The data integration challenge: ‘FAIR’ data for city resilience

Session B4 description

https://resilientcities2019.iclei.org/wp-content/uploads/B4-Data-Integration-challenge.pdf

credit: ICLEI

credit: ICLEI

Facilitators

- **Andrew Simmons -** Director of Research, Resilience Brokers, London
- **Simon Hodson -** Executive Director of CODATA, International Science Council, Paris [pp. 3-22]

Panelists

- **Stephen Passmore -** Chief Executive Officer, Resilience Brokers, London [pp. 24-50]
- **Caroline Field -** Committee Chair, British Standard for City Resilience; and Associate Director, Arup, London [pp.42-52]
- **Piero Pelizzaro -** Chief Resilience Officer, Milan [pp.53]
- **Gayatri Singh -** Senior Urban Development Specialist, World Bank, Jakarta *(video intervention)* [pp.42-55]
- **Chris van Diemen -** Co-Founder & Chief Data Officer, Green City Watch, Amsterdam [pp.57-83]

The Data Integration Challenge:

driving solutions for resilient cities, disaster risk reduction and infectious diseases

Simon Hodson
Executive Director
CODATA
www.codata.org

ICLEI Resilient Cities
Gustav Streseman Institute, Bonn, Germany
26 June 2019

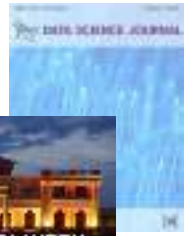
Data Policies




GBIF
Global Biodiversity Information Facility

- CODATA Data Policy Committee http://bit.ly/data-policy-committee;
- One major policy report per year.
- 20-Year Review of GBIF currently underway.
- New Centre of Excellence in Data for Society being set up at University of Arizona.

Data Science


- Data Science Journal: https://datascience.codata.org/
- International Data Week and CODATA Conference series.
- Task Groups and Working Groups.

Data Skills



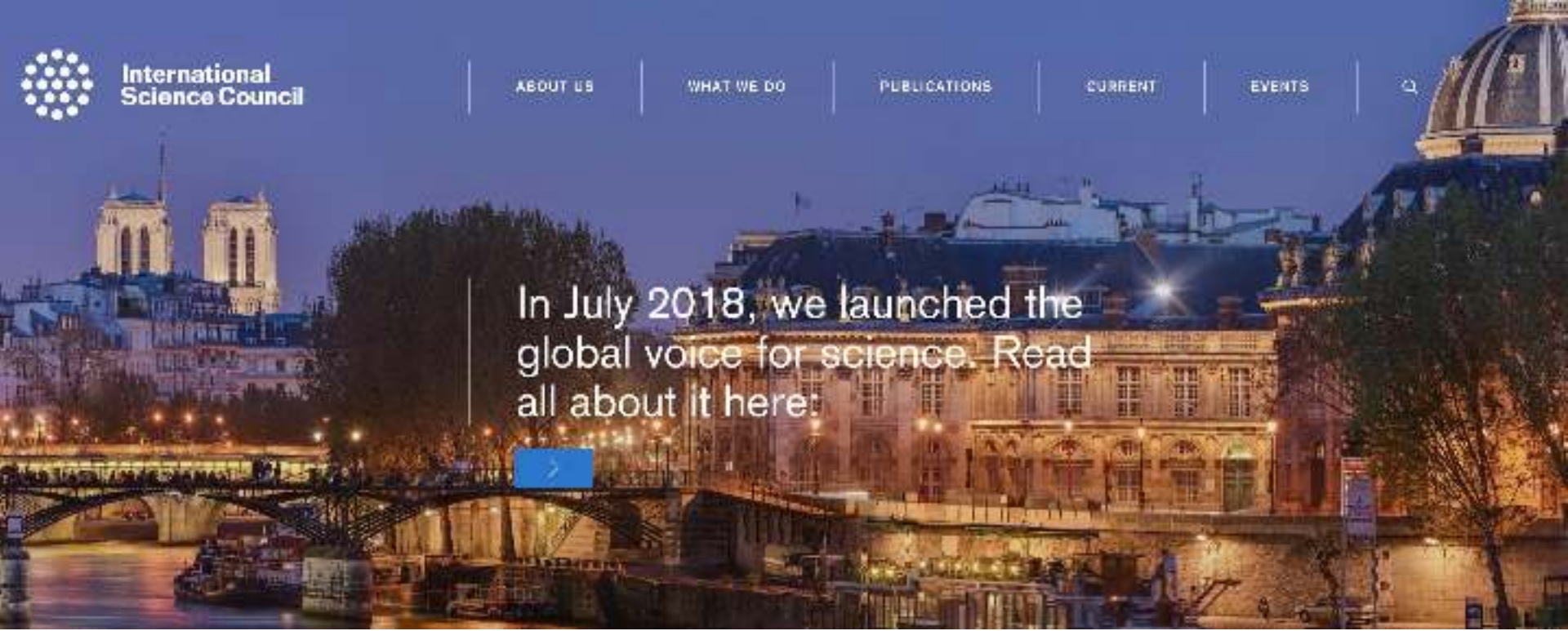


- CODATA-RDA School of Research Data Science.
- CODATA China, PASTD and other training activities.
- #terms4FAIRskills and FAIRsFAIR Competence Centres.

Data Good Practices




- Regional Open Science Platforms
- Data Interoperability for Multi-Disciplinary Research.
- Survey and recommendation of good practices.



- **Formed by a merger of the International Council for Science and the International Social Science Council.**
- **Explicit mission for ALL the sciences and for interdisciplinary and transdisciplinary research.**

CODATA

International Science Council

Global Grand Challenges:
Tackling Complexity: Data-Driven Interdisciplinarity

- The major, pressing global scientific and human issues of the 21st century can **ONLY** be addressed through **research that works across disciplines to understand complex systems**, and which uses a **transdisciplinary** approach to turn data into knowledge and then into action.
- Require the ability to gather data from multiple varies sources and extract information from those complex and heterogeneous data.
- The digital and data revolution presents us with huge opportunities and significant challenges.
- **Better exploitation of data resources for research is the epochal challenge of the 21st century.**
- With the merger of ICSU and ISSC to form the **International Science Council**, **addressing the data revolution and global challenges is a priority.**

futureearth
research for global sustainability

IRDR
Integrated Research on Disaster Risk

URBAN HEALTH AND WELLBEING
A SYSTEMS APPROACH

Slide Credit: Fernando Gouveia Reis and Laura Merson, IDDO

The role of IDDO

Infectious Diseases Data Observatory, Oxford.

IDDO collects and integrates clinical, laboratory and epidemiological data relating to a number of infectious diseases.

Analysis of combined datasets increases the power to determine optimal treatments, identify the most effective intervention in outbreaks.

IDDO
INFECTIOUS DISEASES DATA OBSERVATORY

CODATA
INTERNATIONAL SCIENCE COUNCIL

Slide Credit: Laura Merson, IDDO

West African Ebola Outbreak, 2014-2016.

The government-led response to the West African Ebola outbreak included many different international organisations.

Only a selection of international responders is shown. There were many more.

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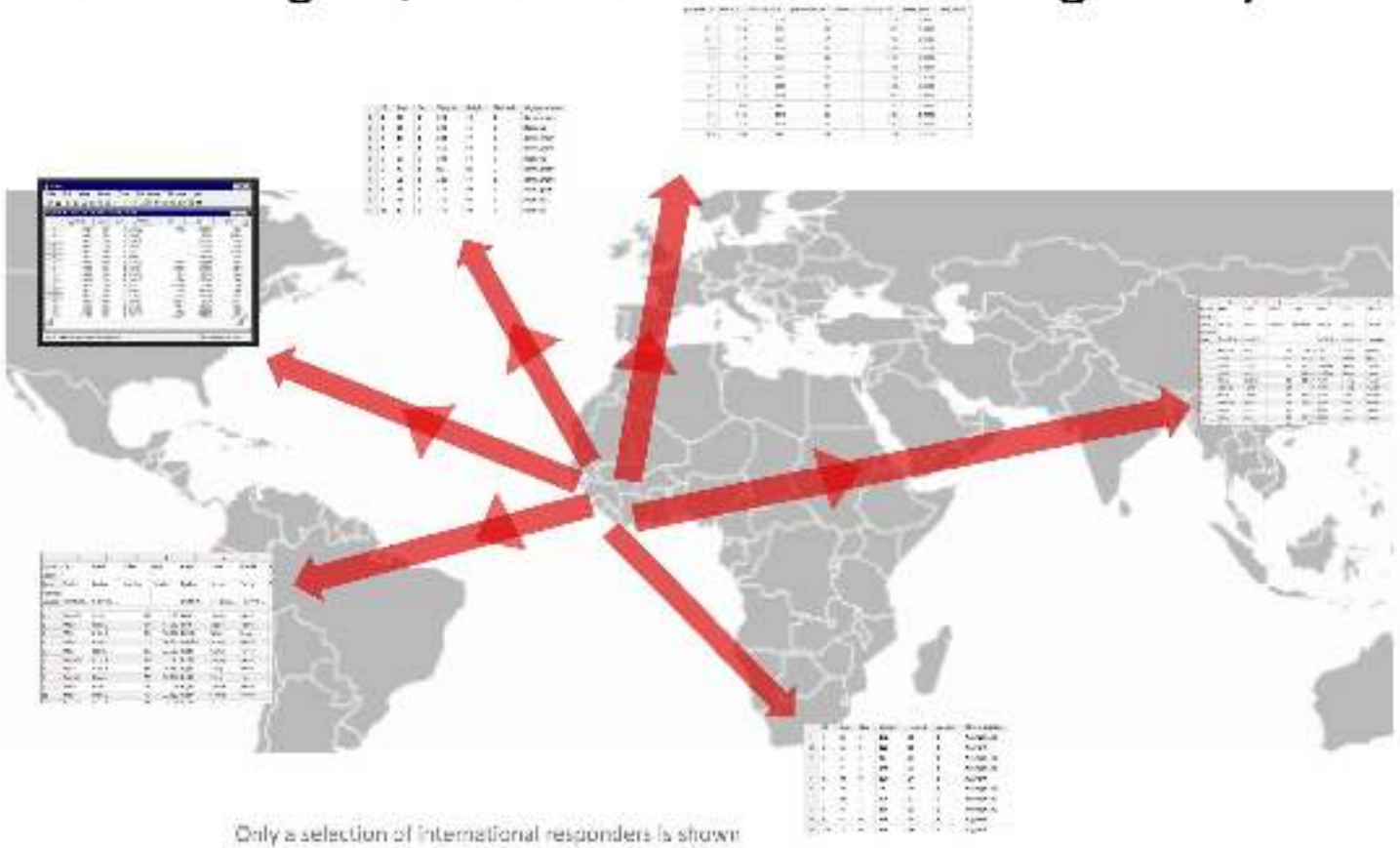
Slide Credit: Laura Merson, IDDO

West African Ebola Outbreak, 2014-2016.

Pisani et al. 2018 Estimate 65% of study data not available, not shared.

When the outbreak ended and organisations left the region, the data was scattered globally



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- Data that characterise many of the factors influencing the progression of an outbreak are available, but remain isolated in siloes within the various domain- specific communities, often with their own domain-specific formats, vocabularies and ontologies.
- Availability of datasets from **industry, the research community, national public health surveillance, climate and environmental monitoring systems, health systems administration, social media feeds, and animal health servic**es will then be sought in order to understand how their integration can fill critical knowledge gaps across disciplines. Reports and lessons learned from previous infectious disease outbreaks have identified **clinical, genomic, demographic, pathogen and vector surveillance, communications, land-use, health administration, and environmental data** as powerful inputs to support planning and operationalising outbreak response. We can anticipate data in numerous formats such as **tabular data in spreadsheets, CSV, TSV, and/or plain text, geospatial point-wise data, geographic data, and a variety of XML and JSON dialects**. For the domains of interest, available ontologies will be sourced and compared to determine methods for integration and interchange.

