Speed presentations

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European Commission

Sustainable Urbanisation Global Initiative (SUGI)
FOOD-WATER-ENERGY NEXUS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730254

Urban Agriculture – Food production in cities

City Food
M-NEX
METABOLIC

FEW-meter
Urbanising in Place
Vertical Green 2.0

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CITYFOOD

Project pitch London 2018

CITYFOOD

- Smart integrated multitrophic city food production systems – a water and energy saving approach for global urbanisation

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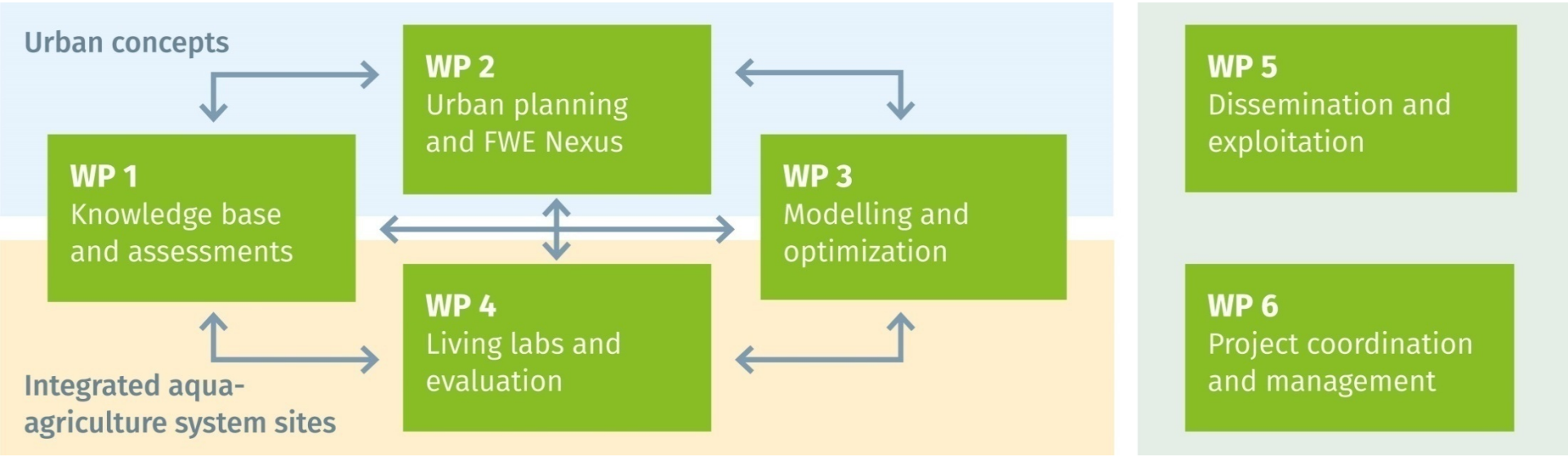
CITYFOOD

Project pitch London 2018



- **Food**
  fish & plants, protein shift
- **Water**
  reuse, waste reduction
- **Energy**
  saving, urban ressources

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FEW the Food Energy Water meter

AIM: to develop a methodology to measure the FEW nexus in Urban Agriculture, using urban metabolism (material flow analysis)

and a co-creation process that involves a wide range of stakeholders.

UNIVERSITIES

Adam Mickievicsz University - PL

Poznan University of Life Sciences - PL

Portsmouth School of Architecture - UK

City University of New York - US

University of Michigan - US

MUNICIPALITIES

City of Gorzów Wielkopolski - PL

City of Nantes - F

INDUSTRY

LEAP micro AD ltd - UK

R. CENTRES

AgroParisTech - F

IRSTV – CNRS - F

ILS - D

ASSOCIATIONS

Landesverband Westfalen und Lippe der Kleingärtner - D

Federation of City Farms and Community Gardens - UK

Polski Związek Działkowców - PL

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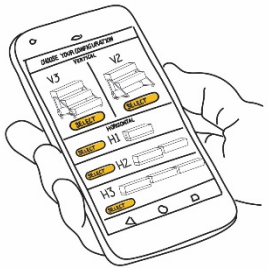
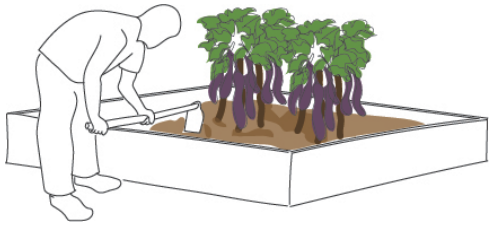
OBJECTIVES

to develop and co-create the FEW-meter methodology



to form an on-line community of urban farmers to gather data



to gather and analyse data from case studies

to develop scenarios of optimal use of urban resources, using material flow analysis.

to develop two experiments : soil remediation and use of anaerobic *digestion*

The Moveable Nexus: Design-led urban food, water and energy management innovation in new boundary conditions

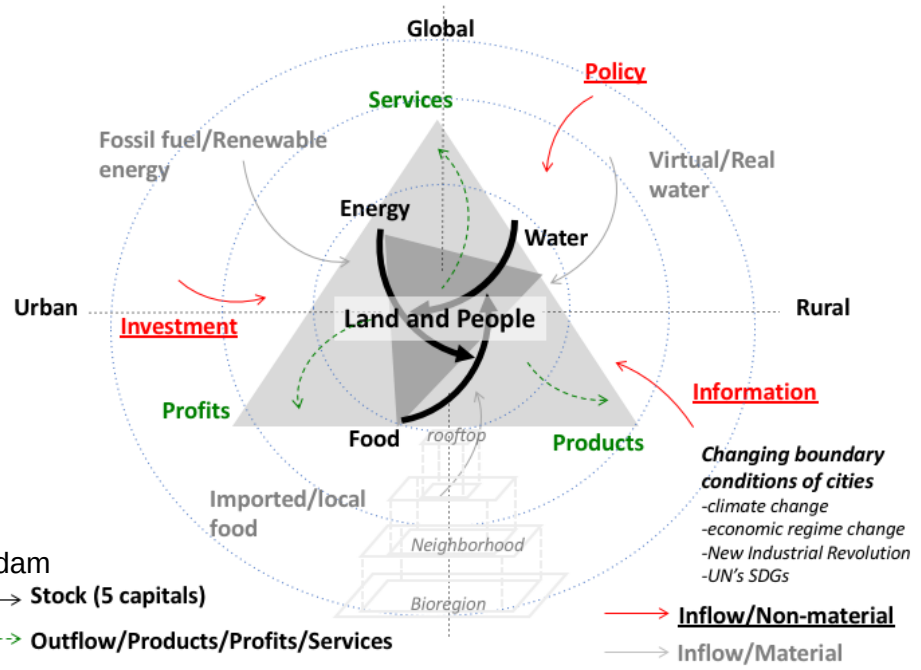
M-NEX is a design-research based effort that aims to deliver greater access to Food-Energy-Water (FEW) system assessment tools to prototype and iterate a FEW-driven design process and platform across multiple scales and contexts. As such, M-NEX is explicitly an Innovation and Implementation project.

