the Art Institute of Chicago, the New York MoMA, and Shanghai EXPO. He has been published extensively in print and online, and has won awards for design, drawing, speaking, and filmmaking.

Michelle Miller

Co-Founder
Coworker.org

michelle@coworker.org
Twitter @michelleimiller

Michelle Miller is a workers' rights activist and participatory media artist. She is the co-founder of Coworker.org, a digital platform that supports innovative, ground-up campaigns for workplace change. Michelle's early work developing Coworker.org was supported by a fellowship at Georgetown University's Kalmanovitz Initiative for Labor and the Working Poor. Before that she spent a decade at the Service Employees International Union (SEIU) directing union-wide programs for member engagement. She focused her energy on fostering the talents of rank-and-file union members, creating projects that welcomed new kinds of worker-leaders and integrated their voices into campaigns through art, culture and media. Her experience taught her that the best ideas, solutions, and strategies for changing the workplace come directly from the lived experiences of workers themselves. Michelle also applies this approach to her creative process. She developed the participatory media-creation process for HOLLOW, a Peabody Award winning interactive documentary created with residents of McDowell County in her homestate of West Virginia. She is a member of Arts and Democracy, a decentralized network of cultural organizers.

Andrew Rasiej

Founder, Personal Democracy Media
Founder/CEO, Civic Hall

andrew@dcn.com
Twitter @Rasiej

Andrew Rasiej is a civic and social entrepreneur, technology strategist, and Founder of Personal Democracy Media, which produces Personal Democracy Forum and other events about intersection of technology and politics. Among its offerings are TechPresident.com an award winning news outlet. He is the Founder of MOUSE.org, which focuses on 21st century public education, Co-Founder of Mideastwire.com, which translates Arabic and Farsi news and opinion pieces into English, and Senior Technology Advisor to the Sunlight Foundation a Washington DC organization using technology to make government more transparent. Andrew is the Chairman of the NY Tech Meetup, a 40,000-member organization of technologists, venture funders, marketers, representing start up and more mature companies using technology to transform themselves, New York City, and the world. Andrew coined such terms as: We-Government, Voter-Generated Content, and Videracy, to help describe our expanding digitally connected world. In 2005 Andrew ran a highly visible campaign for NYC Public Advocate on a technology and innovation driven platform to redesign the office as a network, bring low cost broadband to undeserved communities, and open up access to city controlled public data.

He is a graduate of the Cooper Union for the Advancement of Science and Art.

Josep Roig

Secretary General
United Cities and Local Governments

j.roig@uclg.org @peproig

Josep Roig has held the post of Secretary General of United Cities and Local Governments since September 2011. He was a founding member of Metropolis, the metropolitan section of UCLG, in 1985, becoming Secretary General of the organization in 1999. Previously, Josep worked in the Barcelona Metropolitan Corporation (1983-1990, 1996-2000, 2009-2011), in different positions on economic promotion, asset management, finances and planning, first as Coordinator of Technological and Industrial Parks, then as Deputy Director and, finally, as Financial Director and Deputy Director General. Graduated in economics by the University of Barcelona (1967-1972) and Fulbright Scholarship at the University of Southern California (1974-1977).

Douglas Rushkoff

Director, Laboratory for Media and Social Change
Professor Media Theory and Digital Economics
CUNY/Queens

rushkoff@rushkoff.com
Twitter @rushkoff

Douglas Rushkoff is the author of Present Shock: When Everything Happens Now as well as a dozen other bestselling books on media, technology, and culture, including *Program or Be Programmed, Media Virus, Life Inc,* and the novel *Ecstasy Club*. He is Professor of Media Theory and Digital Economics at CUNY/Queens. He wrote the graphic novels Testament and A.D.D., and made the television documentaries Generation Like, Merchants of Cool, The Persuaders, and Digital Nation. He lives in New York, and lectures about media, society, and economics around the world.

Nicola Twilley

Author, *Edible Geography*
Co-Host, Gastropod
Contributing Writer, The New Yorker

nicola.twilley@gmail.com
Twitter @nicolatwilley

Nicola Twilley is a co-host of the award-winning Gastropod podcast, author of the blog Edible Geography, and a contributing writer at *The New Yorker*. She is deeply obsessed with refrigeration, and is currently writing a book on the topic. In her spare time, she makes smog meringues as part of an ongoing exploration of the taste of "aeroir" with the Center for Genomic Gastronomy/CoClimate.

Stefaan Verhulst

Co-Founder and Chief Research and Development Officer
Governance Laboratory, NYU

sv39@nyu.edu

Stefaan G. Verhulst is Co-Founder and Chief Research and Development Officer of the Governance Laboratory @NYU (GovLab) where he is responsible for building a research foundation on how to transform governance using advances in science and technology. Verhulst's latest scholarship centers on how technology can improve people's lives and the creation of more effective and collaborative forms of governance. Specifically, he is interested in the perils and promise of collaborative technologies and how to harness the unprecedented volume of information to advance the public good.

Kathi Vian

Distinguished Fellow
Institute for the Future

kvian@iftf.org
Twitter @kathivian

As a distinguished fellow at IFTF, Kathi looks at the global future through three intersecting lenses: the evolution of smart networking and social media, the innovations in open economies, and the extreme environments in which human communities will evolve over the coming century. Kathi has a long history of applying new methodologies and frameworks to thinking about cutting-edge issues in technology and society and their impacts on individuals, communities, organizations, and the world at large, and for more than a decade Kathi led IFTF's Ten-Year Forecast Program. Kathi began working with IFTF in 1974 and holds a BA in languages and linguistics from Ohio State University and a PhD in communications from Union Graduate School.

John Webb

User Experience Researcher
Google New York

jwebb@google.com

John Webb is a user experience researcher at Google based out of the New York office. He conducts investigative and tactical research to inform design and product strategy for Google's Search team with a particular focus on developing civic engagement experiences.

Mike Zuckerman

Culture Hacker
[freespace]

zuck.mike@gmail.com
Twitter @TheOtherZuck

Mike has gained tremendous national and international attention for his work as the co-founder of [freespace], Mike considers himself a "Culture Hacker" continuing to push the boundaries of shared economy models and their impact on the development of innovation ecosystems; energizing sustainable development efforts and supporting grass roots community development. Mike's [freespace] venture now spans the world. Originally it was a month-long experiment to cultivate civic hacks. It was hosted in a 14,000 square foot warehouse at 1131 Mission Street in San Francisco's Central Market District. Through the gift of a temporary, underutilized physical space, [freespace] fosters creativity, community, and civic innovation. Mike's other projects include acting as a key team member for Yerdle, helping to launch the first sustainable nightclub in America, prototyping experimental community engagement spaces in Africa and Haiti, and working to green the global entertainment industry.

UCLG
United Cities
and Local Governments

INSTITUTE FOR THE FUTURE

INSTITUTE FOR THE FUTURE
201 Hamilton Avenue
Palo Alto, CA 94301 | **www.iftf.org**