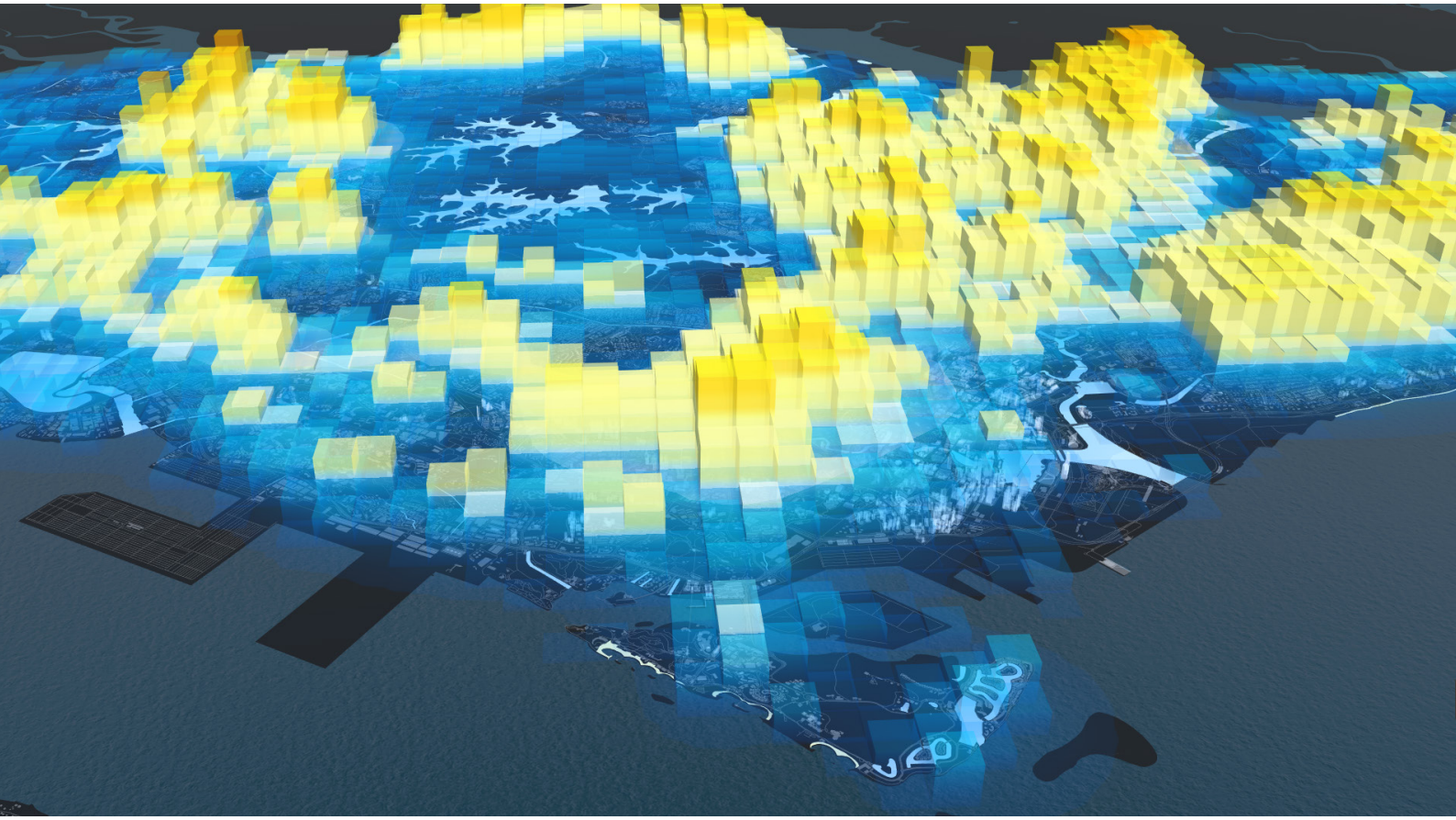
Disruptive Technologies for Development

World Bank Learning Event

June 25-27
World Bank Singapore Office
10 Marina Boulevard
Singapore



WORLD BANK GROUP

(FCL) FUTURE CITIES LABORATORY 未来城市实验室

LOCATION AND DIRECTIONS

All of the sessions will take place at the

World Bank Singapore Office
10 Marina Boulevard
Marina Bay Financial Center, Tower 2, #12-01
Singapore 018983

The World Bank Singapore Infrastructure & Urban Development Hub is housed in the World Bank Group Office Singapore in #12-01 Marina Bay Financial Center Tower 2, No. 10 Marina Boulevard, Singapore 018983 (close to Downtown Station on the Downtown MRT Line DT, or Marina Bay Station on the North South MRT Line NS).

Our office number during work hour is +65 6517-1240.

WEBSITE

All presentations will be available online at
www.thegpsc.org

ONLINE INTERACTIONS

Follow the event online, and post on social media using the following hashtag: **#Disrupt2Development**

DIGITAL OBJECT IDENTIFIER

This document has been assigned the following digital object identifier: **10.3929/ethz-b-000271473**


WHAT FUTURE DO WE WANT?

About the Event

OVERVIEW

The World Bank Singapore Office will host a three-day Learning Event (LE) on the topic of Disruptive Technologies for Development from June 25 to 27, 2018 in Singapore. The event will be curated and moderated by the Future Cities Laboratory at the Singapore ETH Centre.

The Learning Event will provide a platform for knowledge exchange and structured learning on key topics related to the use of Disruptive Technologies for Development. Good practice knowledge and experience from Singapore and other countries will be highlighted as will the experiences of the participating country delegations. The thematic focus of the Learning Event will lie on the potential of Disruptive Technologies for integrated development with sub-themes such as integrated urban planning, transport, water, energy, waste, health, economy and land. The event will focus on capacity building and application in ASEAN+ countries. Among others, Singapore's ecosystem approach towards Disruptive Technologies for Development and regulatory framework presents a significant opportunity for knowledge sharing and collaborative learning. topics of discussion include the following:

Potential of Disruptive Technologies.
Understanding the threats and promise of disruptive technologies (e.g. blockchain, artificial intelligence, big data, machine learning, 5G, and cloud computing, autonomous vehicles) and the technological and social developments driving them (sensors, digitalization, battery technology, data storage, computing power, decentralisation, new social contract).

Challenges of Disruptive Technologies.
Getting to know some of the different types of disruptive technology relevant to development challenges, especially focusing on understanding the challenges of managing urbanisation, settlement patterns and urban-rural linkages in developing countries (demographics, uneven technological systems, patchy data, governance systems) and what this means for benefiting from disruptive technologies

Integration of Disruptive Technologies.
Designing appropriate ways to prepare for integrating disruptive technologies by enhancing evidence base (big and small data – census, satellite, social media, survey, ethnographic, agent-based modelling for land use and transport planning)

Implementation of Disruptive Technologies.
Elaborating relationship between the technological development, implementation and scalability of disruptive technology, including the institutional framework needed.