Three objectives and targets	Design-led research approach
To implement existing FEW research in cities through the design practice.	Each partner works at local living lab on innovative solutions of FEW management.
To aggregate existing FEW tools into one analytical decision-support tool.	International workshop every 6 months at one of the six study regions.
To use existing knowledge and aggregated tool in a series of design workshops at six living labs.	Evolutionary gowth of design methods, evaluation tools and engagement mechanism for the M-NEX platform.

Incremental Growth of M-Nex

- Belfast
- Doha
- Detroit
- Sydney
- Tokyo
- Amsterdam

Common concepts: FEW as Quality of Life for Sustainability



Partners: UK-Prof Greg Keeffe, Kevin Logan; Qatar-A.Prof Anna Grichting, Maryam Alfaraidy; USA-A.Prof Geoff Thun, Dr. Ming Xu; JP-Prof Wanglin Yan, Prof Rajib Shaw, Dr. Bijon Kumar; Netherlands-Prof Andy van den Dobbelsteen, Nick ten Caat; Collaborator: AU-Prof Rob Roggema

Work Packages, Milestones and Deliverables

M-Nex will develop three research platforms: a design platform, an evaluation platform and a participation platform through participatory workshops in a row. Each platform will assemble, structure and synthesize existing knowledge, tools, data, innovation practices, co-design methods, implementation models and case studies of systemic and applied solutions across the FEW-nexus.

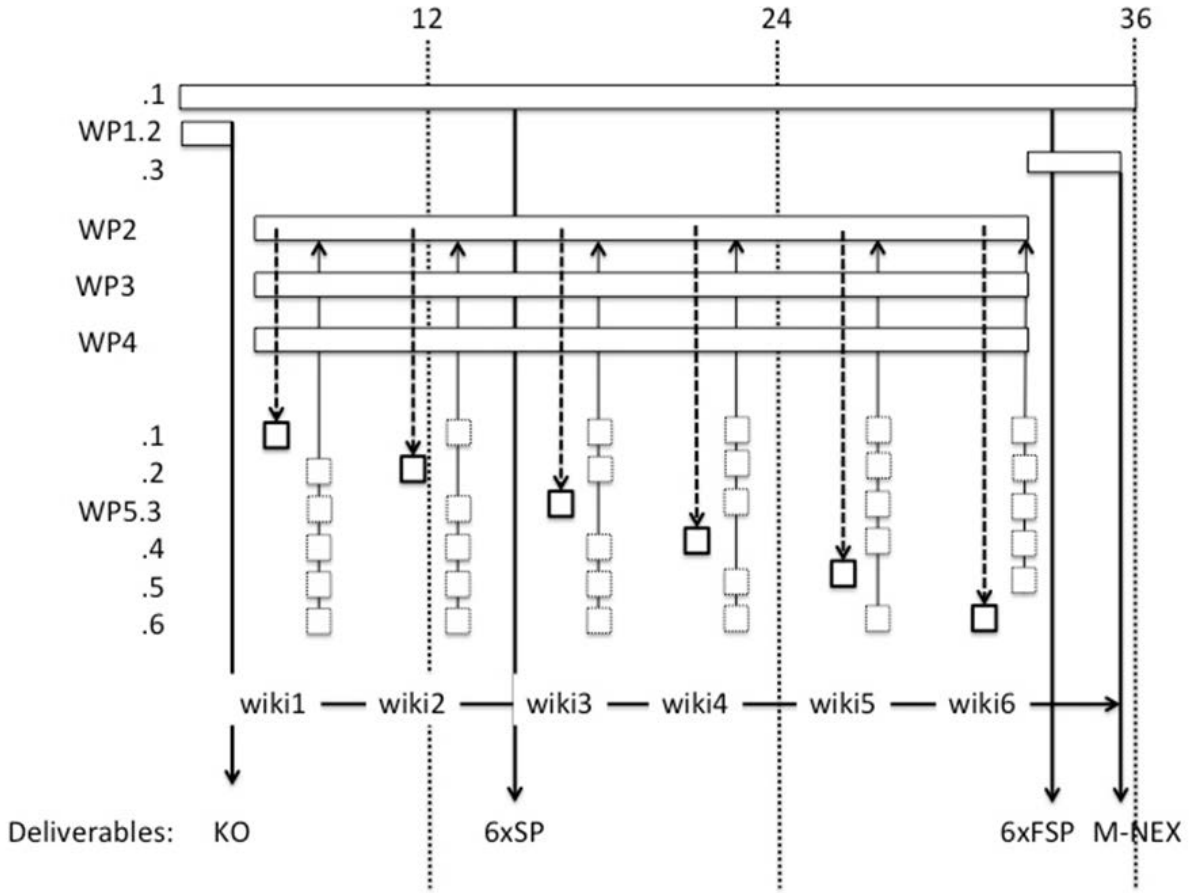
WP.1	Project management
WP.2	Design Platform
WP.3	Evaluation Platform
WP.4	Participation Platform
WP.5	Living Labs
WP5.1	Belfast, UK
WP5.2	Doha, Qatar
WP5.3	Detroit, USA
WP5.4	Sydney, Australia
WP5.5	Tokyo, Japan
WP5.6	Amsterdam, Netherlands

Note:

KO：Kick-off;

SP: Strategic Plan; FSP: Final Strategy Plan;

wiki1～6: incremental M-Nex platform by wiki-like ICT tools.



M-Nex Kick-off Meeting in Sydney, 2018/05/16-18

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URBANISING IN PLACE

Building the Food-Water-Energy nexus from below

Michiel Dehaene (Ghent University)
Chiara Tornaghi (Coventry University)

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Partners

Ghent University
Coventry University
University of Sheffield
Quantum Waste
Shared Assets
Wageningen University
Sampling Riga
Art Academy of Latvia
Architecture Workroom Brussels,
National University of Rosario
URBEM Sao Paolo.

<u>Casestudies in</u>
Riga, Latvia
Brussels, Belgium
London, United Kingdom
Rosario, Argentina

From the FOOD DIS-ABLING CITY to the FOOD ENABLING CITY

Urbanisation tend to marginalise the role of farmers and food producing communities in managing the food-water-energy (F-W-E) nexus: nutrient cycles, energy conservation, water harvest, soil management and food production happen under residual conditions.