FAIR

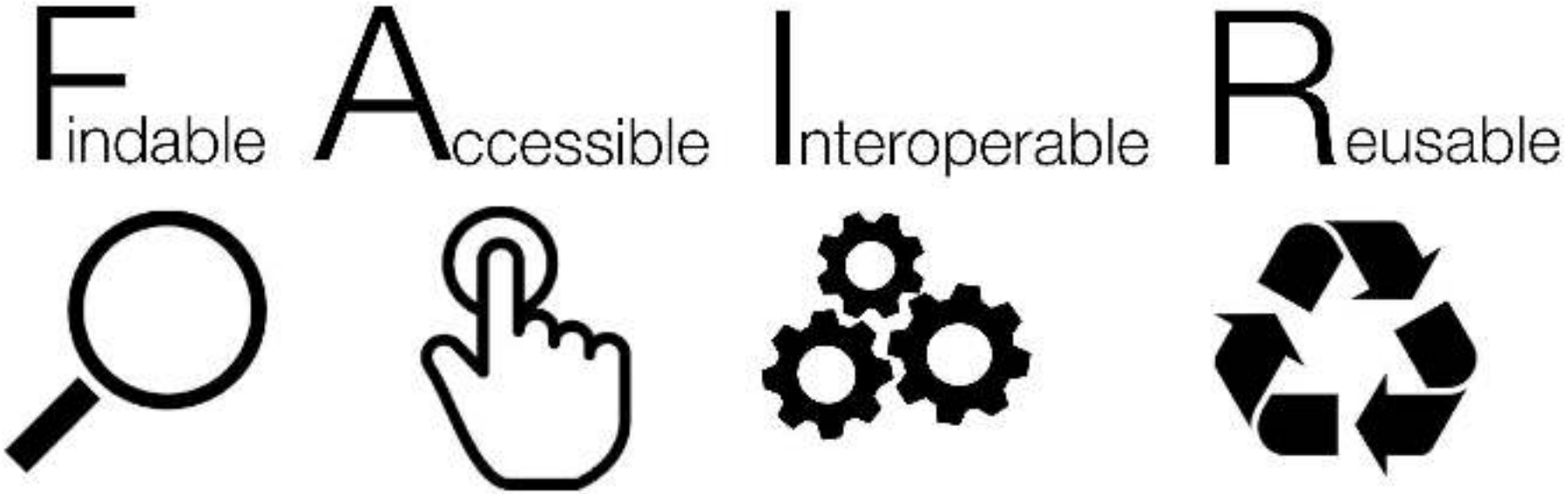


Image CC-BY-SA by SangyaPundir

(Mons, B., et al., The FAIR Guiding Principles for scientific data management and stewardship, Scientific Data, http://dx.doi.org/10.1038/sdata.2016.18)

FAIR Guiding Principles

To be Findable:

- F1. (meta)data are assigned a globally unique and persistent identifier
- F2. data are described with rich metadata (defined by R1 below)
- F3. metadata clearly and explicitly include the identifier of the data it describes
- F4. (meta)data are registered or indexed in a searchable resource

To be Accessible:

- A1. (meta)data are retrievable by their identifier using a standardized communications protocol
- A1.1 the protocol is open, free, and universally implementable
- A1.2 the protocol allows for an authentication and authorization procedure, where necessary
- A2. metadata are accessible, even when the data are no longer available

To be Interoperable:

- I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
- I2. (meta)data use vocabularies that follow FAIR principles
- I3. (meta)data include qualified references to other (meta)data

To be Reusable:

- R1. meta(data) are richly described with a plurality of accurate and relevant attributes
- R1.1. (meta)data are released with a clear and accessible data usage license
- R1.2. (meta)data are associated with detailed provenance
- R1.3. (meta)data meet domain-relevant community standards

(Mons, B., et al., The FAIR Guiding Principles for scientific data management and stewardship, Scientific Data, http://dx.doi.org/10.1038/sdata.2016.18)

European Commission Expert Group, Chaired by Simon Hodson, Turning FAIR into Reality (2018) https://doi.org/10.2777/1524

- **FAIR does not NECESSARILY mean Open**
  - Data visiting rather than data sharing.
- **Findable:** have sufficiently rich metadata and a unique and persistent identifier, to enable discovery.
- **Accessible:** retrievable by humans and machines through a standard protocol; authentication and authorization where necessary.
  - Allows programmatic access for analysis.
- **Interoperable:** metadata use a 'formal, accessible, shared, and broadly applicable language for knowledge representation'.
  - The descriptions of variables etc follow a shared specification and are commensurable.
- **Reusable:** metadata provide rich and accurate information; clear usage license; detailed provenance.
  - Both humans and their analytical tools know what can be done with the data (license) and can assess its provenance.

ENABLING FAIR DATA PROJECT

HOME / ENABLING FAIR DATA PROJECT

Enabling FAIR Data Project: http://www.copdess.org/enabling-fair-data-project/; https://eos.org/agu-news/enabling-fair-data-across-the-earth-and-space-sciences

Nature Comment Article: https://www.nature.com/articles/d41586-019-01720-7

Australian Academy of Sciences: http://bit.ly/Australian_Academy_FAIR_Data

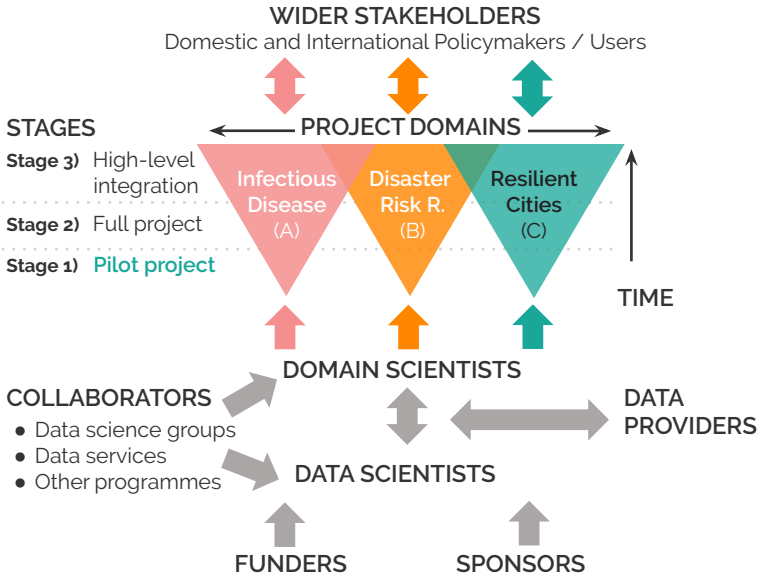
Tackling Complexity: Data-Driven Interdisciplinarity
CODATA and ISC Data Integration Pilot

- **The interoperability of data in interdisciplinary grand challenge research programmes is one of the major challenges for global research.**
- FAIR provides some of the tools to address this.

- **As part of the new ISC Science Action plan we have presented a proposal for a major international programme.**
- Series of workshops to plan the initiative.
- CODATA, with support from ISC, has been exploring these issues with a set of pilot case studies.

CODATA and ISC Data Integration Pilot

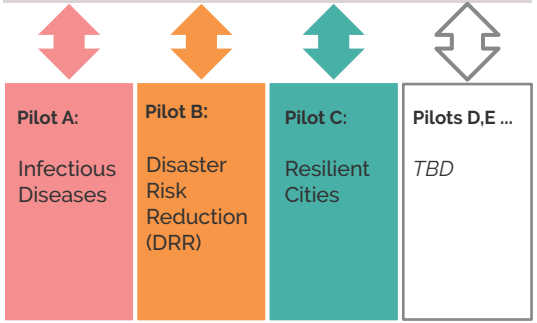
- The initiative addresses data integration for pressing, 21st century global challenges, initially through three closely-allied interdisciplinary research areas:
  - **Infectious Diseases (IDDO)**
  - **Disaster Risk Reduction (CODATA TG, PHE, IRDR)**
  - **Resilient Cities (Resilience Brokers)**
- With global collaboration within and across domains and disciplines, the overall activities are designed to:
  - have practical outputs of value to policymakers and users;
  - to develop technical approaches and methods that have generic value; and
  - to be persuasive demonstrators to the broader scientific community of the value of the approach.



CODATA and ISC Data Integration Pilot

Intelligence Support for Data Science and Data Integration

Provides generic support for an expanding series of pilots.



Problem Definition:

Interdisciplinary or transdisciplinary research on topics where there is a need for data integration.

Domains include:

- Infectious Diseases
- Disaster Risk Reduction (DRR)
- Resilient Cities

Data Integration Intelligence Methodology:

Phase 1: Understanding the pilot

Phase 2: Understanding the data

Phase 3: Identifying opportunities for data integration

Phase 4: Identifying recommendations and requirements

Data integration recommendations

Phase 5:
Implementation of Data Integration Intelligence

Interoperability and data integration solutions

Phase 6:
Enhanced Research

Innovative research outcomes and recommendations

Phase 7:
Distilling Generic Lessons for Data Integration and Enhanced Research

Recommendations for interdisciplinary research; recommendations for societal actors.

Interoperability of Metadata Standards in Cross-Domain Science

Pilot Case Studies Prepared Data Audits

- What is the overarching question or challenge that is being addressed?
- What are the data sets which, ideally, need to be accessed, assembled in order to address these questions?
  - Who 'owns' the data? What is the licensing and use regime?
  - Where are the data stored? What are the access requirements?
  - **What is the data format?**
  - **What is the metadata format used? What provenance information is provided? Can fitness for use be assessed?**
  - **How are the variables defined? What semantics, controlled vocabularies or ontologies are used to define these qualities, values?**
  - **Is code associated with processing/analyzing the data available?**

Dagstuhl Workshop in partnership with DDI

- Detailed examination of the requirements and the challenges of the pilot case studies.
- Recommendations on how to address issues of interoperability and integration: what standards can and should be used; how implementing those standards may assist the pilots; what work is necessary on the standards to assist interoperability in these use cases.
- Articles forthcoming in Data Science Journal.
- **Proposal prepared for the ISC Science Action Plan.**

DDI
DATA DOCUMENTATION INITIATIVE

CODATA

Workshop: Interoperability of Metadata Standards in Cross-Domain Science, Health, and Social Science Applications

Schloss Dagstuhl – Leibniz Center for Informatics, October 1-5, 2018 in Western Germany

Conclusions

- Too much time is lost on data wrangling (estimates as high as 80%)
- Key ingredients for interdisciplinary, grand challenge research where heterogenous data needs to be integrated:
  - FAIR Data (machine readable)
  - Alignment of metadata specificiations and ontologies.
  - More effective ingest and FAIR by design.
  - Machine Learning / Artificial Intelligence to assist with data integration
- Data visiting vs data sharing. Allowing programmatic access can help with protection and avoid challenges of data transfer.

- Extracting information from complex systems studied by interdisciplinary grand challenge research initiatives is one of the greatest challenges of our age.

- CODATA is working with interdisciplinary research initiatives to understand the requirements and how these can be generalised.

- We hope that this will become a ISC sponsored global programme. Keen to have input, direction, engagement.

High Level Policy and Strategy Workshop: Implementing Open Research Data Policy and Practice, Beijing, 17-18 September.

- Examines the theme in China and elsewhere, in the light of the emergence of data policies and in particular the China State Council's Notice on 'Measures for Managing Scientific Data'.
- Timely to examine changes in data policy, emergence of FAIR, major initiatives such as EOSC, ARDC, and CAS activities including the Digital Belt and Road.
- Important opportunity for comparative discussions.

CODATA 2019 Beijing Conference, 19-20 September

- Call for presentations and posters, deadline 8 July: https://conference.codata.org/CODATA_2019/
- **Sessions on FAIR, data interoperability, on hazards, on cities.**
- Information and registration: http://codata2019.csp.escience.cn/dct/page/1
- Ongoing series of CODATA Conferences.

Thank you for your attention

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Data-driven resilient city-regions

B4 - The data integration challenge: 'FAIR' data for resilient cities
26th June 2019 - 16:00 - 17:30 - Room: S25-26

ICLEI Resilient Cities 2019
10th Global Forum on Urban Resilience and Adaptation
Bonn

Stephen Passmore Chief Executive Officer, Resilience Brokers
Paola Pollmeier *program director and open data specialist, Ruta-N Medellin* *(pre-recorded video)*

resilience brokers

ecological sequestration trust

Introduction to Resilience Brokers and the Trust

- UK group to speed up and scale up transformative urban/rural development;
- Operates in space between private, public, knowledge and civil society sectors;
- Leading experts foster **integrated-systems thinking** and **collaborative approaches**;
- Develop tools and demonstrators to support implementation of 2030 agenda in city regions;
- Open source, free-to-use tools - "**resilience.io"** integrated-systems modelling platform
- Data-driven, social and natural science based.

resilience brokers

Data brokering approach - a change in paradigm

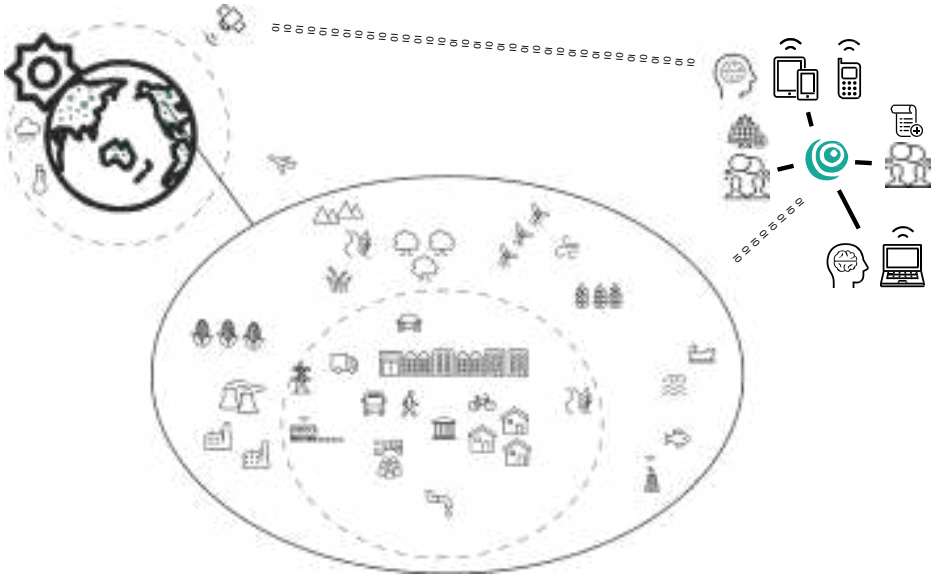
Interoperability through mediation -

System of systems integration, linking complex and heterogeneous systems by building bridges between existing network platforms and systems infrastructures.