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Participants will include practitioners and decision makers from World Bank client countries, Task Team Leaders (TTLs) or senior project team members, as well as resource partners from local governments Country Management Unit (CMUs) and government counterparts who would benefit

OBJECTIVES

The LE will provide an opportunity for delegations to develop a deeper understanding of Disruptive Technologies for Development. Delegations will:

- Gain an understanding of what are disruptive technologies, some of the main technological and social trends that are driving them, and how they are impacting upon the way urban settlements are planned and managed
- Consider the different role government, private sector and civil society actors play in the successful adoption of disruptive technologies
- See how disruptive technologies are being harnessed in Singapore and internationally, with a view to application within the ASEAN+ region, to support sustainable development
- Identify required knowledge, skill and practices to make best use of disruptive technologies in management systems
- Share experiences on technological innovation, procurement and implementation processes
- Provide a framework that focuses on processes of planning for and institutionalization of disruptive technologies to address relevant developmental challenges within developing nations
- Share and discuss how to move technological innovation into World Bank projects

STRUCTURE

This learning event offer an immersive approach to knowledge exchange including workshops, site visits, peer-peer knowledge sharing and action planning, which aims to support development or ongoing implementation of World Bank funded projects. Key characteristics include:

- "Objective" focused structure: Demand driven and problem-solving orientation, with possible technical assistance, including consultation and expert visit to client nations through City Partnership Program and other programs
- Knowledge exchange to foster operations: Knowledge exchange and Just-In-Time-Assistance and potential technical assistance for clients and World Bank Task Teams
- Structured Learning: Delivery of structured learning for clients and partners such as e-learning courses, and package of selected Knowledge Exchange Instruments before during, and after the LE in Singapore
- Application to Knowledge Networks: Contribution of relevant inputs to COP to support development of their knowledge assets such as case studies and best practice lessons and to diffuse them to broader community

SESSION FORMATS

The learning event will comprise a mixed format of knowledge sessions focused on specific aspects of disurptive technology, panels with country representatives and World Bank, site visits to relevant locations in Singapore, and internal workshops. The following color code denotes these formats throughout the program:

Disruptive Technology for Development

In an age of accelerating technological change, how should cities and governments manage the consequences and opportunities of disruption?

The term 'disruptive technologies' (DT) emerged in the 1990s as a synonym for new kinds of technologies that have the capacity to substantially restructure conventional business models and create new markets (Christensen 1997). Since that time, the term has been applied to many aspects of everyday life, including education, transport, financial services, healthcare, research and development.

The subsequent rise of the digital revolution gave powerful impetus to disruptive technologies. This development was underpinned by new sensing technologies – from micro sensing devices, such as cameras, gyroscopes, accelerometers, pressure gauges, light meters, biosensors, to satellite-based remote sensing technology, through to new forms of data mining of human behaviour – and an exponential increase in computing power to store and analyse information harvested by such technologies. This digital-technological nexus enhanced the volume, speed and reach of information transmission. It enabled disruptive technologies to be scaled up and disseminated globally, as well as translated and adapted to local situations. Furthermore, the growing ubiquity and shortening cycles of innovation of digitally-enhanced technologies opened the door to many more participants in the field of technological entrepreneurship. This effect, often called distributed agency, is perhaps one of the most powerful catalytic features of contemporary disruptive technology.

The current and emerging capacities of disruptive technologies already make them important to the field development enhancing such areas as job creation, pollution monitoring, and flood mitigation. The potential they hold for alternative future pathways for development makes them indispensable. Many scholars suggest that disruptive technologies are essential to planning robust future oriented development pathways, be they incremental, compressed or 'leap-frogged' (Cirera and Maloney 2017).

A number of cases that combine various and often quite simple forms of big data, machine learning, artificial intelligence can demonstrate these possibilities. Take the example of Go-Jek in Indonesia. Anthropologist Doreen Lee describes how "a small Indonesian startup named Go-Jek began to offer an on-demand service for motorcycle taxi rides in Jakarta [... and] became Indonesia's first 'unicorn,' acquiring over $1.2 billion of venture capital funding". She further points out how this start-up disrupted both the formal and informal transport sectors, transforming the energies of conventional moto-cyclists, 'ojeks', and turned them into "a unifying and equalizing platform that has deterritorialized and professionalized services once associated with the readily available and close-at-hand underclass patronized by their social betters" (Lee 2018).

A second set of examples comes from the apparently mundane area of plumbing and electrical infrastructure. Decentralised technologies have emerged to disrupt expensive and often unreliable centralised, or 'big pipe', approaches to infrastructure provision. Decentralised technologies are supplementing and even substituting centralised services in rainwater harvesting and water purification, waste treatment, and energy generation. Often these technologies are used in combination to generate powerful local peer-to-peer micro-systems. A third set of disruptive technological examples comes from the field of education. Here the rise of formal and informal platforms for teaching, learning and knowledge exchange (not simply 'transfer') have been impressive. So-called 'massive open on-line courses', or moocs, have exponentially increased the number of people around the world taking part in high quality education provision. At the other end of the scale, micro-learning and engagement platforms like Gnowbe, have been used to support life-long learning with sophisticated cloud-based collaborative and game-based approaches to learning, often integrated into the work place.

As is often the case, it is the combination of often smaller and incremental changes that catalyse full-blow 'disruptive' transformations. The rise of photovoltaics, in combination with digital information technology, allied to development of cloud-based and peer-to-peer data, gives rise to such transformations. As Christensen and colleagues put it: "novel combinations of existing off-the-shelf components, applied cleverly to a small, fledgling value network" can have powerful and far-reaching effects (Christensen, Raynor, and McDonald 2015).

This Learning Event will explore the challenge of understanding and making the most of this dynamic field. As will become clear, in many cases this is a complex challenge. As many contemporary commentators point out, some twenty years since the term emerged, 'disruption' has become inflationary (Alexander 2016). They point out the need to distinguish between disruptive and radical innovation, a lens that helps to discern the potential and challenges of DT (Hopp et al. 2018). This approach helps appreciate the eco-system of innovators, market drivers, government planning frameworks and incentives, and wider technological development that support or inhibit disruptive technologies. These factors, in turn are embedded in and interact with complex socio-economic settings. Furthermore, in the context of developing countries disruption may pose threats rather than deliver benefits. Rising expectations may outstrip government capacity to provide basic services and decent paying jobs, thus frustrating opportunities for growing youthful populations.

The compact size of the nation state, the scarcity of resources and the high level of development make Singapore a test-bed for DT. The combinatory and catalytic possibilities of disruptive technologies have underpinned the digital economy of Singapore. This is why we need to ask the key questions around DT for development at the Singapore Hub of the World Bank at this very moment: What is the potential of DT in developing countries? What are the associated challenges that come with DT? How can we integrate DT into our cities and governments? Can we start to see a *new paradigm of disruptive innovation*? In answering these questions the Learning Event wants to propose three topics for discussion: Is *managed disruption* an oxymoron or a new paradigm of disruption for developing country contexts? Can we envision *socially and ecologically responsible disruption* that delivers overall benefits to society while reducing the downside effects? Shall we conceptualise *urban disruption* since cities are the locus of innovation, in both the developing and developed world?

The first keynote speaker of this Learning Event will therefore anchor DT within a larger socio-economic perspective to discuss the promises, synergies, efficiency gains, technological development under the aspects of sustainability and resilience. We invite speakers to explore the foundations of the digital transformation in the first session: Big data, machine learning, artificial intelligence and decentralised protocols radically shift the sectors, but there are, in themselves not yet disruptive. As session two will show, the potential for disruption emerges when these frameworks get applied to contemporary solutions ranging from FinTech, internet of things, drones and autonomous vehicles. These technologies disrupt markets, define the future of work and transform our environment and cities. Smart and connected devices create, manage and sell their own data. The second keynote speaker will reflect on resilience as a paradigm through which disruptive change can be *managed and harnessed for development*. The speaker will discuss the risks inherent in complex and interrelated systems, and using Singapore as an example, show how systems can be strengthened through new methods of forecasting and data analysis.