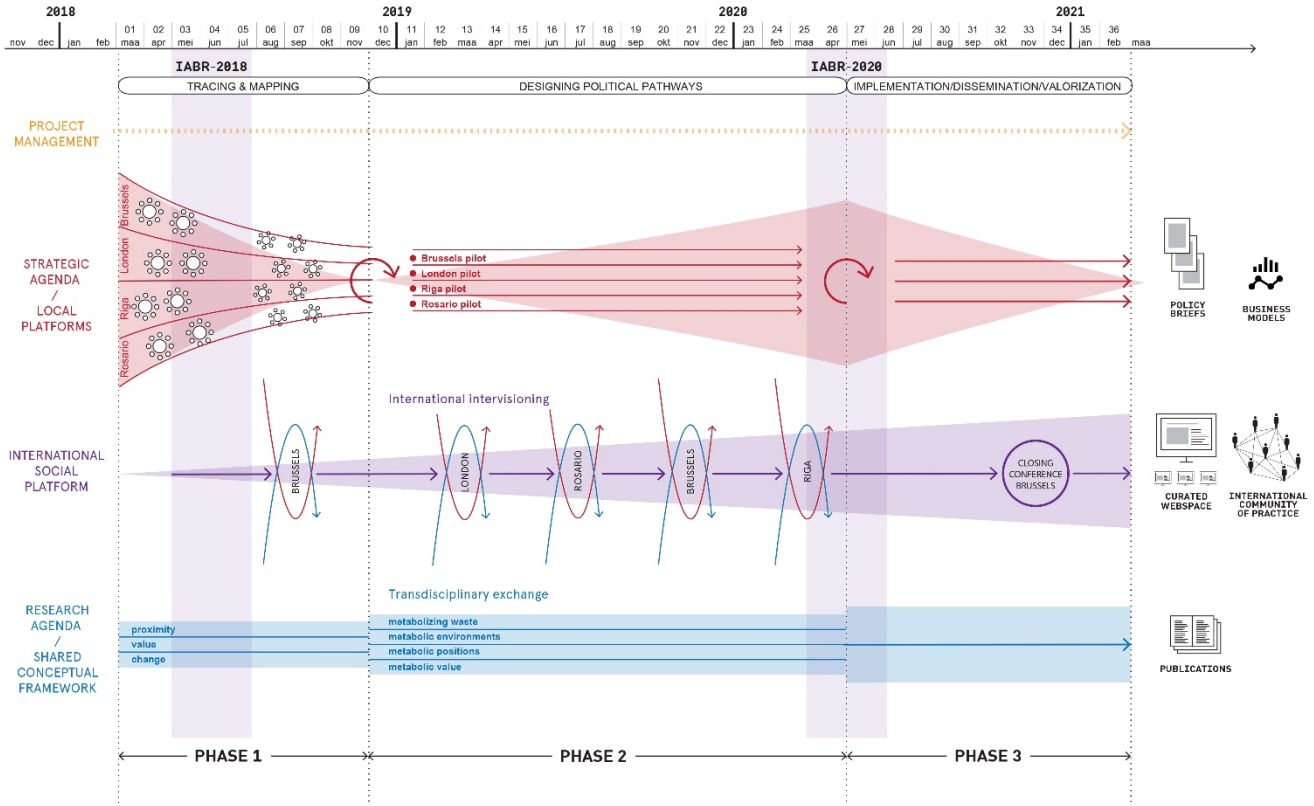
This project will explore how these practices on the metropolitan fringe may be reconfigured within what we call ‘agroecological urbanism’: a model of urbanisation which places food, urban metabolic cycles and an ethics of land stewardship, equality and solidarity at its core.

Aim/objectives

The project will identify ways of transforming urbanization to reintegrate food growing within urban metabolisms, by working on four areas:

- Metabolizing waste streams
- Claiming metabolic positions
- Enabling alternative, localized metabolic ecologies.
- Capturing Metabolic Value

(Urban) Social platform: is the 'brewing pot' where 'communities of practice' and the 'scientific communities' engage with co-creation and transdisciplinary work.



Expected results and impacts

- Atlas: identifying emerging and residualised metabolic practices
- Modelling urban resourcefulness: proximity, value, change
- Curated online space
- Incubator for an Agroecological Urbanism

Metabolic

Green Urban Centers of Tomorrow

- **Food, Water and Energy (FWE):**
  Essential nutrients of growing urban centers, as a complex supply-chain network, to sustain vibrant operation & healthy urban metabolism

- **Objectives:** To investigate urban metabolism from FWE Nexus aspect
  - Incorporate advanced tools/models into scientific collaboration framework
  - Propose governance strategies
  - Develop an international FWE Nexus capacity building system

- **Potential Solutions:**

- **Methods:**
  Identify critical FWE factors & delivery pathways to urban centers via AI, datamining, system dynamics, LCA, agro-logistics and scenario analysis

- **Expected Results & Impacts:**
  - Develop optimal reallocation schemes, management strategies and solutions at FWE Nexus level
  - Propose virtual resource center for transdisciplinary training to share