Geo-locate flows, infrastructure - ML

Data-brokering infrastructure enables access to and interoperability with a wide variety of data sources:

- geo-locational data and from Earth observations;
- open datasets across scales (e.g., local, regional);
- proprietary data sets;
- ground-based sensors;
- crowdsourced data.



GEO GROUP ON EARTH OBSERVATIONS

CODATA

resilience brokers

Decisions - Investment in infrastructure

- Energy, Water, Transport, Housing, …
- Local, foreign, government, private, …

Decisions - Market Policies and planning

- Taxation, tariffs, quota, subsidies, …
- Land use plans, regulations, …

Indicator outcome range (5-20 years)

- Sector resource and energy flows
- Effects on imports & exports
- Wastes & Emissions (CO_2, CH_4,…)
- Employment, income, in(equality)
- Human well-being indicators
- Sector economic activity / GDP
- Access to service / %

#switch2sendai

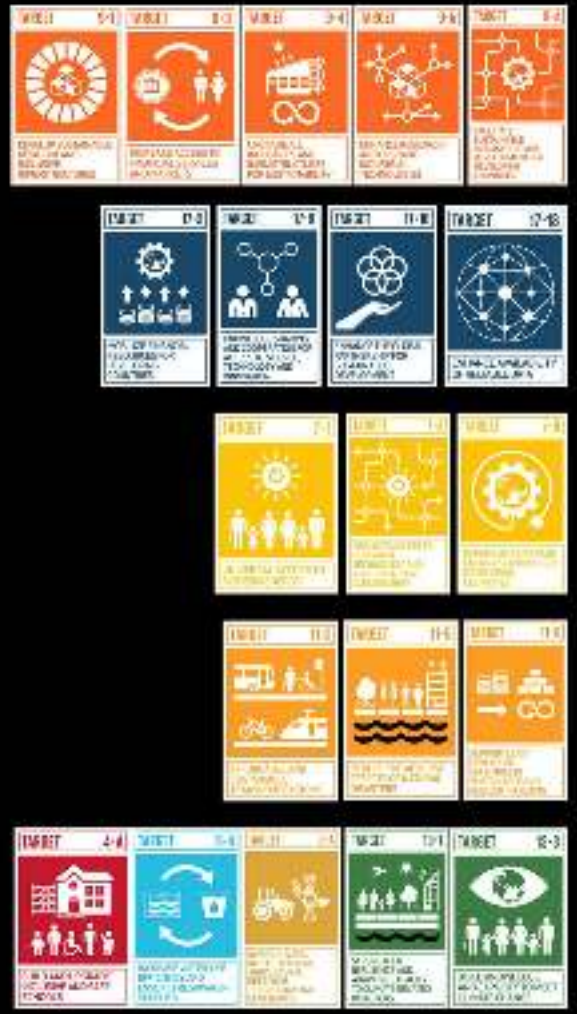
PARIS 2015

- Technology options
- Proposed locations
- Market rules and regulation

Key performance

Policy & Investment Decisions

https://icebreakerone.org/



THE TIME FOR THEORY IS OVER

ICEBREAKER ONE.ORG

‘Smart’ cities and ‘resilient’ cities

Defining the role of open data in different city strategies

‘Is the smart city focus on efficiency at odds with the need for resilient cities to be open, democratic and inclusive, processes which are time and labor intensive?’

Pamela Robinson, Ryerson University and GeoThink Researcher

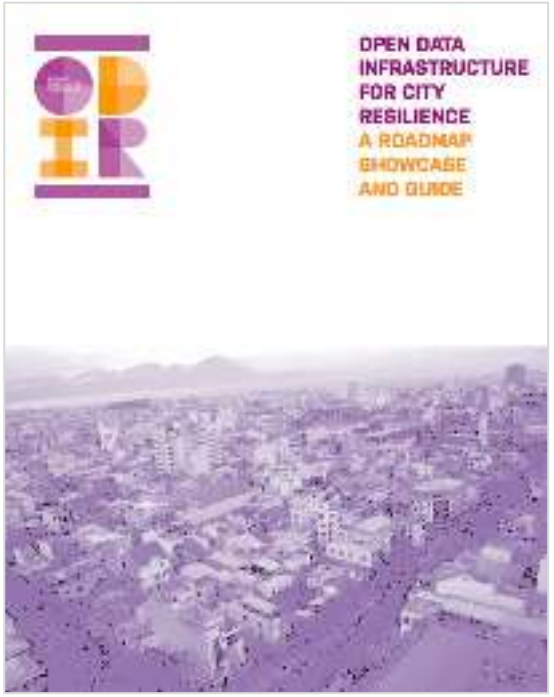
‘The ability to ingest crowd sourced data, and turn data into actionable information is a trait of engaged administrations and data programmes that leverage platforms to harness new data and feedback on local issues.

This includes the ability to allow partners to stream sensor based data to a city’s open portal.’

Sifa Mawiyoo, Open Data Geospatial Technologist, ICT Authority, Kenya

‘OPEN DATA INFRASTRUCTURE FOR CITY RESILIENCE:
A roadmap showcase and guide’

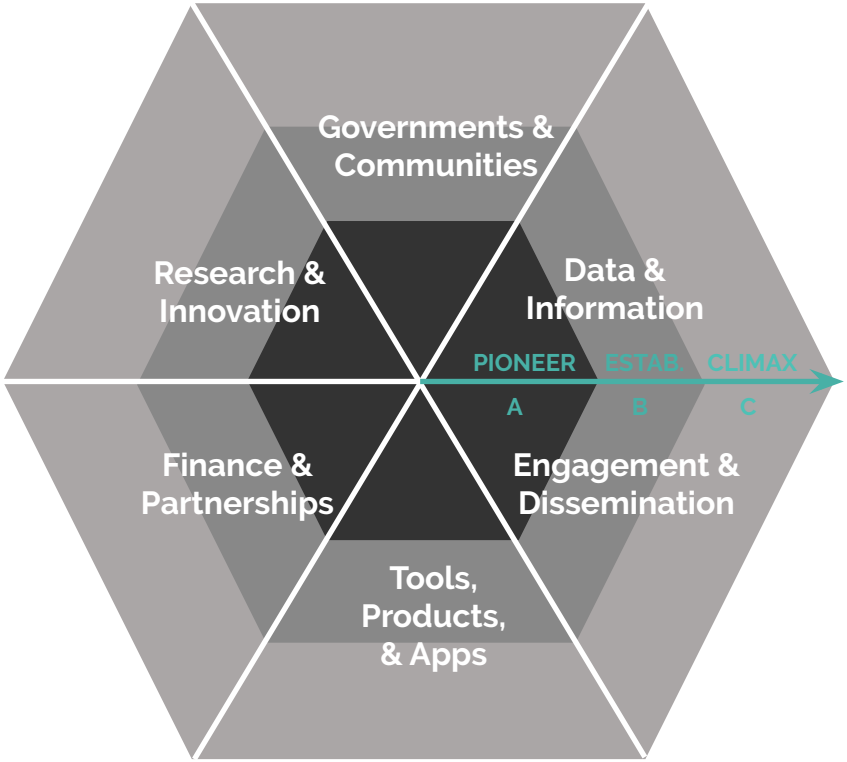
May 2018, available through UNISDR



Implementation

Collaboratory maturity

- X sector champions
- Data audit and integration methodology
- Co-development
- Capacity building
- Evolve and embed



Implementation

resilience.io platform use cases

Greater Accra, Ghana	*Water supply, sanitation and accessibility*
Hunter Valley, Australia	*Water infrastructure, energy transition, institutional resilience*
Union Canal, Scotland, UK	*Water supply, sanitation and accessibility*
Anninghe, Sichuan, China	*Integrated multi-hazard modelling*
Queen Elizabeth Olympic Park, London, UK	*Digital and social inclusion, green space accessibility*

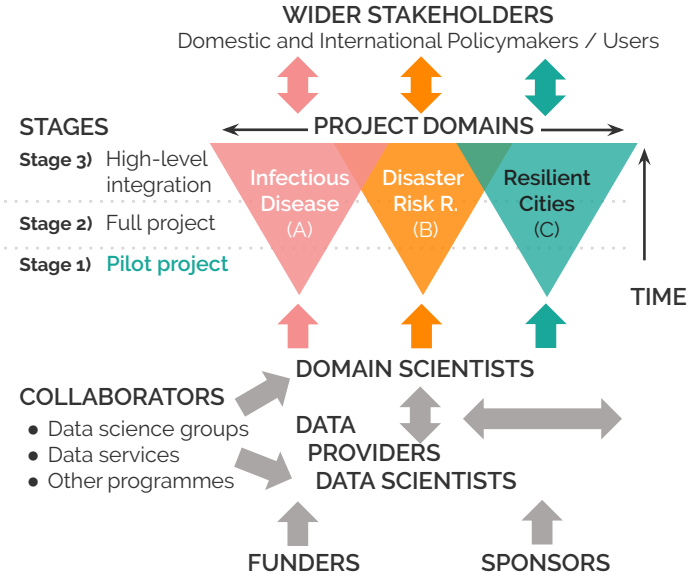
Additional Resilience Brokers Projects

Medellín, Colombia	*Air quality, public health, transport, green space*
Beirut, Lebanon	*Green space, urban health, pedestrian and cycling routes*
Western Cape, South Africa	*Water supply, energy transition*
Norfolk & Suffolk, UK	*Net positive energy buildings & public health*

ISC-CODATA Data Integration Initiative

Pilot projects for 3 global challenges - stages

- The initiative addresses data integration for pressing, 21st century global challenges, initially **through three closely-allied domain field,** with three work stages.
- With global collaboration within and across domains and disciplines, the overall activities are designed to:
  - have practical outputs of value to policymakers and users;
  - to develop technical approaches and methods that have generic value; and
  - to be persuasive demonstrators to the broader scientific community of the value of the approach.
- Through an approach that supports, connects and amplifies the work of **existing Communities of Practice** and science bodies that are relevant and influential, CODATA's long-term, decadal Data Integration Initiative has the **potential to fundamentally enhance the capacity of science** in the 21st century.



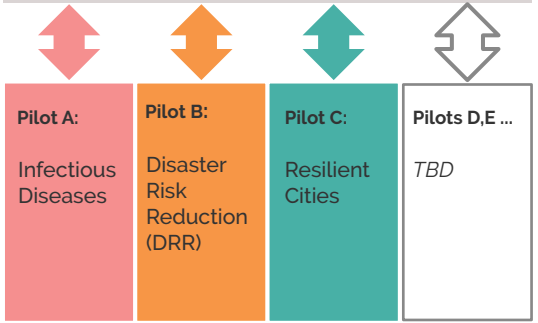
International Science Council

CODATA

Enhancing Data Integration Intelligence

Intelligence Support for Data Science and Data Integration

Provides generic support for an expanding series of pilots.



Problem Definition:

Interdisciplinary or transdisciplinary research on topics where there is a need for data integration.

Domains include:

- Infectious Diseases
- Disaster Risk Reduction (DRR)
- Resilient Cities

Data Integration Intelligence Methodology:

Phase 1: Understanding the pilot

Phase 2: Understanding the data

Phase 3: Identifying opportunities for data integration

Phase 4: Identifying recommendations and requirements

Data integration recommendations

Phase 5: Implementation of Data Integration Intelligence

Interoperability and data integration solutions

Phase 6: Enhanced Research

Innovative research outcomes and recommendations

Phase 7: Distilling Generic Lessons for Data Integration and Enhanced Research

Recommendations for interdisciplinary research; recommendations for societal actors.