The next session uses mobility as a lens to question changing energy, transportation, economy and technology paradigms. The panelists will discuss the implications of autonomous vehicles (AV), electro-mobility, drones on one side and their socio-economic impact in the form of sharing economies and data generators on the other side. The last session will debate the appropriate degree of government proactiveness in either *facilitating* disruption, or *managing* the negative consequences triggered by increasing speed and risk posed by new technologies.

Site visits to the Housing Development Board's (HDB) research centre, the Model Factory and the Future Cities Laboratory (FCL) in Singapore will allow participants to experience cutting edge technology first hand. Singapore, as an innovation hub for the region and the location of the World Bank Infrastructure and Urban Hub, is the ideal place in which to have this discussion on the future development and deployment of DT by the World Bank. We look forward to having this conversation with you.

Stephen Cairns,
Aurel von Richthofen,
Andrew Stokols

Future Cities Laboratory, Singapore, June 2018

References

Alexander, Leigh. 2016. "Why It's Time to Retire 'Disruption', Silicon Valley's Emptiest Buzzword." The Guardian (blog). November 1, 2016. https://www.theguardian.com/technology/2016/jan/11/disruption-silicon-valleys-buzzword.

Christensen, Clayton M. 1997. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. The Management of Innovation and Change Series. Boston, Mass: Harvard Business School Press.

Christensen, Clayton M., Michael E. Raynor, and Rory McDonald. 2015. "What Is Disruptive Innovation?" Harvard Business Review, December, 44–53.

Cirera, Xavier, and William F. Maloney. 2017. The Innovation Paradox: Developing-Country Capabilities and the Unrealized Promise of Technological Catch-Up. The World Bank. https://doi.org/10.1596/978-1-4648-1160-9.

Hopp, Christian, David Antons, Jermain Kaminski, and Torsten Oliver Salge. 2018. "What 40 Years of Research Reveals About the Difference Between Disruptive and Radical Innovation." Harvard Business Review, September, 7.

Lee, Doreen. 2018. "How Ojek Became Go-Jek: Disruptive Technologies and the Infrastructure of Urban Citizenship in Indonesia." http://www.ijurr.org/spotlight-on-overview/disruptive-technologies/how-ojek-became-go-jek/.

Schedule

MONDAY JUN 25

Breakfast and Registration	8:30 - 9:00 AM
Welcome and Opening Remarks Jyoti Shukla, Country Director Singapore World Bank, Anna Wellenstein, Director, Global Practice for Social, Urban, Rural and Resilience Dr. Stephen Cairns, Director, Future Cities Laboratory, Icebreaker/Energizer - Led by Andrew Stokols, FCL Research Manager	9:00- 9:40 AM
Keynote Address: Disruptive Technologies for Development **Poon King Wang** Director – Lee Kuan Yew Centre for Innovative Cities Singapore University of Technology and Design (SUTD), Introduced by Dr. Stephen Cairns	9:45 - 10:30 AM
Coffee Break	10:30-11:00 AM
Session 1 Foundations of Disruptive Technologies: Data and intelligence Moderated by **Nagaraja Rao Harshadeep**, World Bank **Dr. Bige Tuncer**, Professor of Architecture SUTD **Dr. Ayesha Khanna**, AI entrepreneur and CEO of ADDO.AI **Dr. Sekhar Kondepudi**, NUS School of Design and Environment	11:00-12:00
Lunch	12:00- 1:00 PM
Session 2 Application of Disruptive Technologies: Protocols and Internet of Things Moderated by **Aurel von Richthofen**, Future Cities Laboratory **Dr. Heiko Aydt**, Research Coordinator, Future Cities Laboratory **Jonathan Tan**, CEO Unabiz **Zelda Anthony**, Head of Blockchain for IBM, ASEAN	1:00 -2:00 PM
Discussion with Country Representatives Representatives from China, Thailand, Indonesia, Thailand, and Sri Lanka	2:00-3:00 PM
Travel to HDB Lab, Woodlands	
Site Visit 1: HDB Building Research Centre	3:30-5:00 PM
Wrap-Up	5:00 PM

FORMAT LEGEND

Discussion Panel

Keynote Address

Workshop

Site Visit

Learning Session

TUESDAY JUN 26

Coffee and Networking	8:30 - 9:00 AM
Reflections and Takeaways from Day 1 Jyoti Shukla, Country Director World Bank, Singapore Andrew Stokols, FCL Research Manager	9:00- 9:20 AM
Keynote Address: Resilience - concept and strategy to cope with unexpected and ambiguous disruptions **Dr. Hans R. Heinimann**, Director, Future Resilient Systems, Singapore ETH Center	9:20 - 10:00 AM
Coffee Break	10:00-10:15 AM
Session 3 Disrupting Mobility Moderated by **Aurel von Richthofen**, Future Cities Laboratory **Shaowei Ying**, CEO, DataSpark **Chris Leck**, Director, Futures Division, Singapore Transport Ministry **Tanvi Maheshwari,** Researcher, Future Cities Laboratory	10:15-11:15 AM
Shark Tank: Entrepreneur Pitches Pitches by selected startups based in Singapore, followed by discussion	11:15-12:00 PM
Lunch	12:00- 1:00 PM
Session 4 Managing Disruption: Policy and Planning Frameworks Moderated by **Andrew Stokols**, Future Cities Laboratory **Dr. Seeram Ramakrishna,** Professor NUS, Circular Economy Policy Expert	1:00 -2:00 PM
Discussion with Country Representatives Representatives from China, Malaysia, Vietnam	2:00-3:00 PM
Travel to SIM Tech Model Factory	
Site Visit 1: SIM TECH Model Factory	3:30-5:00 PM
Wrap-Up	5:00 PM

WEDNESDAY JUNE 27

Opening remarks (Jyoti Shukla and Practice Managers), Refresher on Days 1 and 2	9:00- 9:30 AM
Workshop **Staff Presentations** : presentations of three slides based on client discussion on Day 1 and 2 for each participant. TTLs to identify themes, challenges and potentials.	9:30 - 10:30 AM
Coffee Break	10:30-10:45 AM
Workshop: Developing Strategies for Disruptive Technologies Group Drafting of Strategies for Disruptive Technologies (45 min) Presentation and Discussion (30 min) Draft Summary Writing for Creation of Final Report (30 min)	10:45-12:30
Lunch	12:30- 1:30 PM
Wrap-up, reflection, next steps	1:30-2:30 PM
Feeback on Workshop (PollEv)	2:30-3:00 PM
Travel to Future Cities Laboratory	
Site Visit 3: Future Cities Laboratory	3:30-5:00 PM
Wrap-Up	5:00 PM

Learning Sessions

Learning Session 1

Foundations of Disruptive Technology

Data and Protocols

MONDAY June 25 | 11:00 AM to 12:00 PM

This session will set the stage for the revolution taking place in big data and AI. What are the implications across sectors from these new protocols and possibilities of data?