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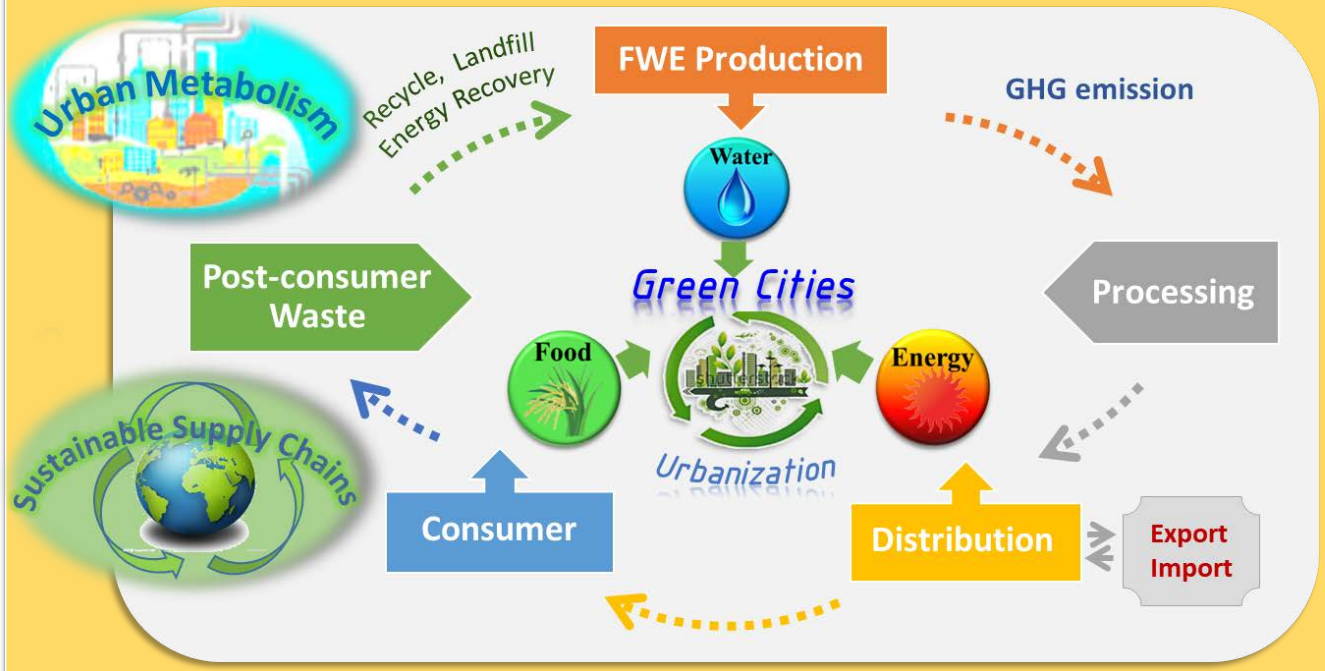
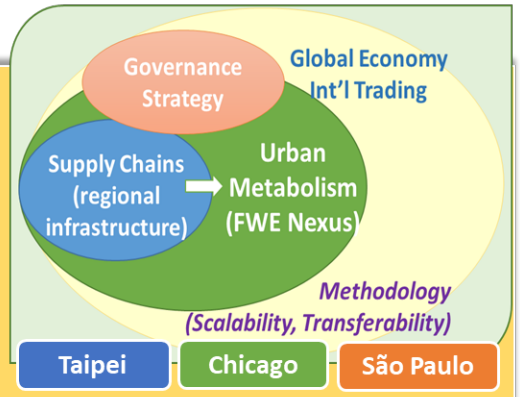
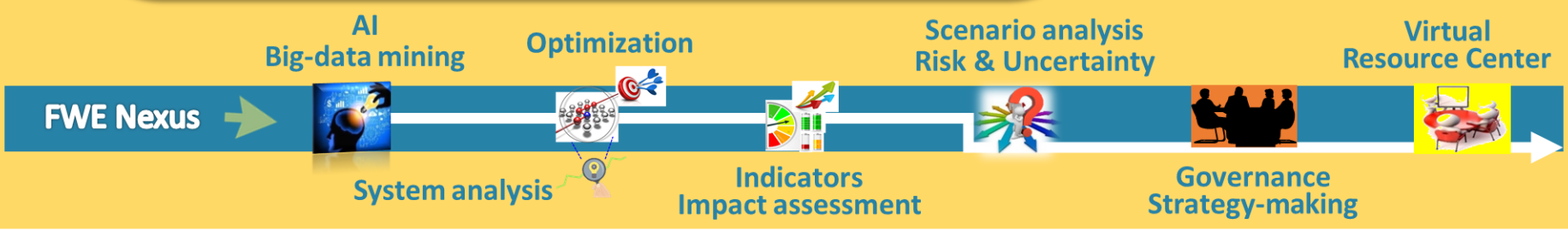
Metabolic

Intelligent Urban Metabolic Systems for Green Cities of Tomorrow





- Governance strategies
  Incentive programs
- Decision-maker dialogs
- Stakeholder meetings



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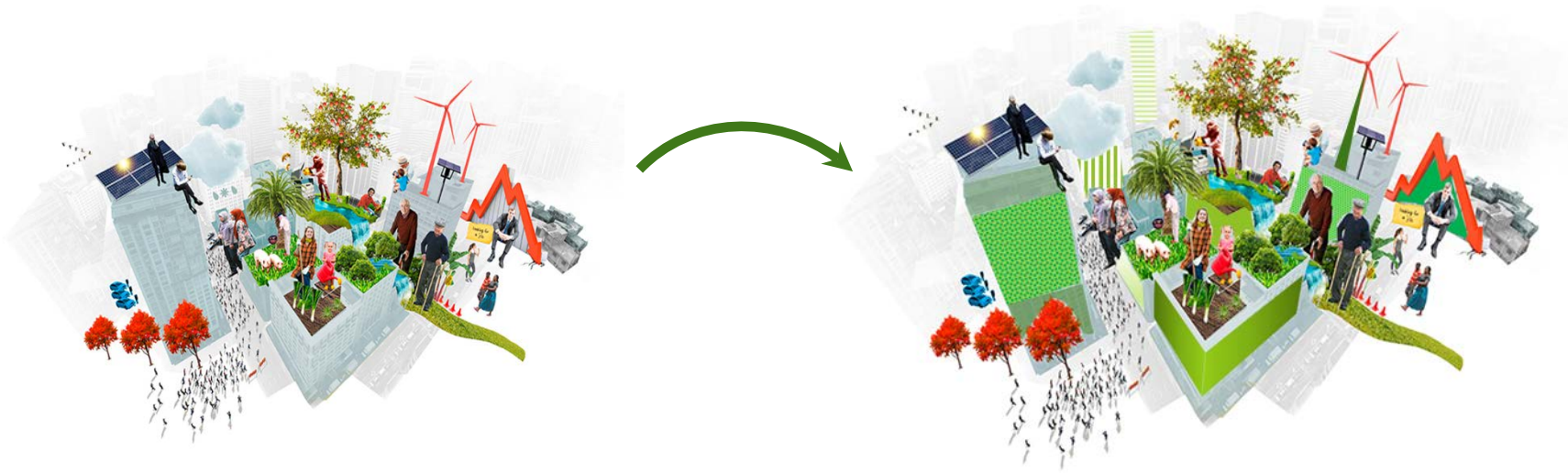
VERTICAL GREEN 2.0



Vertical greening for livable cities –
co-create innovation for the breakthrough of an old concept

Technische Universität Berlin, University of Natural Resources and Life Sciences Vienna, Green4Cities GmbH Wien,

Urbanistični Inštitut Republike Slovenije, National Taiwan University (NTU)

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Chances

- Vertical Green provides multiple ecosystem services: passive cooling, flood alleviation, bioenergy and food production, biodiversity, noise reduction etc.