CODATA pilot project for resilient cities

Medellin case study

Integrated data approach on a topic in Medellin

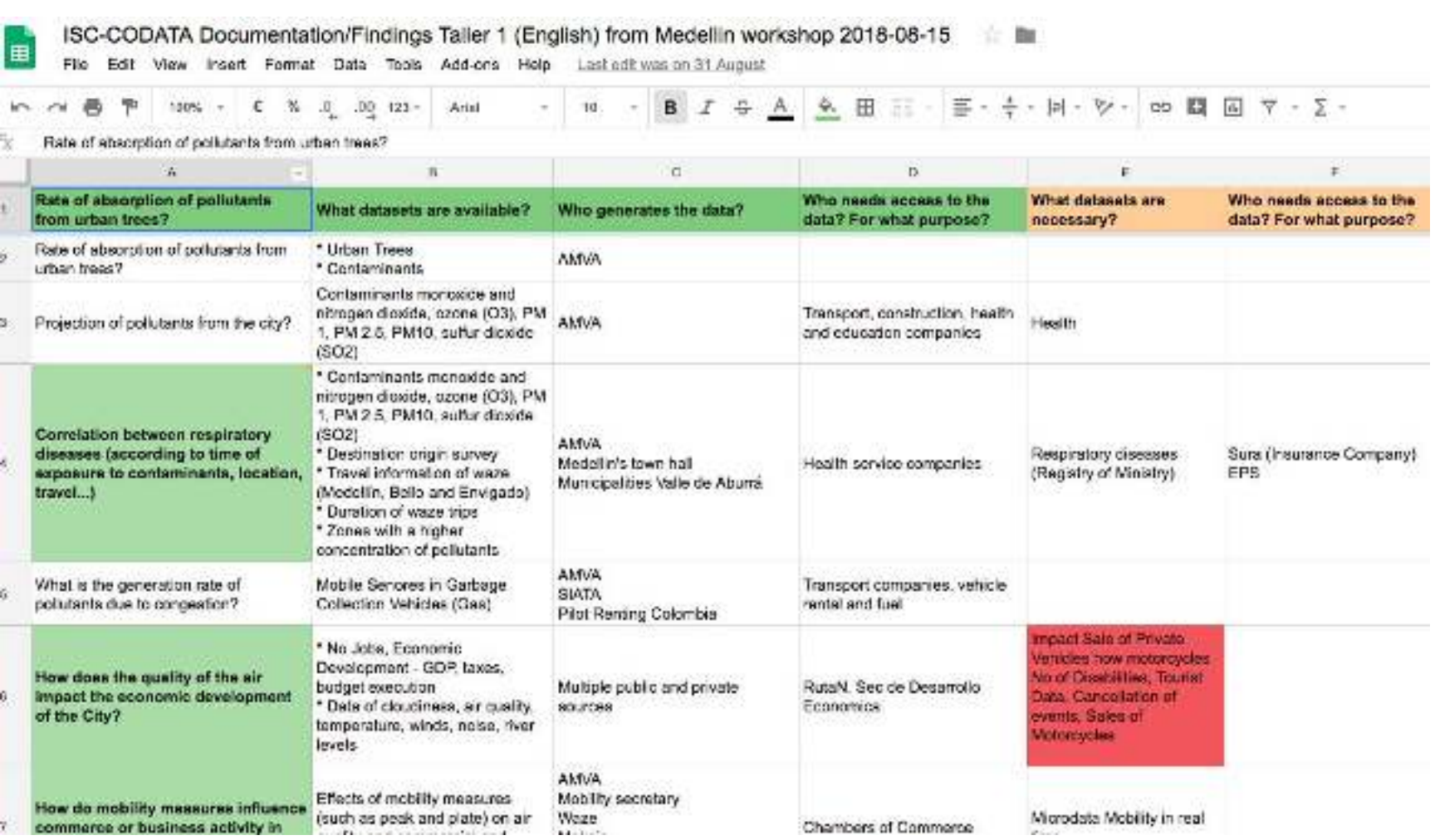
- a systems approach to air quality (and **public health** and **economic outcomes**) has been agreed, advancing existing initiatives in Medellin.

Medellin project working group:

- Ruta N - Business & Innovation Center for Medellin Municipalit - ***Paola Pollmeier*** *(Medellin lead)*
- Universidad Nacional de Colombia Sede Medellín (UNALMED) - *Santiago Medina Hurtad*
- Medellin Municipality - Planning Office and Chief Resilience Officer *(CRO)*
- Foundation Makaia
- Instituto Tecnológico Metropolitano de Medellín (ITM)
- Departamento Administrativo Nacional de Estadística (DANE) - *Carlos Felipe Lombo, Angelica Robayo*
- Medellin Data Council members
- Medellín Lab (ACI Medellin)

Data integration workshops in Medellin for CODATA

credit: Ruta N

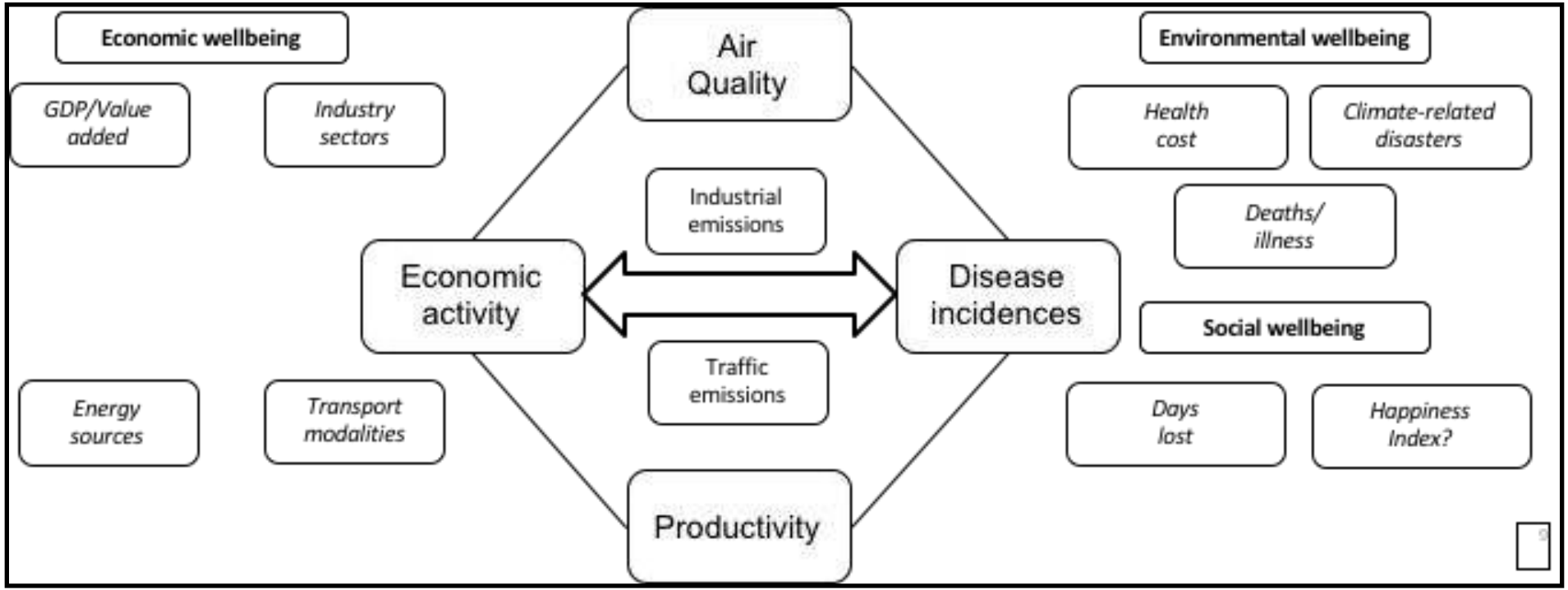


ISC-CODATA Documentation/Findings Taller 1 (English) from Medellin workshop 2018-08-15

File Edit View Insert Format Data Tools Add-ons Help Last edit was on 31 August

Rate of absorption of pollutants from urban trees?

Rate of absorption of pollutants from urban trees?	What datasets are available?	Who generates the data?	Who needs access to the data? For what purpose?	What datasets are necessary?	Who needs access to the data? For what purpose?
Rate of absorption of pollutants from urban trees?	* Urban Trees * Contaminants	AMVA			
Projection of pollutants from the city?	Contaminants monoxide and nitrogen dioxide, ozone (O3), PM 1, PM 2.5, PM10, sulfur dioxide (SO2)	AMVA	Transport, construction, health and education companies	Health	
Correlation between respiratory diseases (according to time of exposure to contaminants, location, travel...)	* Contaminants monoxide and nitrogen dioxide, ozone (O3), PM 1, PM 2.5, PM10, sulfur dioxide (SO2) * Destination origin survey * Travel information of waze (Medellin, Bello and Envigado) * Duration of waze trips * Zones with a higher concentration of pollutants	AMVA Medellin's town hall Municipalities Valle de Aburrá	Health service companies	Respiratory diseases (Registry of Ministry)	Sura (Insurance Company) EPS
What is the generation rate of pollutants due to congestion?	Mobile Sensores in Garbage Collection Vehicles (Gas)	AMVA SIATA Pilot Renting Colombia	Transport companies, vehicle rental and fuel		
How does the quality of the air impact the economic development of the City?	* No Jobs, Economic Development - GDP, taxes, budget execution * Data of cloudiness, air quality, temperature, winds, noise, river levels	Multiple public and private sources	RutaN, Sec de Desarrollo Economico	Impact Sale of Private Vehicles, how motorcycles No of Disabilities, Tourist Data, Cancelation of events, Sales of Motorcycles	
How do mobility measures influence commerce or business activity in	Effects of mobility measures (such as peak and plate) on air	AMVA Mobility secretary Waze	Chambers of Commerce	Microdata Mobility in real	


Economic wellbeing
GDP/Value added
Industry sectors
Energy sources
Transport modalities
Air Quality
Industrial emissions
Economic activity
Traffic emissions
Productivity
Disease incidences
Environmental wellbeing
Health cost
Climate-related disasters
Deaths/ illness
Social wellbeing
Days lost
Happiness Index?

Methodology *(overview)*

Phase 1: Understanding the Pilot

Step 1: What is the research topic?

Step 2: What are the core research questions?

Step 3: What data types are needed?

Step 4: What specific datasets are needed? What datasets are readily available?

Phase 2: Understanding the Data

Step 5: What are the access and usage characteristics of the datasets?

Step 6: What is the format, structure, definitions, and descriptions of the data? [steps 1-6 Medellin?]

Phase 3: Identifying Opportunities for Data Integration

Step 7: What are the opportunities and challenges in relation to interoperability and data integration?

Step 8: What are the data preparation / transformation functions required to make the data analysis ready?

Phase 4: Identifying Recommendations and Requirements

Step 9: Run intensive data interoperability workshop.

Step 10: Present and iterate outputs with the initiative and the discipline community.

Phase 5: Implementation of Data Integration Intelligence

Step 11: Planning step / meeting
Step 12: Improve stewardship and *FAIRness* of data
Step 13: Refine Semantics
Step 14: Implement "plinth"

Phase 6: Enhanced Research

Step 15: Conduct and publish analysis using the integrated datasets.

Phase 7: Distilling Generic Lessons for Data Integration and Enhanced Research

Step 16: Evaluate the research and action benefits of data integration using this model

Step 17: Draw general lessons for data integration programme

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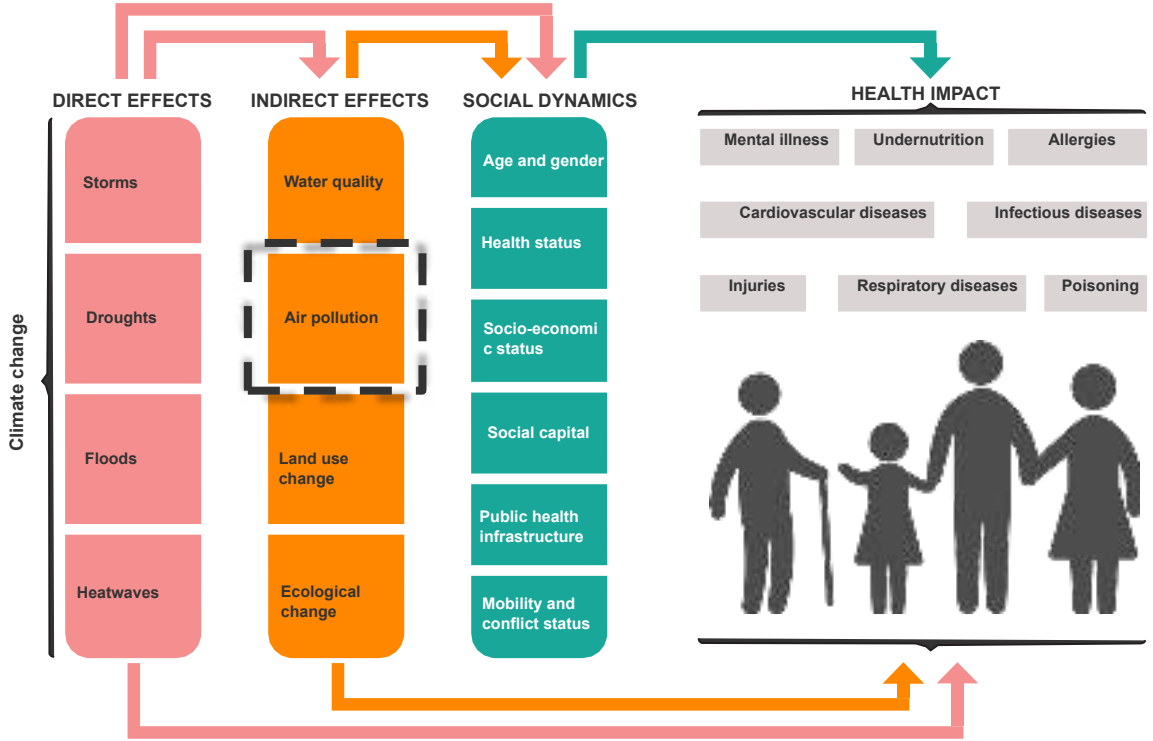
2018-08-18

CODATA pilot project for resilient cities

Medellin case study

Action plan

1. Define topic.
2. Define scope. *(what questions are asked of the data and who needs to access the data, for what purpose)*
3. Identify what data sets are required, and what datasets are available (pm2.5).
4. Identify key areas of interoperability of data between disciplines *(air quality, demographics, economics, land use, health, green space, GHG emitters/traffic and transport).*
5. What are the data functions required. *(e.g., machine learning, extraction of data from pdf documents)*
6. Collect data and build integrated data tools & analyses.
7. Conduct intensive data lab at Dagstuhl workshops (1-5 October) – metadata workshop.
8. Present initial results to Medellin and ISC CODATA groups.