The speakers will address how Big Data is generated, stored and processed by the large global players such as Google, Apple, Facebook on one have and how it can be leveraged by users, citizens, SMUs, agencies on the other hand. The talk will touch upon the challenges and potentials of Big Data such as data-privacy concerns, trust and data-monopoles.

Artificial Intelligence and Machine Learning will highlight how the advancement of machine thinking and learning impacts all aspects of digital technologies. The speaker will show the potential to process Big Data with AI and ML to recognize hidden rules and patterns of society, economy and cities

Dr. Bige Tuncer
Professor, Singapore University of Design and Technology

Dr. Ayesha Khanna
CEO and Founder, ADDO AI

Dr. Sekhar Kondepudi
Professor, NUS

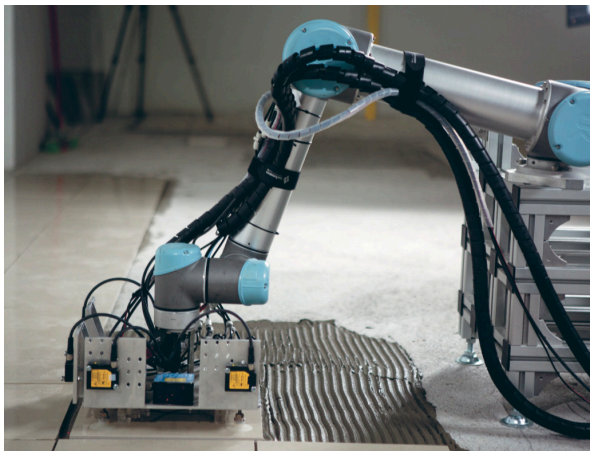
Moderated by
Nagaraja Rao Harshadeep,
World Bank

Learning Session 2

Application of Disruptive Technologies

IoT, Blockchain, and Beyond

MONDAY June 25 | 1:00 to 2:00 PM



This session explores the potential application of disruptive technologies for development that follow from the conjuncture of data and protocols described in Session 1. The session covers these emerging fields: IoT and Blockchain Technology.

- Internet of Things (IoT) discusses the emerging ecosystem of devices, gadgets and hybrids that will permeate our environment in the near future, combining sensors, data-processors and transmitters. These devices can be deployed everywhere and at all scales of a city: on your milk box, fridge, door, house, road, neighbourhood and city. The interconnectedness and constant data generation poses questions about data-privacy but also threats of an increasing interconnected society.

- Decentralized Protocols, Blockchain Technology and Smart Contracts explains the fundamentals of Blockchain Technology and explores the consequences of these for development and the city in particular. How will 'trust-less' global, instantaneous ledger system revolutionise not just the finance sector, but any kind of industry that relied on a mutually agreed and policed trust system.

Dr. Heiko Aydt
Researcher and Project Leader
Future Cities Laboratory

Zelda Anthony
Head of Blockchain, IBM ASEAN

Jonathan Tan
CEO, Unabiz

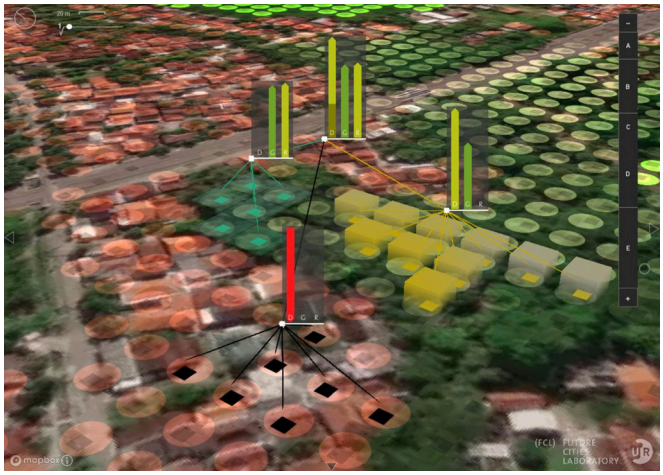
Moderated :
Aurel von Richthofen
FCL Senior Researcher

Learning Session 3

Disrupting Mobility:

Implications for Cities, Energy and Beyond

TUESDAY June 26 | 10:15 AM to 11:15 AM



This session uses mobility as a lens to question changing energy, transportation, economy and technology paradigms. The panelists will discuss the implications of Autonomous Vehicles (AV), electro-mobility, drones on one side and their socio-economic impact in the form of sharing economies and data generators on the other side.

As contemporary cities were largely shaped by the prevailing means of transportation, in many cases individualised cars, Autonomous Vehicles challenge urban and rural development paradigms.

The advent of digital technologies enabled a new scale of sharing economy that disrupted all scales of transportation: From bikes to cars, buses, boats to helicopters and planes, mobility is now ubiquitous. This development challenges long term infrastructure developments such as roads and public transport.

These shared forms of mobility also create new forms of data that offer valuable insight into urban patterns. The data can be harnessed to plan better mobility, allocate energy, inform urban design, etc.

Tanvi Maheshwari
Researcher, Future Cities Laboratory

Chris Leck
Director, Futures Division
Singapore Ministry of Transport

Shaowei Ying
CEO, DataSpark

Moderator:
Aurel von Richthofen
FCL Senior Researcher

Learning Session 4

Managing Disruption:

Policy and Planning Frameworks

TUESDAY June 26 | 1:00 to 2:00 PM

How can Disruptive Technologies be harnessed in a productive way and lead to sustainable development? What is the role of government in promoting or encouraging disruptive technologies and how should governments respond to the increasing speed and risk posed by new technologies? Using Singapore and other regional cases, how and in what sequence should long-term policy and visions be implemented, especially amidst an accelerating pace of disruption.

Many of the technologies poised to disrupt industries and practices require large centralized investment and planning, even as others offer the possibility of a more decentralized approach to infrastructure management and governance

One theme explored by this session will be the appropriate balance between government and private sector roles in facilitating disruptive technologies. What is the right approach in ensuring innovation, providing jobs, but also in lessening the negative impacts of disruption for vulnerable groups of society?

How can Disruptive Technologies drive a circular economy in a sustainable future?

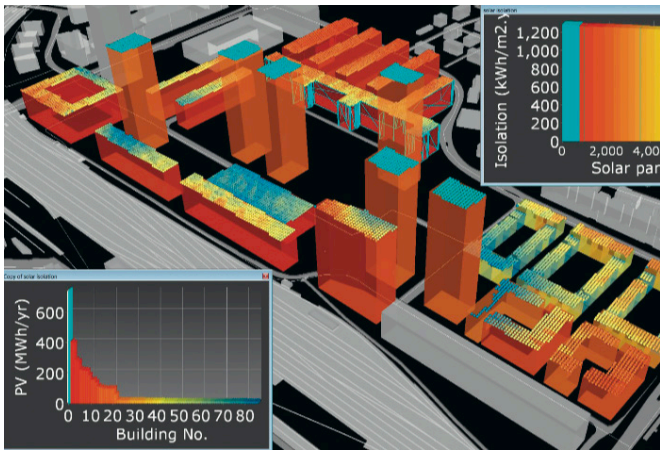
Dr. Seeram Ramakrishna
Professor, National University of Singapore

Moderator:
Andrew Stokols
Research Manager, Future Cities Laboratory

Shark Tank

ENTREPRENEUR PITCHES

TUESDAY June 26 | 11:15 AM to 12:00 PM



Presentations by selected industry partners by NUS Enterprise with products and solutions that harness disruptive technologies for urban development.