- Vertical Green 2.0 could be a ecologically, economically and socially consistent part of the green infrastructure especially in dense building stock

Challenges

- Vertical Green = biological-technical system in an complex architectural-technical and social context

- *Ecological challenge*: sustainability, e.g. water, energy, nutrients, CO_2 balance, biodiversity

- *Economical challenge*: direct costs, indirect benefits, risks, maintenance

- *Social challenge:* ecosystem disservices, participation

Photo: Nehls

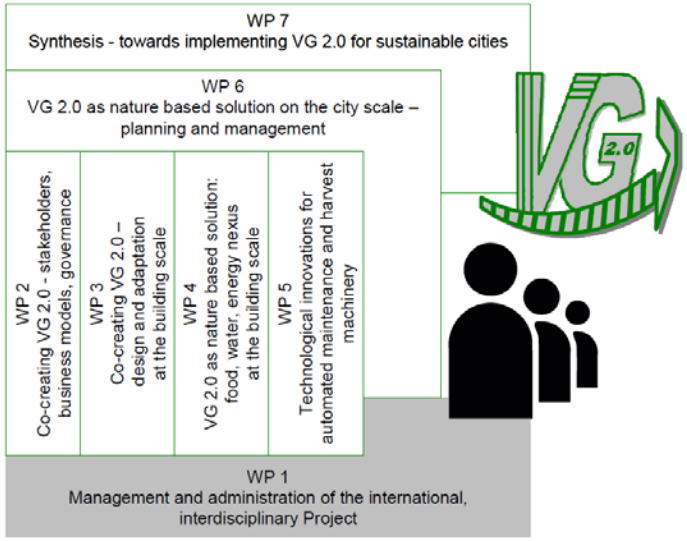
Aims: re-thinking, re-designing and re-managing VG as progressive food-water-energy nexus

1 Integrating VG at building and district scales: water, heat and energy management

2 Technological innovation for maintenance and harvesting machinery

3 Strategies for design, governance and operation of sustainable, secure, city-integrated greening and cultivation

Photos: Zluwa



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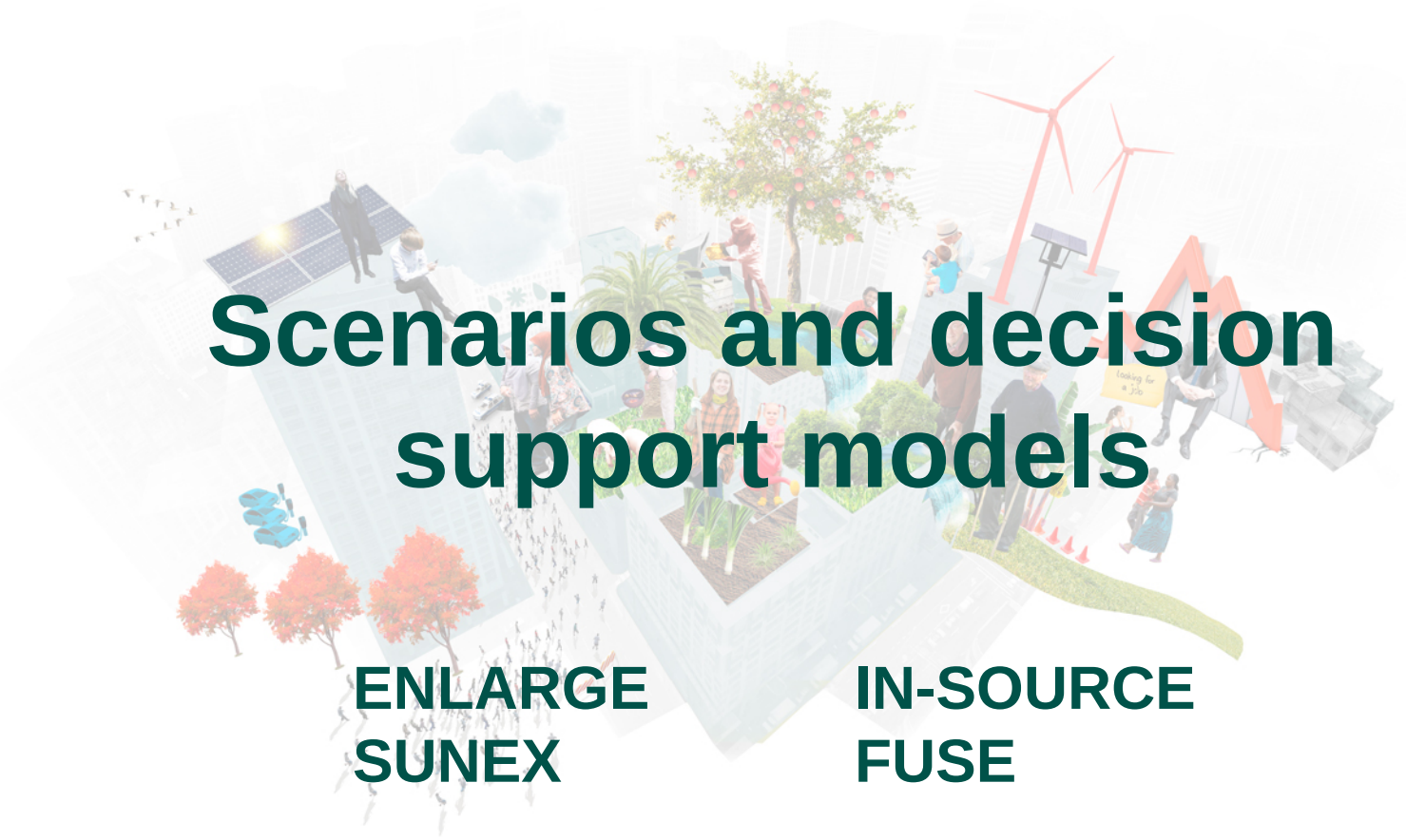

Scenarios and decision support models

ENLARGE
SUNEX

IN-SOURCE
FUSE

ENLARGE

***EN**abling **LARGE**-scale adaptive integration of technology hubs to enhance community resilience through decentralized urban food-water-energy nexus decision support*

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ENLARGE

Goals

- Develop decision support tools for urban FWE nexuses
- Screen and Optimise FWE technology hubs integration
- Generate a suite of water, carbon and ecosystem services indicators
- Increase urban resilience, reduce risk

Approach

- Distributed and agent-based modelling
- Multi-scale urban metabolism models
- Sustainability indexes, life cost-benefit analysis
- Social equity assessment and community resilience metric
- Multi-criteria assessment, Optimisation
- Generate scenarios from strategic plans of cities

Case Study Cities

- Amsterdam
- Miami
- Marseille

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INtegrated analysis and modeling for the management of sustainable urban FWE ReSOURCEs

Acronym: IN-SOURCE

Duration: 2018–2020

Contact: Prof. Dr. habil. Ursula Eicker

Partner: University of Applied Sciences Stuttgart (HFT), Landkreis Ludwigsburg, AH Consult, Austrian Institute of Technology GmbH (AIT), University of Natural Resources & Life Sciences Vienna, City University of New York (CUNY), New York Institute of Technology (NYIT)

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Objective

Development and application of tools for case studies in order to quantitatively assess the predicted impact of changes in urban land use due to population, climate change, the energy transition and the challenges of providing a truly resilient infrastructure

FOOD

Indicators:
Quality, sustainable production, security of supply, land use, energy footprint, CO_2 footprint

FOOD → WATER

- Impact of food production and food waste treatment on water quality
- Climate change impact on food production and water demand

FOOD → ENERGY

- Use of waste food for energy production
- Impact of urban farming on transport and processing energy

WATER → FOOD

- Water treatment for irrigation
- Water treatment for food process water
- Water treatment for potable water