The direct and indirect effects of climate change on health and wellbeing

There are complex interactions between both causes and effects. Ecological processes, such as impacts on biodiversity and changes in disease vectors, and social dynamics, can amplify these risks. Social responses also ameliorate some risks through adaptive actions.

adapted from The Lancet – for illustrative purposes only

Facilitators

- **Andrew Simmons -** Director of Research, Resilience Brokers, London
- **Simon Hodson -** Executive Director of CODATA, International Science Council, Paris [pp. 3-22]

Panelists

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- **Chris van Diemen -** Co-Founder & Chief Data Officer, Green City Watch, Amsterdam [pp.57-83]

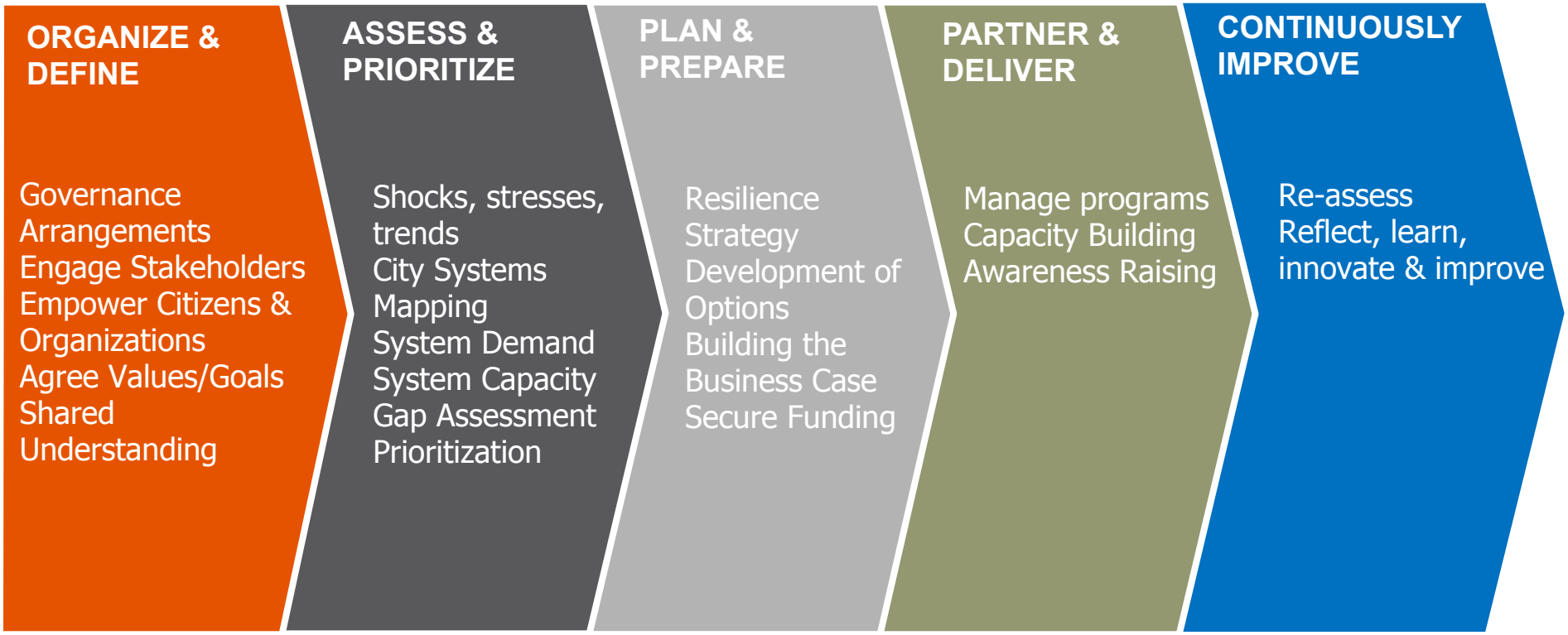
FAIR data for City Resilience: British Standard for City Resilience

Caroline Field

Committee Chair BS 67000

Associate Director, Arup

BS 67000 Resilience Framework.

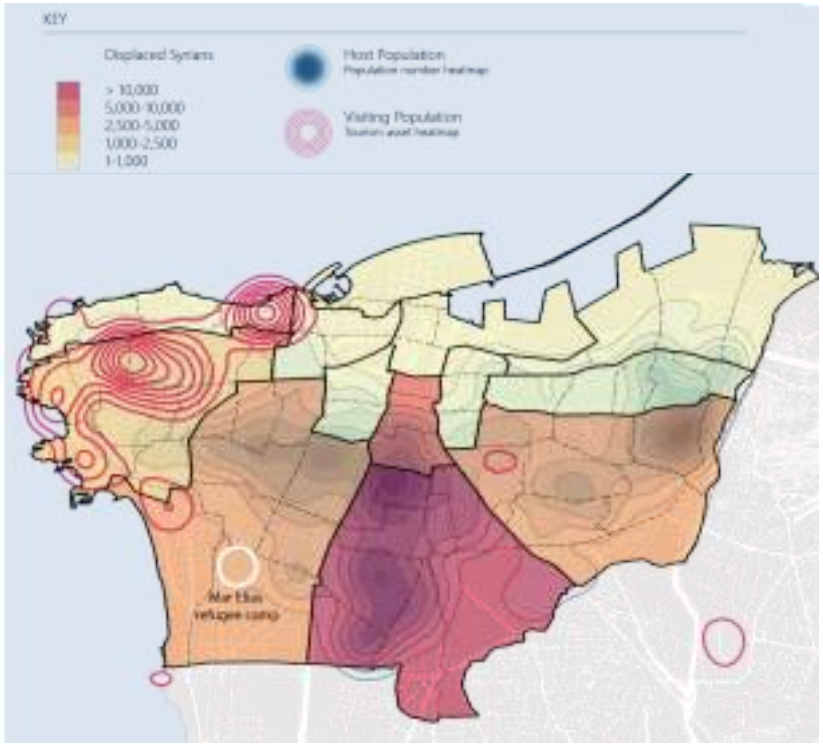


Organize & Define: Data Collection

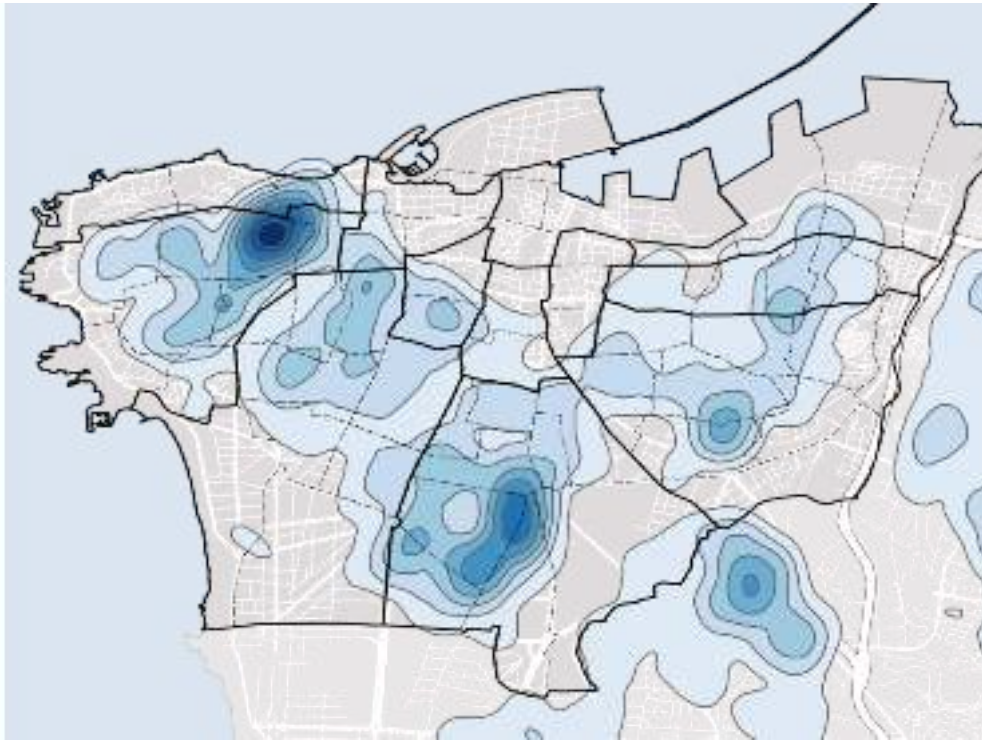
Infrastructure-related data
Demographic data
Socio-economic data
Employment statistics
Environment-related data
Community/neighbourhood related data
Housing
Disaster risk data
Disaster loss data

Assess & Prioritize (Diagnostics)