(5 min pitch + 3 min short questions each)

Transcelestial Laser Communications Technology
(Soumoditya Dey)

Hydroleap Wastewater Treatment through Electrocoagulation
(Dr. Mohammad Sherafatmand)

3for2 Singapore's most energy efficient radiant cooling system
(Lukas Lienhart)

City Energy Analyst Energy Analyst for Urban Design Proposals
(Dr. Jimeno Fonseca)

Panel Discussion by World Bank and Government Representatives Followed by Networking Lunch.

Site Visits

Housing and Development Board

Centre of Building Research

MONDAY June 25 | 15:30 to 17:00 PM

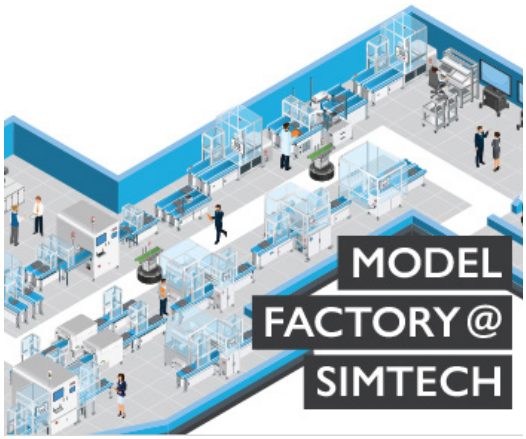
The Centre of Building Research (CBR) is HDB's Master Laboratory. Set up in 2009, it spearheads our Research and Development (R&D) efforts in building and environmental sustainability, while nurturing new technologies for future generations of public housing.

The CBR focuses its R&D initiatives on 5 areas, which are aligned with our 'Roadmap to Better Living' for building 'Sustainable Towns': reducing overall energy consumption and driving adoption of renewable clean energy sources, fostering urban greenery and innovtive greening solutions, efficient waste and water management, building technology and creating high-quality sustainable urban living for all.

Hosted by:

Dr. Koh Guan Bian
Deputy Director (Innovation & Technology Transfer Hub)

Address:
10 Woodlands Avenue 8,
Singapore 738973



SIM TECH Model Factory

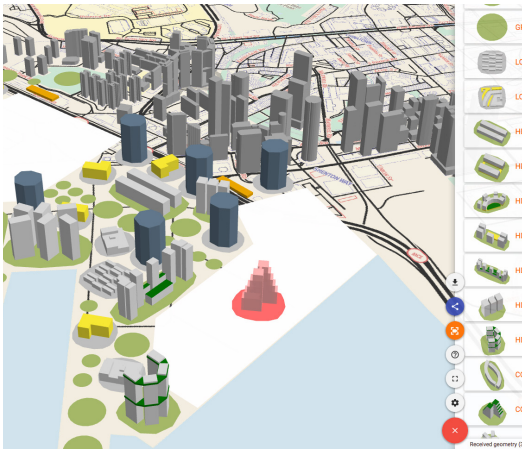
TUESDAY June 26 | 15:30 to 17:00 PM

The Model Factory@SIMTech is an actual production environment that allows for experiential experimentation and learning of manufacturing system technologies. For the Manufacturing Control TowerTM (MCTTM), the focus will be on digitalisation technologies. From a research viewpoint, the environment provides an ideal platform for the development of critical technologies such as cyber-physical-production systems (CPPS) and flexible automation across the three layers in a manufacturing environment, namely Shop-floor, Enterprise and Supply Chain. This will provide the essential platform for understanding the Sense & Response manufacturing paradigm, and the means to prototype new technologies, as a continuous learning journey for MCTTM. From an industry viewpoint, it provides a platform for companies to learn, experiment and most importantly, co-create new technologies for the next-generation factories.

Hosted by:

Dr. Jonathan Low Sze-Choong
Director, SIM Tech Model Factory

Address:
6 Fusionopolis Way, #01-06, Synthesis
Singapore 138636



Future Cities Laboratory

WEDNESDAY June 27 | 15:30 to 17:00 PM

The rationale for Future Cities Laboratory emerges from the challenges of urbanisation and its consequences for Singapore, the ASEAN+ region and the world. The general challenges of urbanisation frame a set of inter-linked research rationales. Planning challenges in Singapore for the coming 75 years: Singapore's urban development poses challenges such as managing population density while improving resilience, environmental sustainability and qualitative aspects of every day urban living. Harnessing the power of information technology for responsive planning: Sustainable future cities need integrated planning that harnesses the full power of information technology appropriate to their large scale and complexity. This involves engaging diverse city-makers, including government, industry, academia, and civil society. Formulating sustainable pathways to urbanisation for ASEAN+ and beyond: New ideas are urgently needed to guide urbanisation of the ASEAN+ (greater ASEAN) region, with its 1.4 billion urbanising population. In turn, the urbanisation of this region will have global impacts.

Hosted by:

Dr. Remo Burkhard
Managing Director, Singapore ETH Center

Address: 1 Create Way
CREATE Tower, #06-01
Singapore 138602

Keynote Speakers

Poon King Wang
Director, Lee Kuan Yew Center for Innovative Cities,
Singapore University of Technology and Design

Mr Poon King Wang is the Director of the Lee Kuan Yew Centre for Innovative Cities (LKY CIC) at the Singapore University of Technology and Design (SUTD). He is concurrently Director - Strategic Planning at SUTD, and Co-Director of the SUTD-JTC Industrial Infrastructure Innovation Centre. He also sits on the Board of Directors of the BCA Centre for Sustainable Buildings Ltd (a collaboration between Singapore's Building and Construction Authority and United Nations Environment Programme).

Prior to SUTD, he served in the public sector in the Economic Development Board; Ministry of Law; Agency for Science, Technology and Research (A*STAR); and the Competition Commission of Singapore. His areas of responsibilities included cluster development, intellectual property, technology futures, STEM outreach, technology commercialization, ASEAN collaborations, and international trade agreements. In the private sector, he was head of business analytics at one of Singapore's largest regional banks, and was a strategy advisor to a mobile local search startup.

He holds a MSc in Industrial Engineering and Engineering Management from Stanford University, a BSc in Electrical Engineering from the University of Illinois (Urbana-Champaign), and a Certificate in Rocket Engineering from Moscow State Technical University.

Professor Dr. Hans Heinimann
Director, Future Resilient Systems, Singapore ETH Center and ETH Professor

Hans Rudolf Heinimann is professor of Forest Engineering at ETH Zurich since 1991. He started office as faculty member with the former Department of Forest and Wood Research at ETH Zurich, where he was promoted to full professor in 1997. He was visiting professor at the Forest Engineering Department at the Oregon State University in US from 1999 to 2000; Faculty of Agriculture at the University of Tokyo, Japan in summer 2009; and Centre for Higher Education, Learning and Teaching (CHELT) at the Australian National University in 2013. From 2004 to 2009, he was a fellow at the Collegium Helveticum, a centre of advanced studies jointly sponsored by ETH Zurich and the University of Zurich, focusing on cross-disciplinary research.