WATER

Indicators:
Water quality, water quantity and long term sustainability, resilience, land use, water footprint

WATER → ENERGY

- Energy requirements in wastewater treatment for different water quality and possible reuse
- Wastewater sewage sludge treatment for thermal energy generation, phosphorous recovery

ENERGY → FOOD

- Smart micro grids for resilient food refrigeration chain and food logistics
- Demand side management potential of food chain refrigeration (supermarkets)
- Energy efficiency of food production

ENERGY → WATER

- Smart grids and renewables for resilient water supply and treatment
- Wastewater plant efficiency and demand side management (DSM), reuse
- Energy efficiency of water supply

ENERGY

Indicators:
CO_2 emissions, reliability and resilience, land use footprint

SUNEX - (Sustainable Urban Food-Water-Energy NEXus)

Formulating a sustainable urban FWE strategy by optimizing synergies between food, water and energy systems

SUNEX - (Sustainable Urban Food-Water-Energy Nexus)

- SUNEX will provide a modelling framework to assess the Food-Water-Energy System addressing the demand and the supply side.
- The objective is to develop efficient solutions for energy, water and food supply for urban regions.
- SUNEX will be demonstrated in 4 case study city regions and will finally provide policy guidelines for different physical and climatic framework conditions & consumption patterns

Berlin

Bristol

Doha

Vienna

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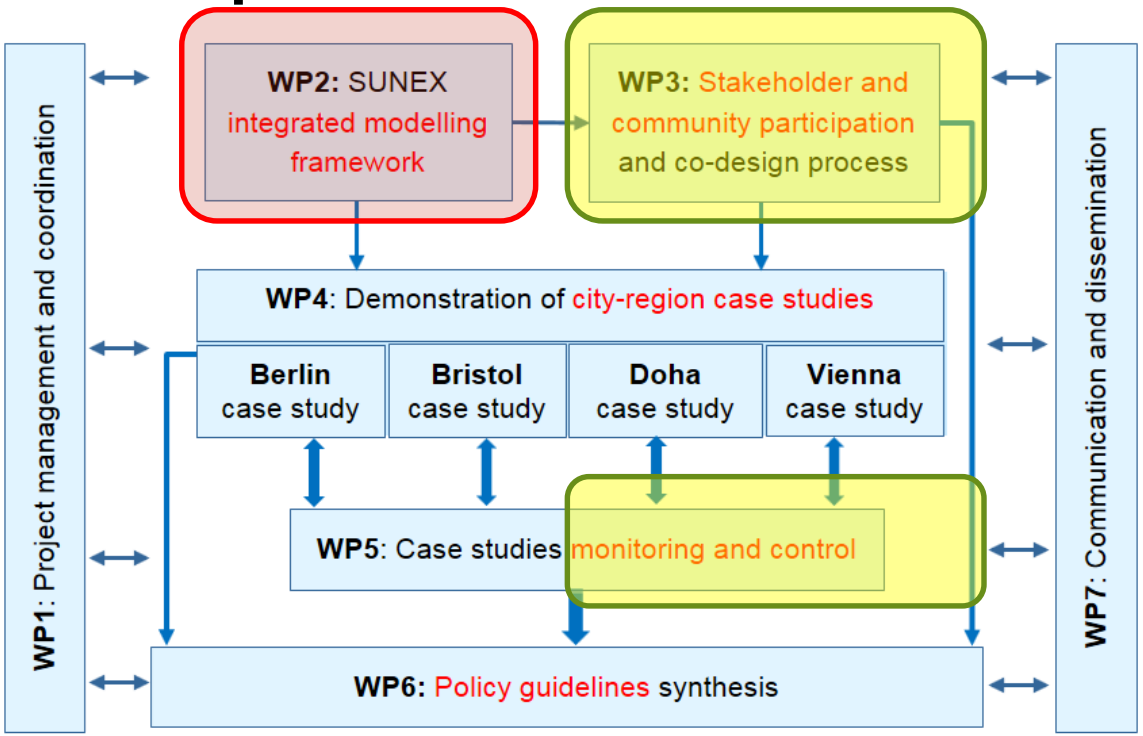
SUNEX – Concept & Team

Concept:



7 Partners:

- Austrian Institute of Technology (AIT, Coordinator) Vienna >> energy system model
- Leibniz Centre for Agricultural Landscape Research (ZALF) Berlin >> food sys model
- University of the West of England (UWE) / Bristol >> water system model
- Bristol Water (BW) / Bristol
- Qatar Environment and Energy Research Institute (QEERI) / Doha
- Qatar Ministry for Municipality and Environment (MME) / Doha
- ROC Connect (ROC) / Palo Alto, California >> monitoring IoT applications

Federal Ministry of Education and Research

FFG Austrian Research Promotion Agency

NSF

FUSE

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Food-water-energy for Urban Sustainable Environments

HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

LELAND STANFORD JUNIOR UNIVERSITY 1891

OFSE Austrian Foundation for Development Research

IIASA International Institute for Applied Systems Analysis

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FUSE: Food-water-energy for Urban Sustainable Environments

Goal: Produce solutions for urban-FWEs challenges through participatory model building

Approach

Multi-agent human-natural systems models to evaluate policy interventions

Two-Stage Sustainability Living Labs to
1) Construct user-inspired solutions
2) Discuss with stakeholders benefits of interventions based on simulated results

Cities

Amman, Jordan

Pune, India

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Urban Living Labs and governance

GLOCULL
Creating interfaces
IFWEN

WASTE FEW ULL
CRUNCH

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GLOCULL

Globally and Locally-sustainable Food-Water-Energy Innovation in Urban Living Labs

Aim

To develop a co-creative Urban Living Lab approach for innovations in the FWE nexus that are both locally and globally sustainable.

Goals

To develop context-sensitive implementation guidelines and a participatory assessment tool kit

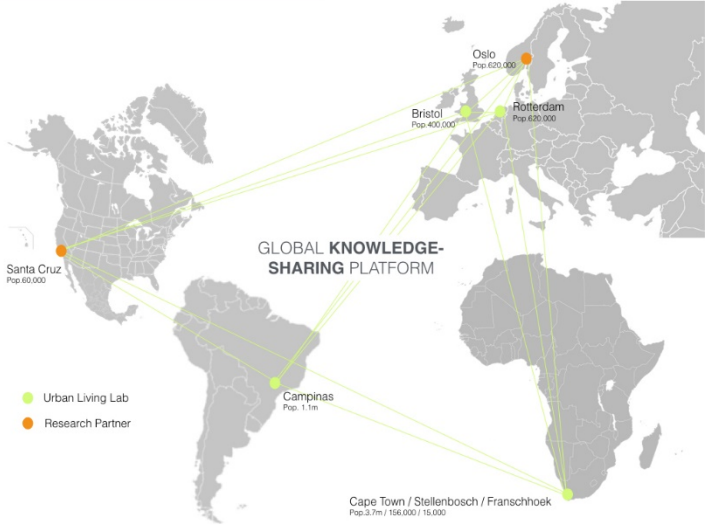
How

Through transdisciplinary action research in seven Urban Living Labs, combined with an integrated, model-supported assessment of local-global interactions in the FWE nexus