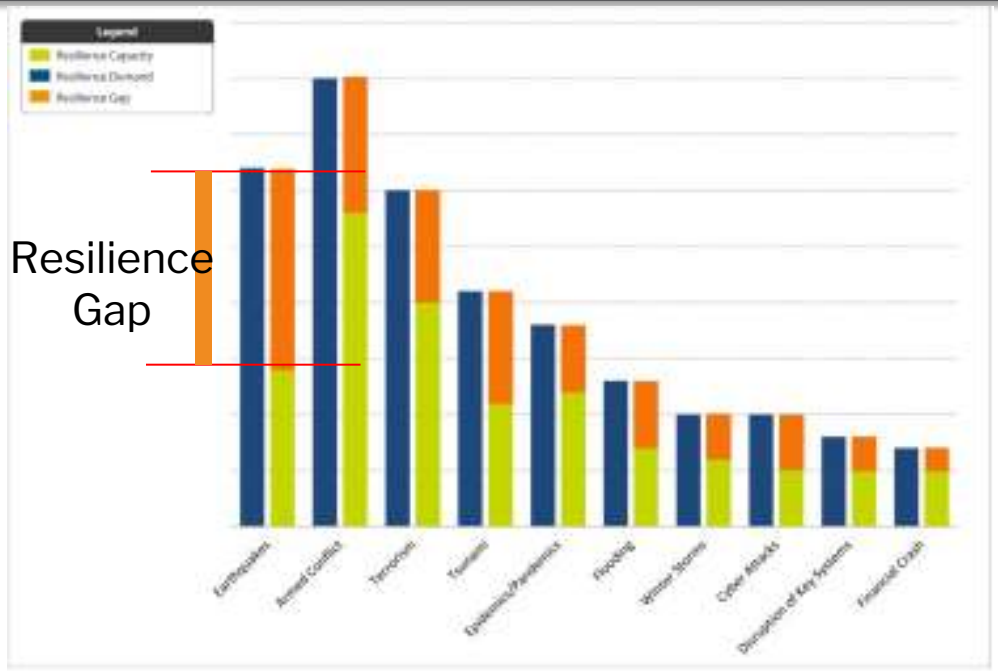
Population

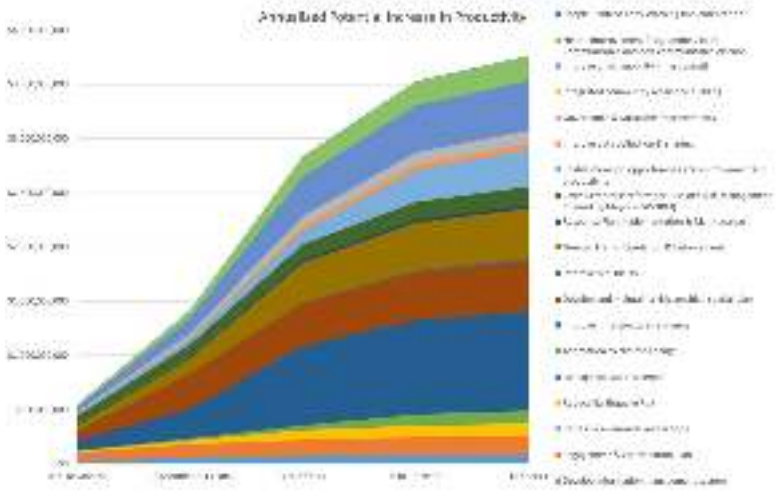


Health Value Chain



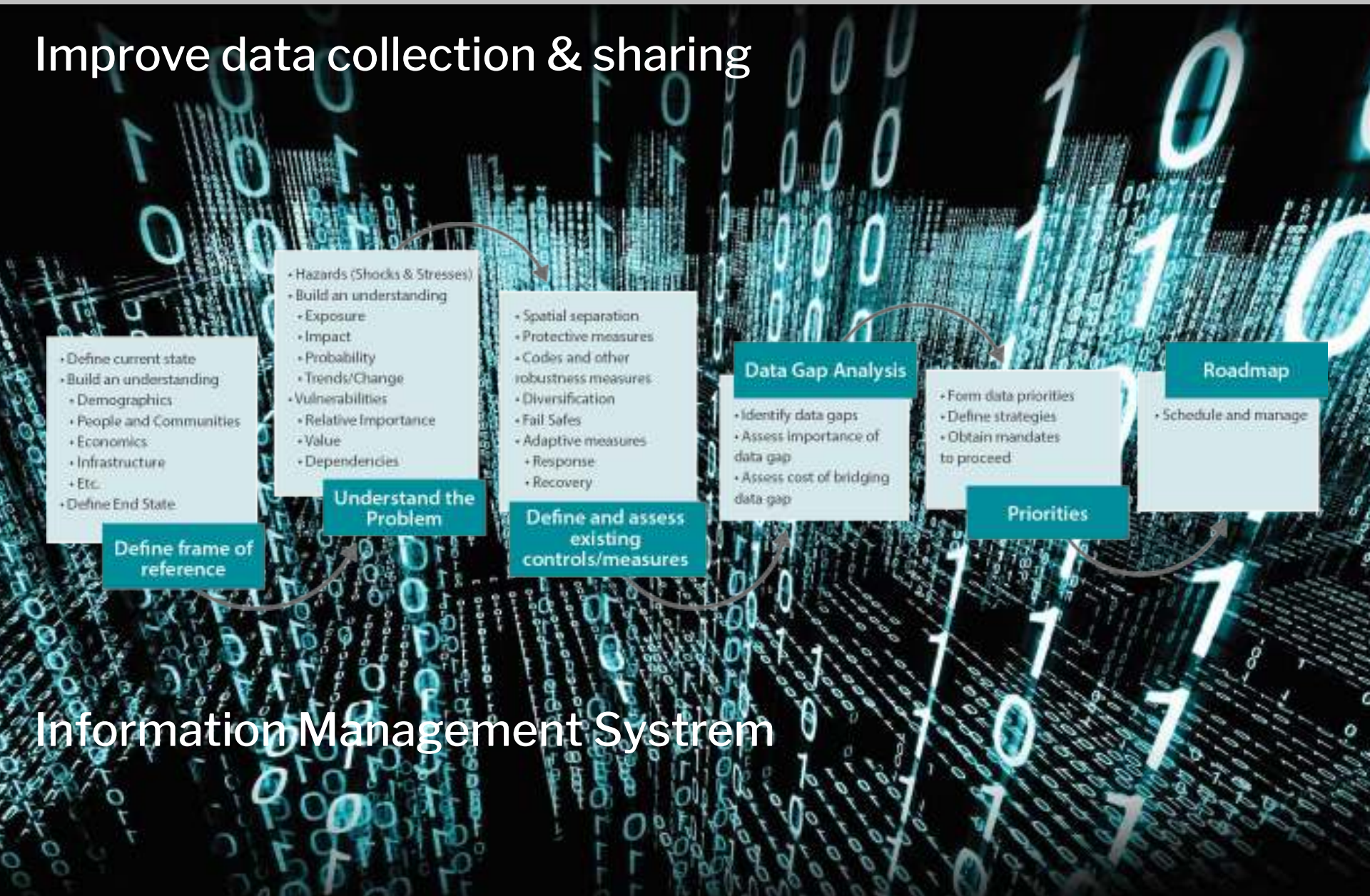
Evidence-based decision making





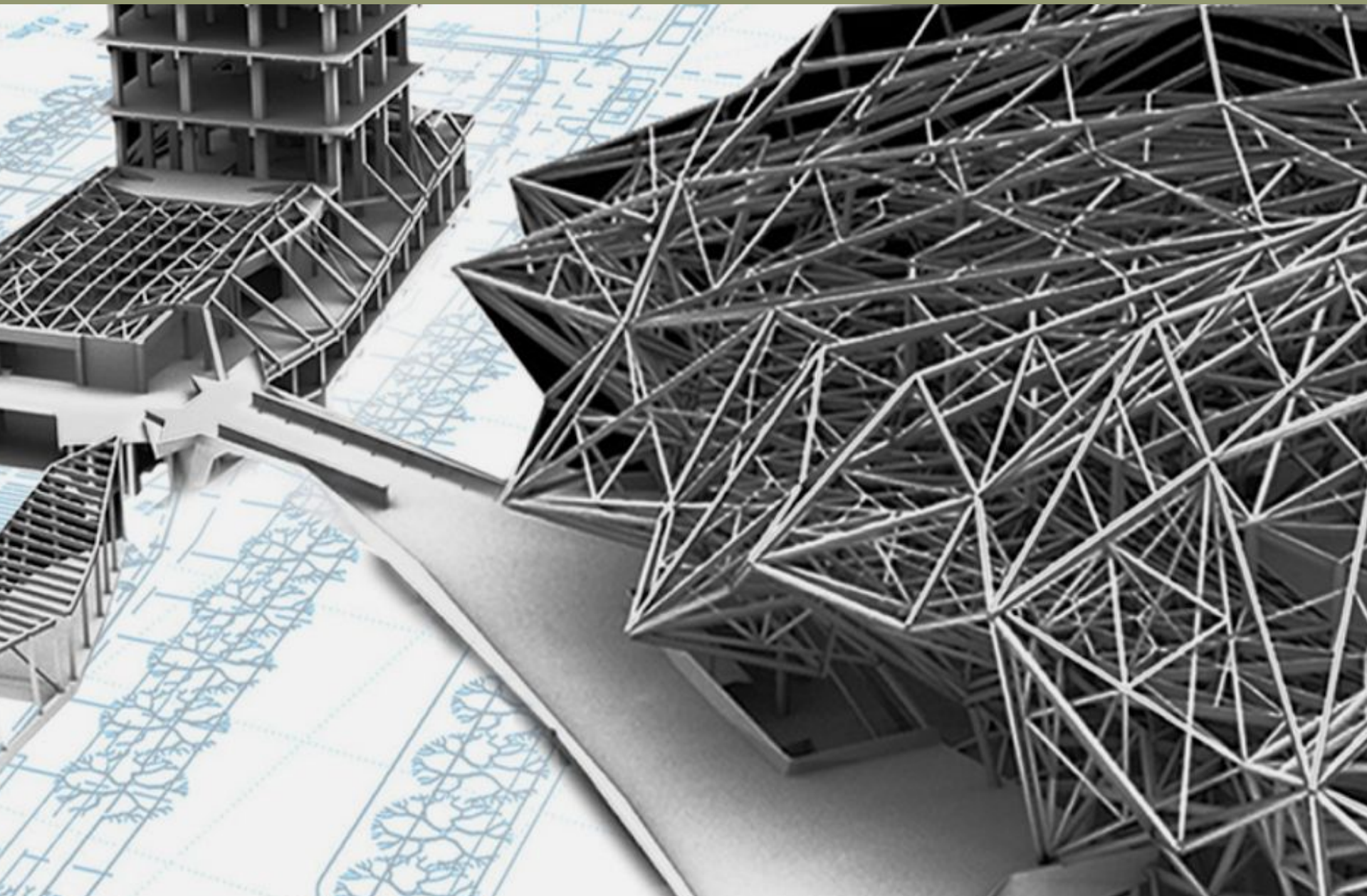
Plan & Prepare: Strategies

Improve data collection & sharing



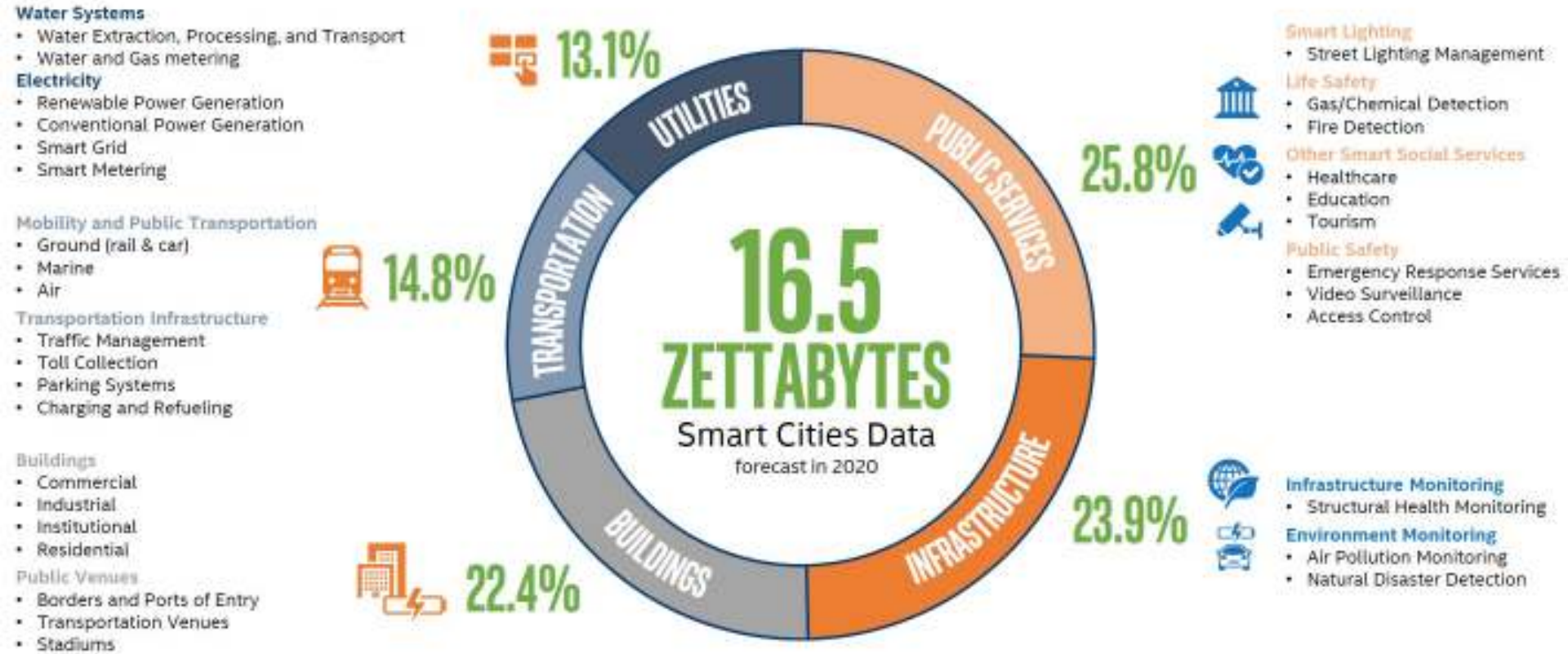
Information Management Systrem

Partner & Deliver



Continuously Improve: Situational Awareness

IOT is Ramping Up: Cities Are Generating More Data



Data/Tech Hot Topics…

Open Data Platform

Traffic Management

Energy Generation

Environment Monitoring

Top Sensor Data and Fusion Applications

Video Surveillance

Smart Parking

Waste Management

Top Blockchain Applications

Energy Distribution

Distribution & Supply Chain

Healthcare & Patient Records

Top Artificial Intelligence & Machine Learning Applications

Video Surveillance

Traffic Optimization

Resource Optimization

Top 5G Network Applications

Smart Grid Management

Fixed Wireless Access

Automated Transportation System

Top Smart City Security Applications

Emergency Response Services

Video Surveillance Systems

Traffic Management Systems

Top Edge Computing Applications

Transportation Management & AVs

Smart Grid Optimization & Demand Side Response

Security & Surveillance

Top Applications Impacted by Privacy Concerns

Video Surveillance

Energy Consumption

Security & Access Control


ARUP
Caroline.Field@arup.com

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City Overview

Delivering Resilience in Milan

Identified Challenges and Opportunities

Workshop Details

CiBiX

Resilient Cities

credit: ICLEI 2019
https://resilientcities2019.iclei.org/wp-content/uploads/RC2019-CiBiX-City-Profile-Milan.pdf

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link to World Bank's City Planning Lab (CPL) initiative:

- https://c4dcommunities.worldbank.org/content/sites/collaboration-for-development/en/groups/city-planning-labs.html

link to CPL's Municipal Spatial Data Infrastructure (MSDI):

- https://collaboration.worldbank.org/content/usergenerated/asi/cloud/attachments/sites/collaboration-for-development/en/groups/city-planning-labs/file2/jcr:content/content/primary/library/cpl_overview_flags-fSQk/municipal_spatialda-uj1U/Municipal%20Spatial%20Data%20Infrastructure_CPL%20Flagship%20Product.pdf

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GREEN
CITY
WATCH
ICLEI: Session B4
Joining forces!
Chris van Diemen
26 June 2019
GREEN
CITY
WATCH

“you don't know about real loss because it only occurs when you love something more than you love yourself”

Robin williams, Good Will Hunting (1997)

GREEN CITY WATCH

Overview

Intro

- Who are we?
- What drives us?

Work

- How do we do it?
- Example: Indonesia

Wrap up.