Heinimann has been actively involved in the international scientific community, and coordinated the Forest Operations Engineering and Management division of the International Union of Forest Research Organisations (IUFRO). In 2017, he was awarded the Distinguished Service Award by the IUFRO in recognition for his outstanding and valuable services to the organisation.

He held various leadership positions in university bodies, such as head of department, director of studies, head of institute, and head of faculty recruiting committees, among others. He was the Pro-rector for Education of ETH Zurich from 2007 to 2013 and is founding member of the ETH Risk Centre, of which he was the chairman from 2011 to 2013. He is a member of several scientific and professional societies, including member of the Swiss Academy of Engineering Sciences (SATW).

Speakers

LEARNING SESSION 1:
FOUNDATIONS OF DISRUPTIVE TECHNOLOGIES

Dr. Ayesha Khanna
CEO and Founder ADDO AI

Ayesha Khanna is Co-Founder and CEO of ADDO AI, an artificial intelligence (AI) advisory firm and incubator. She has been a strategic advisor on artificial intelligence, smart cities and fintech to clients such as SMRT, Singapore's largest public transport company, SOMPO, Japan's largest insurance firm, and Smart Dubai, the government agency tasked to transform Dubai into a leading smart city. In 2017, ADDO AI was featured in Forbes magazine as one of four leading artificial intelligence companies in Asia and Ayesha was named one of South East Asia's groundbreaking female entrepreneurs by Forbes magazine in 2018. Ayesha is also the Founder of 21C GIRLS, a charity that delivers free coding and artificial intelligence classes to girls in Singapore.

Professor Dr. Bige Tunçer
Professor of Architecture
Singapore University of Technology and Design

Bige Tunçer is associate professor of Architecture and Sustainable Design at Singapore University of Technology and Design (SUTD). Prior to joining SUTD, she was visiting professor at ETH Zurich, Switzerland, and assistant professor at TU Delft, Netherlands. Previously, she worked at the Chair for Architecture and Chair for Computer-Aided Design (CAAD) at ETH Zurich. As part of her work at the Delft School of Design, in 2007–2008, she organised the Architectural Engineering: Performance, Geometry, Materials programme consisting of lectures and workshops, which assembled some of the world's leading academicians and practitioners. She has conceived and taught numerous MSc and BSc courses since 1996 and is advisor to a number of PhD and MSc graduation projects. She has organised and participated in three interdisciplinary virtual design studios, and was granted an AIA Education Honor Award for one of them.

Professor Dr. Sekhar Kondepudi
Associate Professor
NUS School of Design and Environment

Dr. Sekhar Kondepudi has 25 years of global business and product experience in a variety of technology verticals including Smart Cities, Internet of Things and Energy Efficiency in the Built Environment.

He is a Vice-Chair for the Focus Group on Smart Sustainable Cities at the International Telecommunications Union (ITU), a specialized agency of the United Nations (UN) developing global standards. He is active in providing strategic advisory services to both public and private sectors related to Smart Sustainable Cities, Internet of Things (IoT) and Energy Efficiency. He is also mentoring and working closely with several IoT startup companies. He is currently an Associate Professor of Smart Buildings and Smart Cities at the National University of Singapore.

In the past, he has led Global Product Management and Business Development for Smart+ Connected Communities (S+CC) Platform & Solutions at Cisco Systems. He headed up a team developing software, related products and solutions for Smart Buildings and Smart Cities with successful implementations in multiple global locations including Songdo, Korea.

Previously, he has been General Manager of Mobile Devices for Wind River Systems, Director of Business Development at Motorola, has worked at a variety of high tech start-ups in Silicon Valley, with the electric utilities industry at the Electric Power Research Institute (EPRI) in Palo Alto, California and the United States Environmental Protection Agency (US EPA).

Speakers

LEARNING SESSION 2:
APPLICATIONS OF DISRUPTIVE TECHNOLOGY

Jonathan Tan
Managing Director, Unabiz

Jonathan oversees UnaBiz's business relationships with ecosystem partners, clients and resellers in Singapore. UnaBiz is Asia's first dedicated IoT network. UnaBiz owns and deploys nation-wide carrier grade network infrastructure in Singapore and Taiwan to enable physical devices to connect to the cloud. This public network is launched, enabling qualified channels and customers equal access to the IoT network to promote a vibrant and competitive market place.

Jonathan has 24 years of ICT broad-based experience in IoT, telecom, satellite, smart city solutions and infrastructure. Jonathan holds a Degree with Honours in Computer Engineering from the Nanyang Technological University in Singapore. Priority to this, Jonathan was part of the pioneer team of EdgeMatrix, Singapore internet and mobile solutions between 1997-2002.

Zelda Anthony
Head of Blockchai for ASEAN, IBM

Zelda Anthony is IBM's Head of Blockchain, ASEAN, based in Singapore. She is responsible for developing IBM's blockchain business in the ASEAN region; understanding the key blockchain trends, opportunities and challenges and how they are impacting IBM's customers and partners in key industries. The role includes developing IBM's go to market strategy for blockchain, building an ecosystem with partners and building IBM's brand in the ASEAN region. Before the Blockchain leadership role, Zelda was Head of Payments for APAC, Financial Services Industry. Prior to IBM, Zelda spent 7 years at SWIFT where she held several roles including, Head of Compliance products APAC, Head of ASEAN, Head of New Customers APAC and Head of Oceania.

Dr.Heiko Aydt
Scenario Coordinator
Future Cities Laboratory

Heiko Aydt joined the Singapore-ETH Centre's Future Cities Laboratory (FCL) in October 2015. He is the coordinator for the FCL's Responsive Cities scenario - an interdisciplinary cluster of thematically linked research projects that aims to develop methods to support better-informed and responsive urban planning, design, governance and management processes. His current research investigates how citizen engagement plays a crucial role in helping cities adapt and respond to urban challenges.

He is also the project leader of Cooling Singapore - a collaborative project that aims to develop a roadmap for addressing urban heat island effect and challenges to thermal comfort by providing actionable knowledge for policy makers. The project, led by the Singapore-ETH Centre, brings together researchers from SMART, TUM CREATE and NUS.

Heiko Aydt received his PhD degree in Computer Science from Nanyang Technological University (NTU) in Singapore and a MSc degree in Software Engineering of Distributed Systems from the Royal Institute of Technology (KTH) in Stockholm. He also holds a Dipl.-Ing. (FH) in Information Technology from Esslingen University of Applied Sciences.

Speakers

LEARNING SESSION 3:
DISRUPTING MOBILITY

Shaowei Ying
CEO, Dataspark

Ying is a veteran in the Big Data sector with deep expertise in telecommunications and Government sectors in multiple geographies across Asia. The Imperial College graduate had served as a Deputy Director in the Ministry of Trade and Industry in Singapore, and was an Associate Principal in McKinsey and Company, before joining Singtel as Head of Strategy and Analytics in the Digital Life Group of the leading telco in Singapore.

Since 2014, Ying has led DataSpark as its COO, transforming the fledgling startup into an innovative Big Data analytics and insights powerhouse which leverages a variety of data-sets and technologies to address geospatial needs across multiple industries.