Project partners (leading local consortia)	Case studies (Urban Living Labs)
Maastricht University The Netherlands	Closing the FWE cycles at the neighbourhood level
Leuphana University of Lüneburg Germany	FWE nexus as boundary object to foster urban sustainability transformation
Lund University Sweden	Sustainable urban craft beer production
BOKU Vienna Austria	Agrophotovoltaics in urban and peri-urban areas
Arizona State University USA	Building blocks and capacity for a sustainable local food system
University of São Paulo Brazil	Perspectives for local solutions for the FWE nexus in the megacity
Stellenbosch University South Africa	Management of edible food waste in Cape Town's informal settlements

WASTE FEW ULL

WASTE: FOOD - ENERGY - WATER **URBAN LIVING LABs**



AIM

- To identify and reduce waste in FEW nexus through global Urban Living Lab network using economic valuation to test viability

6 Countries > **4 Urban Living Labs** > 4 Continents

- **Rotterdam:** Scaling start-up innovation at the *BlueCityLab*
- **Campinas:** New tech, transition management and policy
- **Cape Town:** Scaling small-scale solutions at *The Water Hub*
- **Bristol:** Testing viable phosphate recapture from sewage

Core Activities

- Map resource flows / **identify inefficiencies**
- **Agree response** most appropriate to the local context
- Set out pathways to (and monitoring of) **impact**
- **Model economic value**
- **Engage with decision makers** to close each loop

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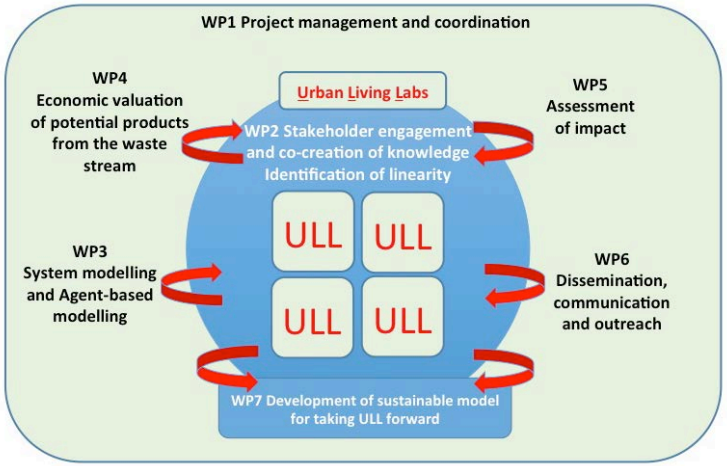
WASTE FEW ULL

WASTE: FOOD - ENERGY - WATER **URBAN LIVING LABs**

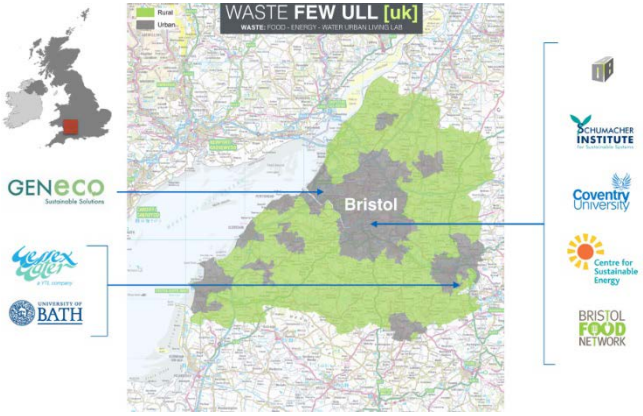


COMPARING METHODS

- **BRAZIL**: Technology road-mapping, tech readiness, impact evaluation, innovation foresight
- **NETHERLANDS**: ("Acceleration Potential Mapping") Actor networks, system analysis, scenario building, back-casting, stepwise identification of acceleration potential, diffusion pathways
- **UK**: Design thinking, systems mapping, resource flow dynamics, corporate risk management
- **South Africa:** incremental small-scale interventions to support sustainable water supply and urban agriculture in an informal setting.

CORE SUPPORT

- **Economic Valuation** (Norway/UK)
- **Knowledge Exchange** (USA)



IMPACT PLANNING

- Stakeholder analysis > Planning > **Testing (!)** > Tracking

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creating interfaces

water food energy

Building capacity for integrated governance at the Food-Water-Energy-nexus in cities on the water

EIFER
EUROPEAN INSTITUTE FOR ENERGY RESEARCH

NICOLAUS COPERNICUS UNIVERSITY IN TORUŃ
Faculty of Humanities

PLANTAGON

UNIVERSITY OF DELAWARE

NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

52north
exploring horizons

KTH VETENSKAP OCH KONST

WARWICK
THE UNIVERSITY OF WARWICK

vizzuality.

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Aims/objectives

- Capacity building for the urban food-water-energy (FWE) nexus, creation of science-citizen-policy interfaces.
- Fostering knowledge exchange and cooperation among local stakeholders on the FWE nexus.
- Development and testing of innovative approaches for local knowledge co-creation and participation.
- Enhancing of the visibility of the FWE nexus.

Approaches/methods

- The project adopts an Urban Living Lab and Citizen Science approach
- Users as co-creators of knowledge