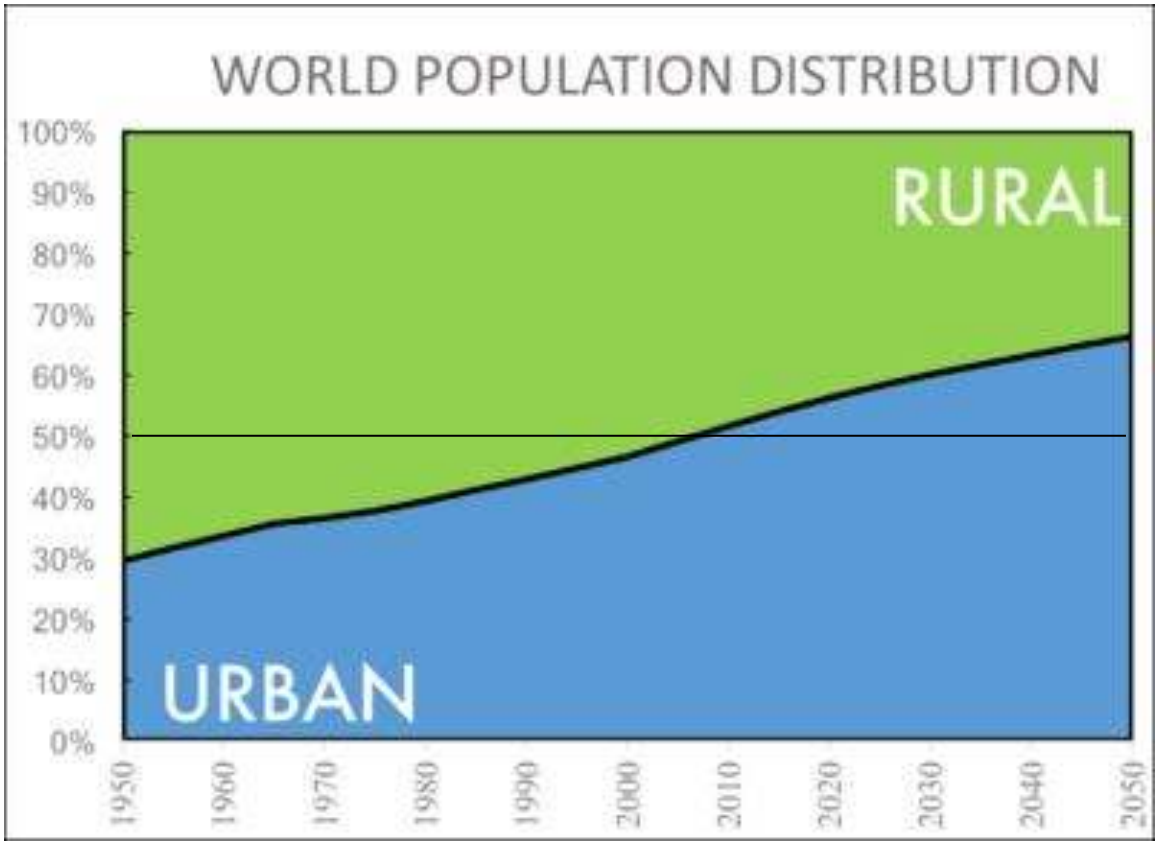
Time: ~7 minutes

The beginning

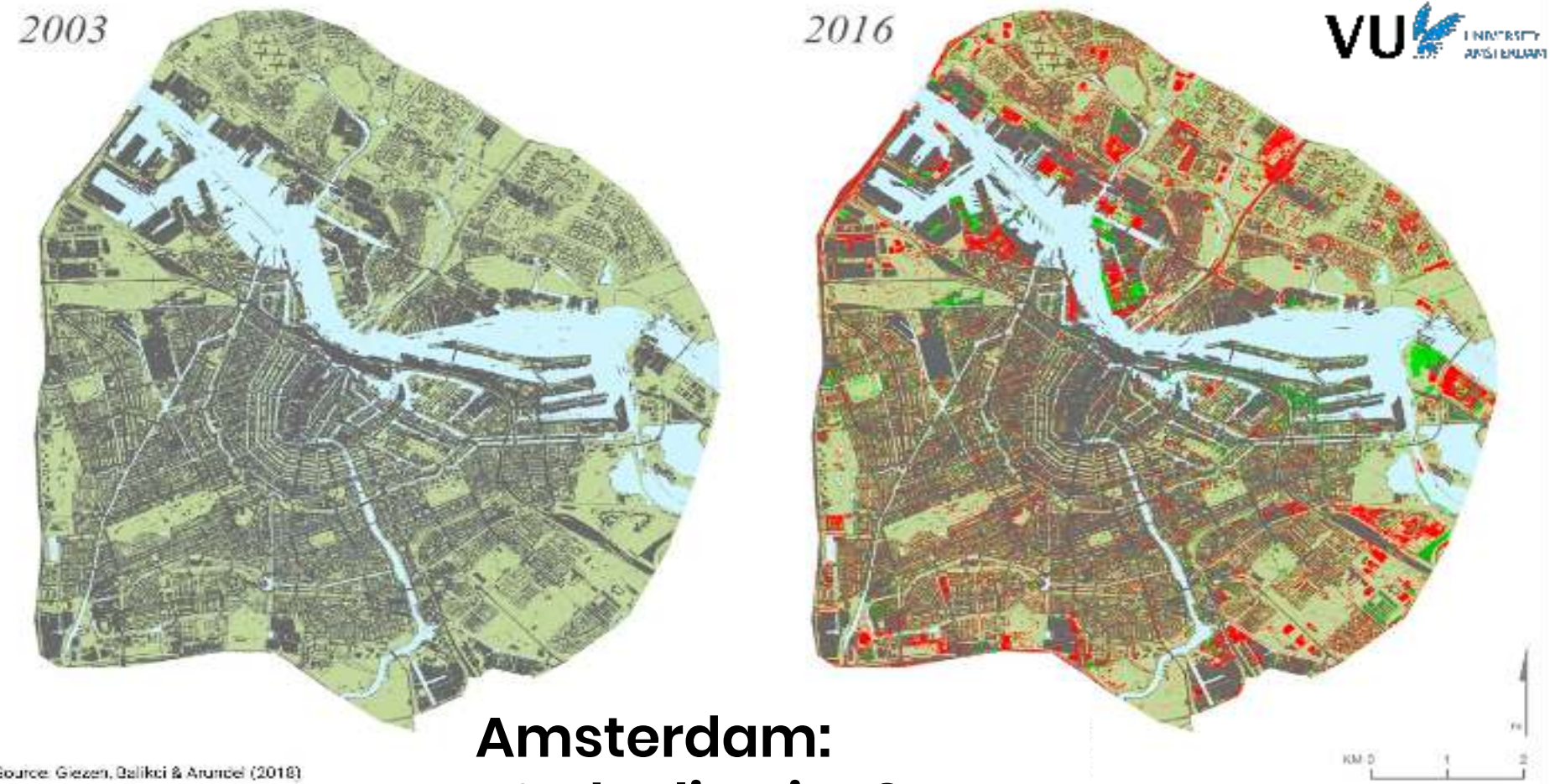
GREEN CITY WATCH

Every week **3 million people** move to the city.

(UN, 2015)



GREEN CITY WATCH



Source: Giezen, Balikci & Arundel (2018)

Amsterdam:
<u>11% decline</u> in 13 years

Mission

To revolutionize the way we value nature, bring transparency to local government, and regenerate our cities.

GREEN CITY WATCH

The team!

Nadine Galle

URBAN ECOLOGICAL ENGINEERING

Jim Groot

REMOTE SENSING & GEOMATICS

Anjelika Romeo-Hall

SUSTAINABLE DEVELOPMENT GOALS

Florence van der Hoven

MACHINE LEARNING AND SENSORS

Chris van Diemen

DATA

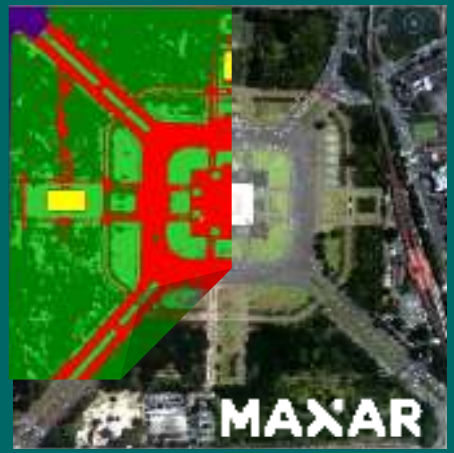
GREEN CITY WATCH

How?

GREEN CITY WATCH

From **Local Knowledge** to a **Global Standard**

GREEN CITY WATCH



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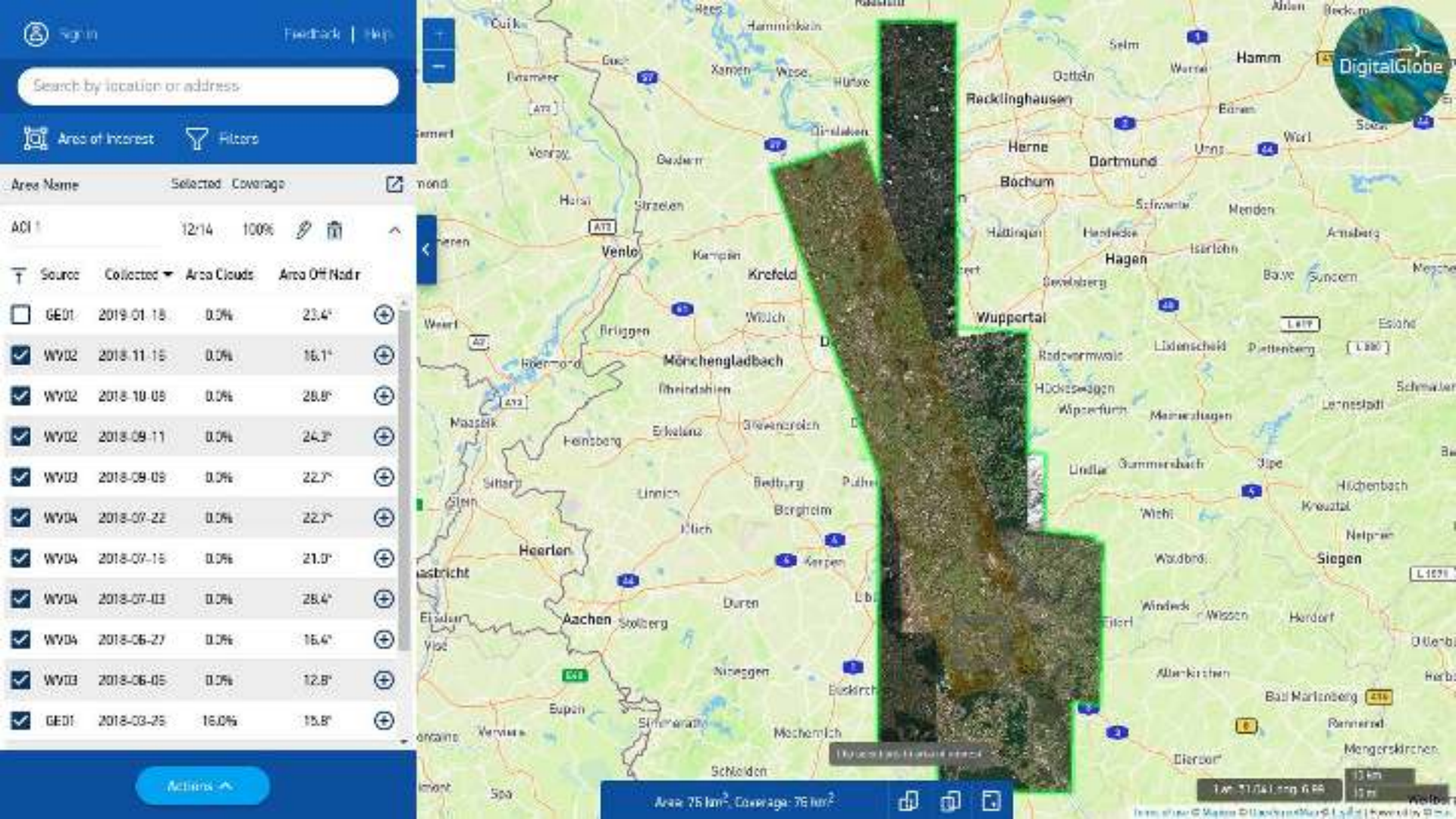
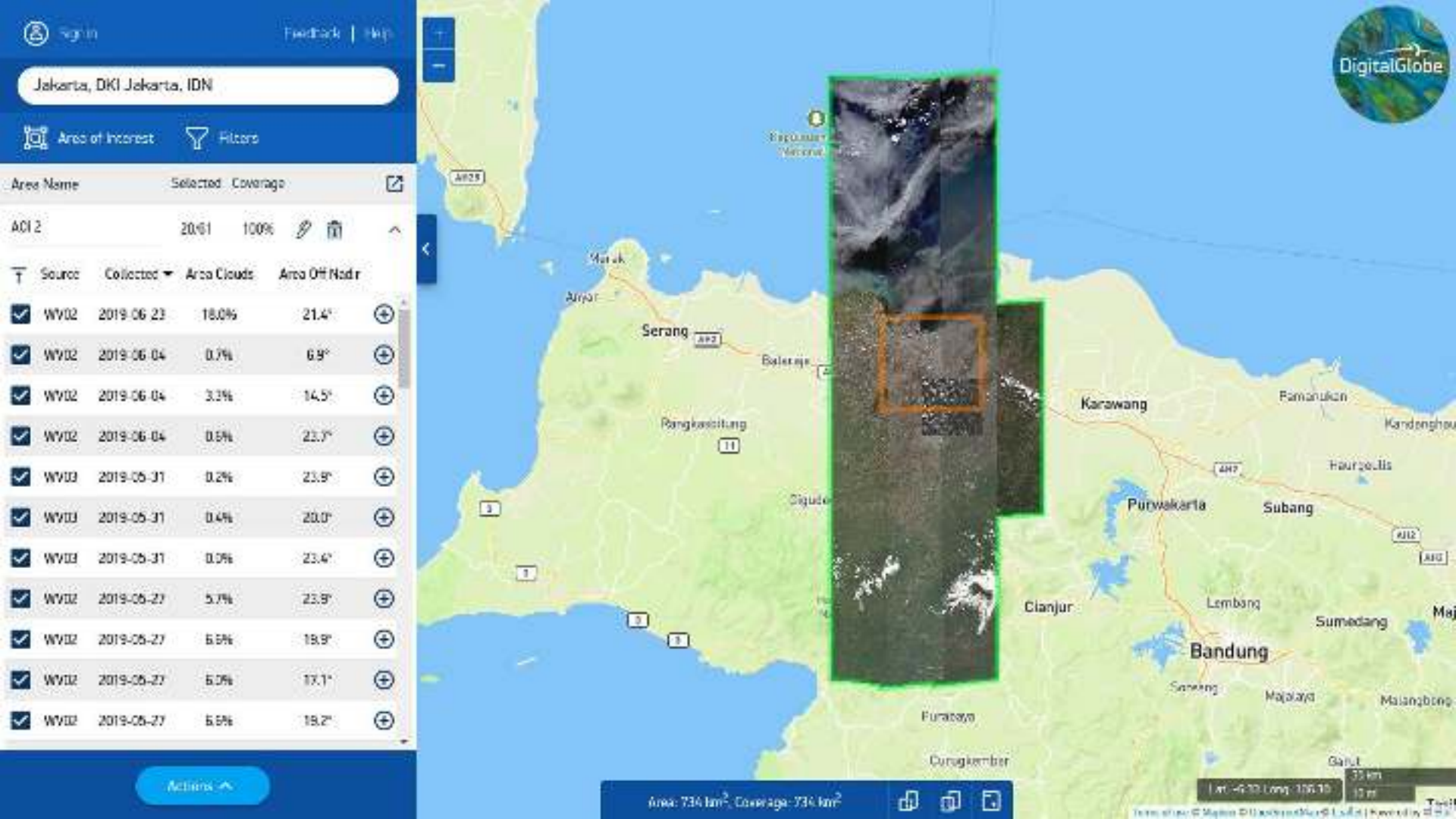
High resolution
Satellite imagery