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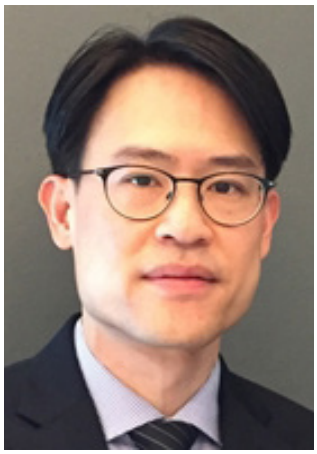
Tanvi Maheshwari
Researcher, Future Cities Laboratory

Tanvi is a part of the Engaging Mobility group where her research focuses on the interplay between automation of transportation flows and urban form. The advent of new transportation technologies like trains, trams and cars have had enduring impacts on how cities are shaped. The automated vehicle is widely seen as a new disruptive technology that can significantly alter city form and streets. It is argued that the presumed efficiency and safety benefits of Autonomous Vehicles do not necessarily translate into good urban environment. Rather, it could reinforce and exaggerate any of the pitfalls of current urban planning norms. As a part of a transdisciplinary collaborative project, she will develop and evaluate design scenarios in order to understand to what extent and under which conditions AVs can contribute to sought-after urban qualities such as sustainability, walkability and liveability in a high-density tropical city like Singapore.

Chris Leck
Director
Singapore Ministry of Transport, Futures Division



Chris Leck is Director of the Futures Division at the Singapore Ministry of Transport, where the Division is responsible for generating future mobility concepts and overseeing their implementation.

He holds a concurrent appointment at the Land Transport Authority of Singapore, where he is a deputy to the CTO and focuses on autonomous vehicle deployment efforts.

Prior to this, he served in various capacities within the Singapore Public Service, including most recently, as Director of Strategic and Political-Military Planning at the Ministry of Defence. Chris graduated with a bachelor's degree in government & economics, and also completed master's degrees in international relations and international law.

Chris has 15 years of prior service in various capacities within the Singapore Public Service. At the department head level, he has served as Head of Strategic and Political-Military Planning as well as Head of International Relations for the Americas, Europe, Middle East and Africa at the Ministry of Defence.

Other past appointments include Head, International Security Policy Branch at the Defence Ministry; Head, Planning and Management Information Unit at the Agency for Science, Technology and Research; and First Secretary, Permanent Mission of Singapore to the United Nations in New York.

Speaker

LEARNING SESSION 4:
MANAGING DISRUPTION: POLICY & PLANNING FRAMEWORKS

Professor Dr. Seeram Ramakrishna
Professor of Mechanical Engineering
National University of Singapore

Seeram Ramakrishna, FREng is a Professor of Mechanical Engineering at the National University of Singapore (NUS). He leads the Circular Economy taskforce with members drawn from across the university, and various national research institutes under the Agency for Science, Technology and Research, ASTAR, Singapore. He is an advisor to the National Environment Agency of Singapore on Industry 4.0 and Circular Economy. He is a member of World Economic Forum's Technology and Innovation for the Future of Production committee. He chairs the Future of Manufacturing technical committee at the Institution of Engineers Singapore. He is a member of Smart Manufacturing Standards Committee of Singapore. Thomson Reuters identified him among the World's most influential scientific minds.

His leadership roles includes University Vice-President (Research Strategy); Dean of Faculty of Engineering; Director of NUS Enterprise; Director of NUS Industry Liaison Office; Founding Director of N U S Bioengineering; Founding Co-Director of NUS Nanoscience & Nanotechnology Initiative, NUSNNI; and Founding Chairman of Solar Energy Research Institute of Singapore, SERIS. He served on the boards of several national organizations.

Speakers

WORLD BANK

Jyoti Shukla
Director,
Singapore Infrastructure and Urban Development Hub,
World Bank

Jyoti Shukla is Director of the World Bank Group's Infrastructure and Urban Hub in Singapore. In this capacity, she oversees and facilitates the activities of some 200 WBG staff representing all entities of the World Bank Group, including IDA/IBRD, IFC and MIGA, and acts as the focal point for external partners. The Singapore hub focuses primarily on improving infrastructure services and promoting smart urban development through public-private sector partnerships.

Ms. Shukla joined the World Bank as a Young Professional in 1994 and has since held multiple positions, largely in the area of public-private partnerships in infrastructure. Her most recent position in the Bank Group has been as Director of the Global Water Practice. She has also led various WBG programs in infrastructure, including as Senior Manager of the Water and Sanitation Program (WSP), as Sector Manager for Energy in South Asia, and as Program Manager for the Public-Private Infrastructure Advisory Facility (PPIAF). The World Bank offers development financing to governments and also advises governments on key policy and institutional issues to incorporate financial, economic and environmental sustainability in their policy interventions.

Ms. Shukla is an Indian national and holds masters' degrees from the Delhi School of Economics and the Woodrow Wilson School of Public and International Affairs at Princeton University. Before joining the World Bank, she held a faculty position at Princeton University and worked with a development consulting firm in India.

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Anna Wellenstein
Director
Global Practice for Social, Urban, Rural and Resilience

Anna is a key member of the World Bank's SURR GP senior management team that sets strategy for analytics and financing in areas such as disaster risk reduction, urban renovation, and geospatial technology.

She also oversees partnerships with bilateral, UN, and regional organizations. Anna has over 20 years of experience in urban development. She's led efforts to design and finance investments, facilitate policy reforms and build capacity to help developing countries reduce poverty and boost equity. Anna has been responsible for technical oversight of new projects financed by the Bank, the portfolio quality of ongoing projects, and setting sector and country strategies.

Anna oversees $25 billion in lending to developing countries in over 200 projects, 325 studies and technical assistance projects. She's developed strong partnerships with governments in countries ranging from large middle income to small island states as well as development agencies and academia.

Speakers

WORLD BANK

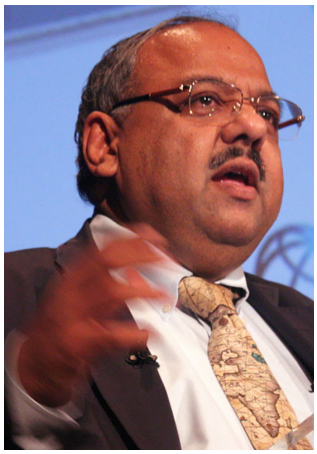
Abhas Jha
Practice Manager
Urban and Disaster Risk Management
World Bank

Abhas Jha is Practice Manager, Urban and Disaster Risk Management (East Asia and the Pacific) within the Social, Urban, Rural and Resilience Global Practice for the World Bank. He leads a global team located in 10 countries (and 6 time zones) working on one of the largest portfolios ($7 billion) of infrastructure lending, technical assistance, and advisory services within the World Bank.

Abhas works on cities, infrastructure, technology, affordable housing, risk and resilience and public policy. He has been with the World Bank since 2001, working on policy reform and development finance in a variety of countries including China, Vietnam, Indonesia, Thailand, the Philippines, Turkey, Mexico, Brazil, Argentina, Jamaica, Laos, Cambodia, Myanmar, PNG and Peru.

Abhas earlier served as Adviser to the World Bank Executive Director for Bangladesh, Bhutan, India, and Sri Lanka. He was for 12 years a member of the Indian Administrative Service (the national senior civil service of India) in the Government of India (in the Federal Ministry of Finance and earlier in the state of Bihar).

Nagaraja Rao Harshadeep (Harsh)
Lead Environmental Specialist
World Bank, Natural Resources Global Practice



Nagaraja Rao Harshadeep (Harsh) is a Lead Environmental Specialist in the Environment and Natural Resources Global Practice of the World Bank, and is leading efforts to promote sustainable multi-sectoral development approaches in a spatial context.

In over 19 years at the Bank, he has led and been part of a range of environmental, water, and other natural resources projects and studies, primarily in Africa, South Asia, Central Asia, and East Asia. This has included work on integrated watershed and basin approaches, climate resilience, international waters (including work on the Aral Sea, Nile, Ganges, Brahmaputra, and other Basins), pollution, water and environment institutions, irrigation systems, biodiversity and environmental assessments.

He has a B. Tech in Civil Engineering from the Indian Institute of Technology (IIT)-Madras, a Masters in Environmental and Resource Engineering from the University of Syracuse, and a Ph.D. in Water Resources and Environmental Systems from Harvard University.

Speakers

WORLD BANK

Fatouma Toure Ibrahima
Operations Advisor
World Bank, Singapore

Fatouma Toure Ibrahima is the Operations Adviser of the Infrastructure and Urban Development Hub in Singapore, where the World Bank, IFC and MIGA work together to generate direct investments and provide technical assistance for infrastructure and related sectors.

Since joining the World Bank in 1998, Ibrahima has worked in several sectors, including the finance and energy sector. Prior to joining the Singapore Hub, Ibrahima served as Regional Representative for the Public Private Partnership Infrastructure Facility (PPIAF), in charge of the West, Central and North Africa portfolio, and Senior Financial Sector Specialist and Task Team Leader in the Africa region, where she led the design and implementation of various country and regional-level energy projects.

A national of Mali, Ibrahima has also served as Special Assistant in the office of the World Bank Group Managing Director and Chief Financial Officer, and as Financial Sector Specialist in the Middle East and North Africa Region, where she managed financial sector and financial system infrastructure projects and contributed to the Financial Sector Assessment Program.

Coordinators

WORLD BANK

Xueman Wang
Senior Urban Specialist and Coordinator for Global Platform for Sustainable Cities, World Bank

Xueman Wang – leads World Bank's Global Platform for Sustainable Cities (GPSC) as well as the work on the design of the International Energy Efficiency Facility to promote green bonds. She was a team leader for the World Bank's Partnership for Market Readiness – a global program for supporting countries to prepare and implement carbon pricing scheme such as emissions trading and carbon tax. She has played a critical role in helping China develop national carbon market and was part of the core team that set up the largest carbon fund in the world in 2007.

She was one of the lead authors for the World Bank flagship report 2010 World Development Report –"Development and Climate Change". Prior to joining the World Bank, she was with the Secretariat of the Convention on Biological Diversity in Montreal, Canada, working on biosafety, and trade and environment.

Before that, she worked at the UN Climate Change Secretariat in Bonn, Germany, where she was responsible for climate negotiations and the compliance regime. Prior to the UN, she worked with the Chinese government on a range of issues including China Agenda 21, climate change and desertification. She was the member of Climate Change Council of the Global Agenda of the World Economic Forum (2012 to 2014). She earned Master of Laws degrees at Wuhan University (Wuhan, China) and the Fletcher School of Law and Diplomacy of Tufts University, 2000.

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Dr. Gayatri Singh
Senior Urban Development Specialist
World Bank, Jakarta

Gayatri Singh is a Senior Urban Development Specialist at the World Bank's Global Practice on Social, Urban, Rural and Resilience. In her current role, she is collaborating with urban and national governments to create inclusive, sustainable and efficient cities through a combination of investment projects, policy reform, technical assistance and cutting-edge research. She is leading the preparation of the National Urban Development Project in Indonesia aimed at developing the capacity of 20+ local governments on integrated city planning and fiscal management, and is co-leading an urban upgrading project in Vietnam's Mekong Delta Region. She also leads City Planning Labs, a technical assistance initiative that builds spatial planning capacity and data foundations of local governments in Indonesia. She has recently authored a remote-sensing based study of slums in Metro Manila, which included the first metro-wide slum mapping initiative utilizing satellite imagery and semi-automated object-based image analysis followed by an in-depth survey. She trained as a Rhodes Scholar in Oxford University and subsequently completed her PhD at Brown University. Her areas of expertise include, municipal service delivery, urban spatial planning, urbanization and migration, poverty, social inequality, conflict-displaced populations and residential segregation. She has authored several academic and policy publications on these topics. Her latest publications include World Bank Reports on "Reducing Poverty and Promoting Inclusion in Cities of East Asia and the Pacific, 2017"; "Navigating Informality: Perils and Prospects in Metro Manila's Slums, 2017"; and "Urban Poverty in Ulaanbaatar: Understanding the dimensions and addressing the challenges, 2016."

Coordinators

FUTURE CITIES LABORATORY COORDINATORS

Professor Dr. Stephen Cairns
Director
Future Cities Laboratory

Stephen Cairns completed an undergraduate degree in anthropology and classical studies at the University of Otago. He trained in architecture at the University of Auckland, and practiced as an architect in New Zealand, Australia and the Pacific, designing the award-winning Headquarters for the Secretariat of the Pacific Community in Noumea. He subsequently undertook doctoral studies at the University of Melbourne, where he wrote a thesis on the colonial architecture in Java, with an emphasis on aesthetics and the politics of representation.

On completion of his PhD, he was appointed to a Lectureship at the University of Melbourne. He took up a Senior Lectureship at the University of Edinburgh, and was appointed Professor of Architecture and Urbanism there in 2009. He served as Head of Department of Architecture, and Director of the Edinburgh School of Architecture and Landscape Architecture. He is currently based in Singapore where he his Programme Director of the Future Cities Laboratory.

His current work is focused on the complex patterns of settlement emerging in the predominantly rice-growing hinterlands of many large cities in Southeast Asia, India and China. His practice-oriented research takes the form of the Tropical Town project, a planned/unplanned low-energy, high-density settlement for such urbanising hinterlands.
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Aurel von Richthofen
Senior Researcher
Future Cities Laboratory

Aurel von Richthofen is a German architect and urban scholar. He is a graduate of the architecture departments of ETH Zurich and Princeton. Aurel has taught architecture and computer-aided urban design as assistant professor at The Ohio State University (2007-2009), TU Berlin (2010), and the German University of Technology in Oman (2010-2014).

In 2014 he became project coordinator at the Future Cities Laboratory (FCL) in Singapore. Aurel von Richthofen is the head of the Education Research Programme at FCL. Since 2017 he leads a post-professional course on advanced urban design for the Urban Redevelopment Authority (URA) in Singapore. In 2016, he organised the Engineering for Development (E4D) Summer School for ETH Zurich and TU Delft in the Netherlands. He is also teaching the course Urban Spatial Reasoning and Representation at the Yale-NUS programme in Urban Studies since 2016.
Research

Andrew Stokols
Research Manager
Future Cities Laboratory

Andrew Stokols is research manager with the Future Cities Lab, where he helps connect cutting edge research to application for various clients in Singapore and beyond. Before this, he was director of the ecological urbanism center of Harvard Graduate School of Design and Peking University where he worked with Chinese cities on ecological security plans. He has previous experience working on urban and social development issues throughout Asia, working on historic preservation in China, rural development in Sri Lanka. He was a 2012-2013 Fulbright Fellow in China. He has a Masters in Urban Planning from Harvard GSD and Bachelors from UC Berkeley.