Green City Watch
Indicators

The right
solution
in the right
location

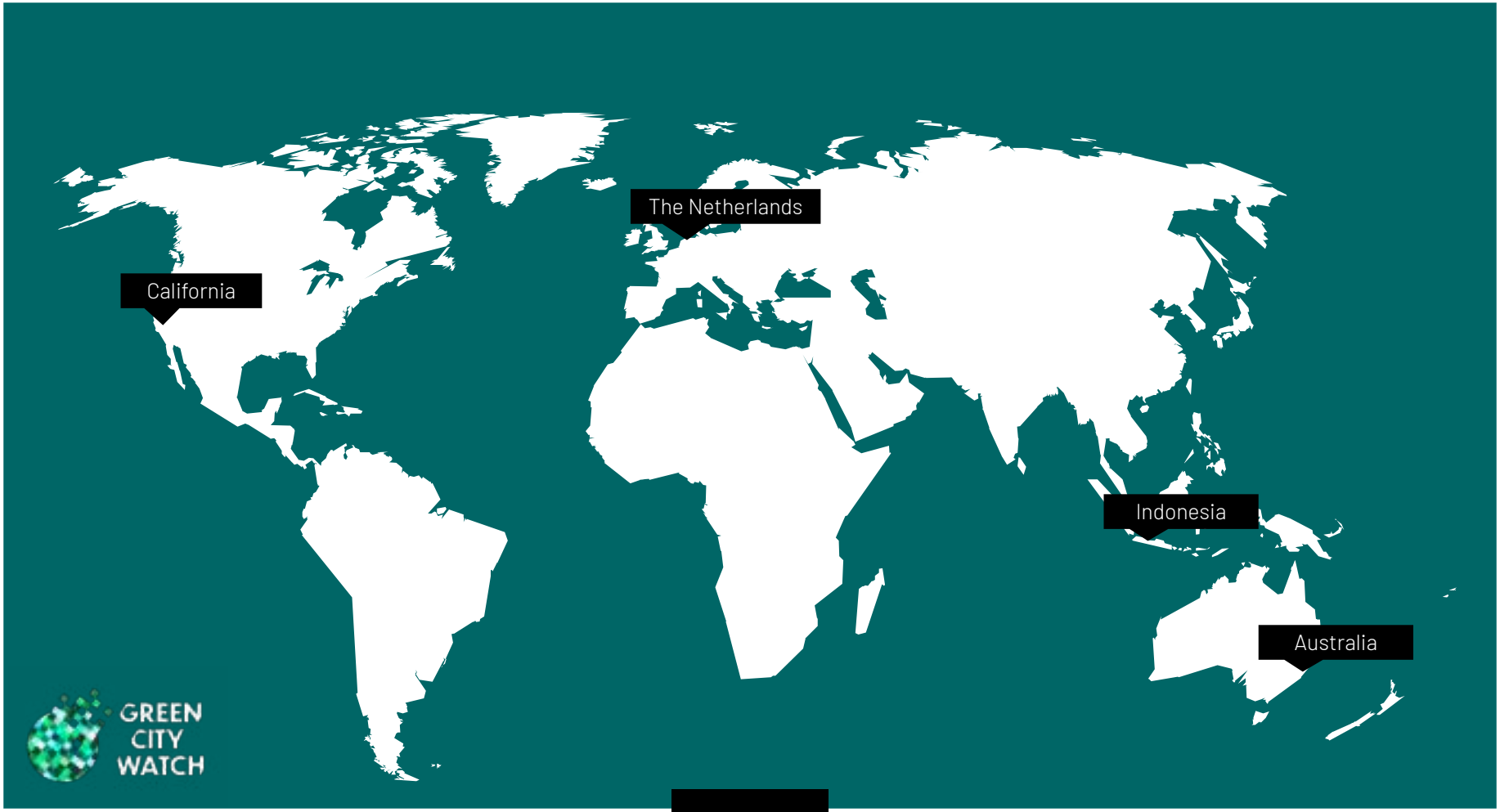
GREEN CITY WATCH


Sign In
Feedback | Help
Search by location or address
Area of Interest
Filters
Area Name
Selected Coverage
AOI 1
12/14
100%
Source
Collected
Area Clouds
Area Off Nadir
GE01 2019-01-15 0.0% 23.4°
WV02 2018-11-15 0.0% 16.1°
WV02 2018-10-08 0.0% 28.8°
WV02 2018-09-11 0.0% 24.3°
WV03 2018-09-09 0.0% 22.7°
WV04 2018-07-22 0.0% 22.7°
WV04 2018-07-15 0.0% 21.0°
WV04 2018-07-03 0.0% 28.4°
WV04 2018-06-27 0.0% 16.4°
WV03 2018-06-05 0.0% 12.8°
GE01 2018-03-25 16.0% 15.8°
Actions
Area: 76 km², Coverage: 76 km²
DigitalGlobe
Venlo
Krefeld
Mönchengladbach
Wuppertal
Hagen
Dortmund
Bochum
Herne
Recklinghausen
Hamm
Heerlen
Aachen
Siegen


Sign In
Feedback | Help
Jakarta, DKI Jakarta, IDN
Area of Interest
Filters
Area Name
Selected Coverage
AOI 2
20.61
100%
Source
Collected
Area Clouds
Area Off Nadir
WV02 2019-06-23 18.0% 21.4°
WV02 2019-06-04 0.7% 6.9°
WV02 2019-06-04 3.3% 14.5°
WV02 2019-06-04 0.5% 23.7°
WV03 2019-05-31 0.2% 23.9°
WV03 2019-05-31 0.4% 20.0°
WV03 2019-05-31 0.0% 23.4°
WV02 2019-05-27 5.7% 23.9°
WV02 2019-05-27 6.5% 19.9°
WV02 2019-05-27 6.0% 17.1°
WV02 2019-05-27 6.5% 19.2°
Actions
Area: 734 km², Coverage: 734 km²
DigitalGlobe
Serang
Rangkasbitung
Karawang
Purwakarta
Subang
Cianjur
Bandung
Sumedang
Lembang
Purbaya
Cirebon
Garut
Majalaya
Pamanukan

Use
Open Source Technology
Invest in
Client Engagement

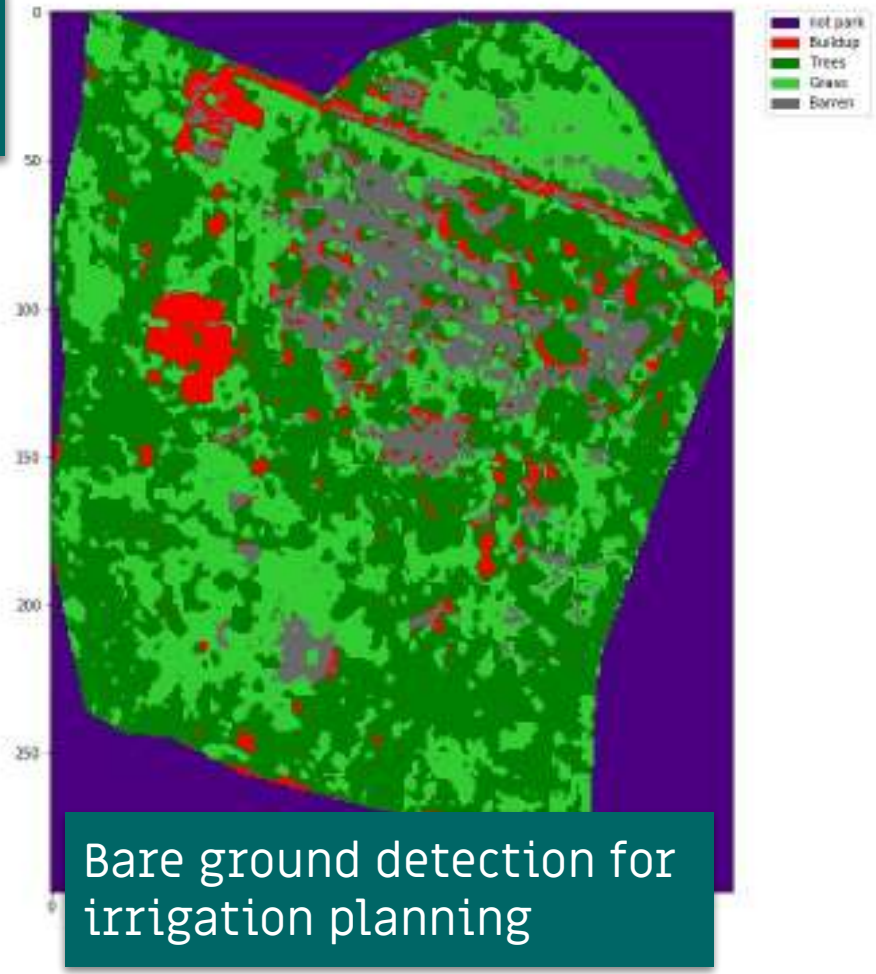
GREEN CITY WATCH


The Netherlands
California
Indonesia
Australia
GREEN
CITY
WATCH

Example: **Indonesia**

GREEN CITY WATCH

JAKARTA, INDONESIA



Bare ground detection for irrigation planning

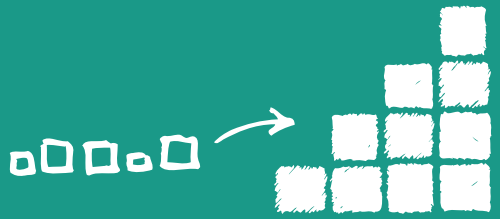

JAKARTA, INDONESIA
Press F11 to exit full screen
Jakarta
kepler.gl
Bare ground detection for irrigation planning
GREEN CITY WATCH

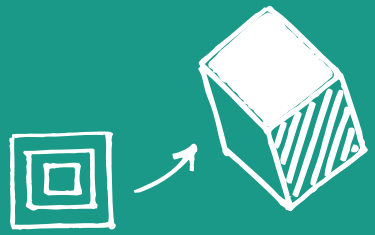
GREEN CITY WATCH

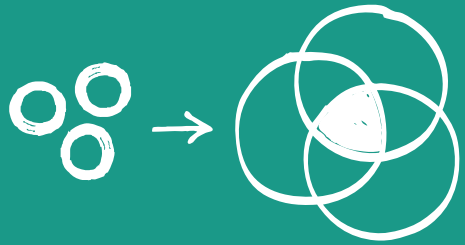
+

DT4D

DISRUPTIVE TECHNOLOGIES FOR DEVELOPMENT







Build

Boost

Broker

Source:
IMF & WB report: Disruptive Technologies and the World Bank Group – Creating Opportunities - Mitigating Risks
September 18, 2018

WORLD BANK

python

aws

kepler.gl

git

Technology Solution

Data Input

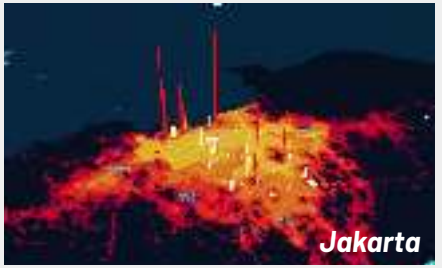
±30 cm resolution 8-band WorldView-3 satellite imagery with global coverage OpenStreetMap data, Drone imagery

Algorithms & Compute

Tech: *AI using Python & Docker on GBDX & AWS cloud platforms, open source, open access*

Visualizations

Tech: *Open-source visualizations with R shiny & Javascript nodejs/kepler.gl*



Implementation Activities

Kickoff

- **Indicator Brainstorm**
- **Study**
- **Indicator Prioritization**

Aug 2019

Development & Operation (feedback loop)

- **Modelling**
- **Evaluation**
- **Data understanding**
- **User feedback**

Rapid Iterative Prototyping
2-4 week cycles
(i.e. CRISP-DM)

Jan 2020

Dissemination

- **Final product**
- **Launch**

May 2020

WORLD BANK

Spreading the word

GREEN CITY WATCH


TEDx
ParcDuCinquanten

NOW: **Local Governments for Sustainability!**

Let's work together :D

Chris van Diemen. . . . . chris@greencitywatch.com

GREEN CITY WATCH


MAXAR
“Feel that right there? You are in the middle of the world man”
Mahershala Ali,
Moonlight (2016)
GREEN CITY WATCH
Chris van Diemen. . . . . chris@greencitywatch.com

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