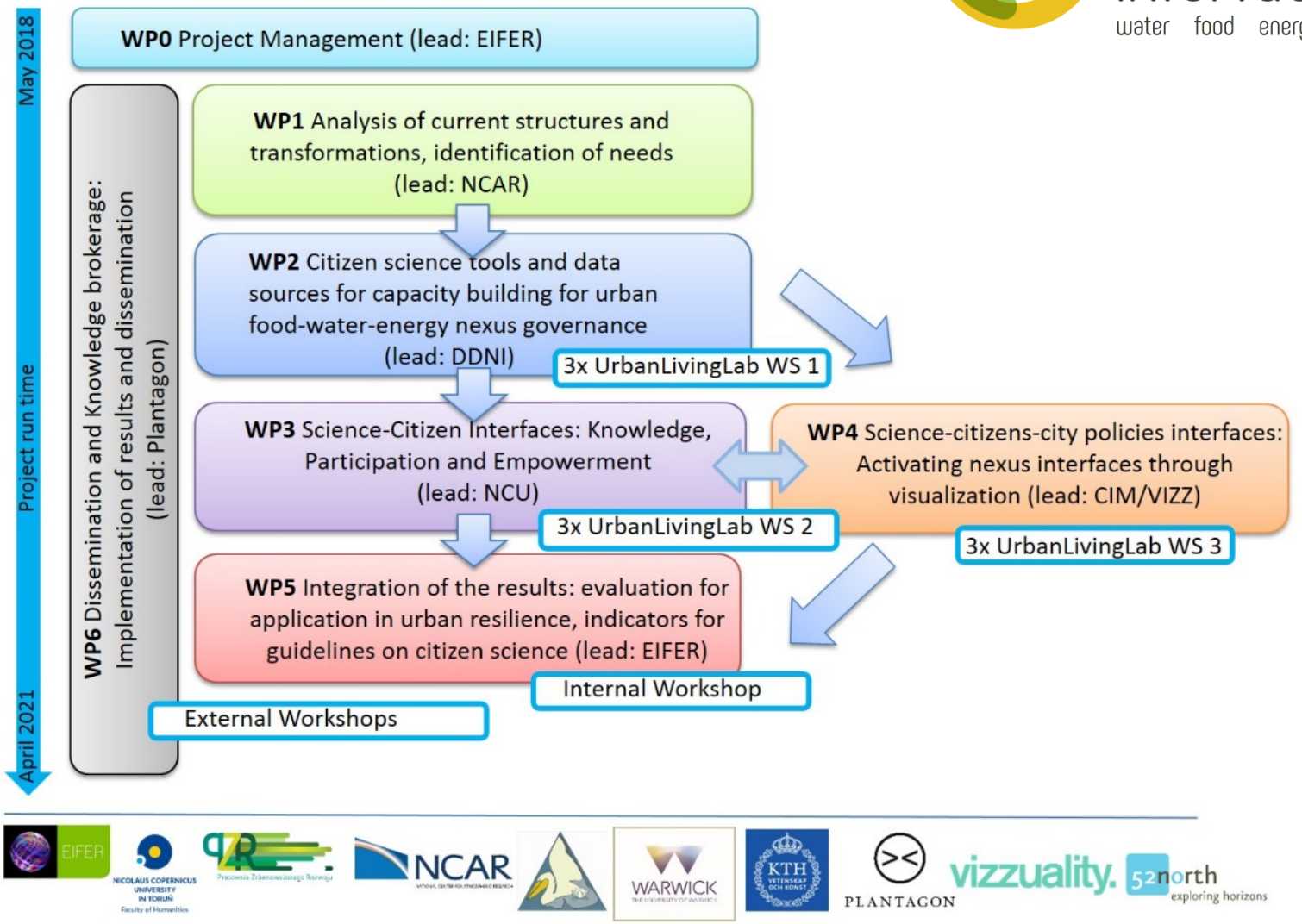
Expected results and impacts

- Contribution to
  - science and to practice
  - the enabling of integrative transformative urban governance to promote FWE systems resilience.
- Recommendations regarding co-creative/integrative approaches for local governments, public authorities, or non-governmental organizations as well as scientists.

Involved cities and case studies

Project structure overview

creating interfaces
water food energy



EIFER · Nicolaus Copernicus University in Toruń, Faculty of Humanities · qzr · NCAR · WARWICK · KTH Vetenskap och Konst · PLANTAGON · vizzuality. · 52north exploring horizons

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CRUNCH

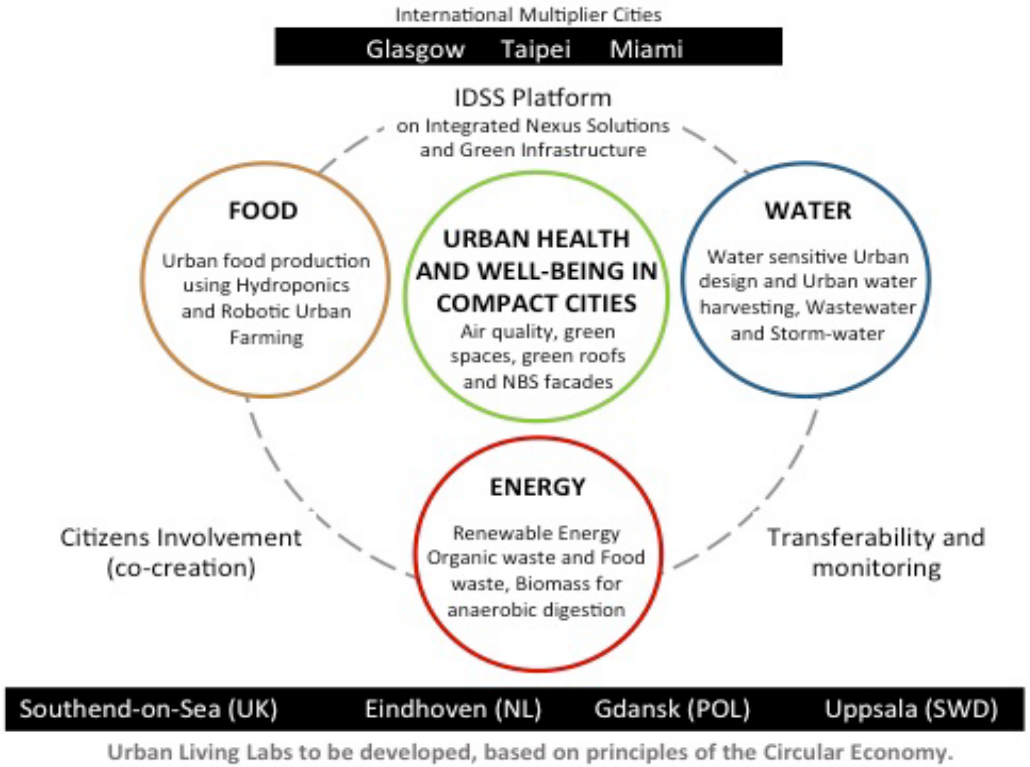
Climate - **R**esilient - **U**rban - **N**exus - **CH**oices

20 partners from 6 countries

Urban Living Labs

Southend-on-Sea, UK
Glasgow, UK
Eindhoven, NL
Gdansk, Poland
Uppsala, Sweden
Miami, USA
Taipei, Taiwan

www.fwe-nexus.eu



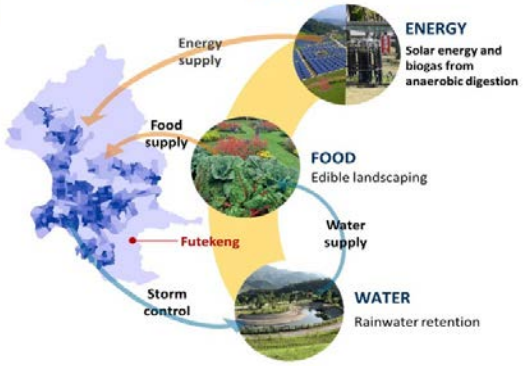
Urban Living Labs to be developed, based on principles of the Circular Economy.

Aims

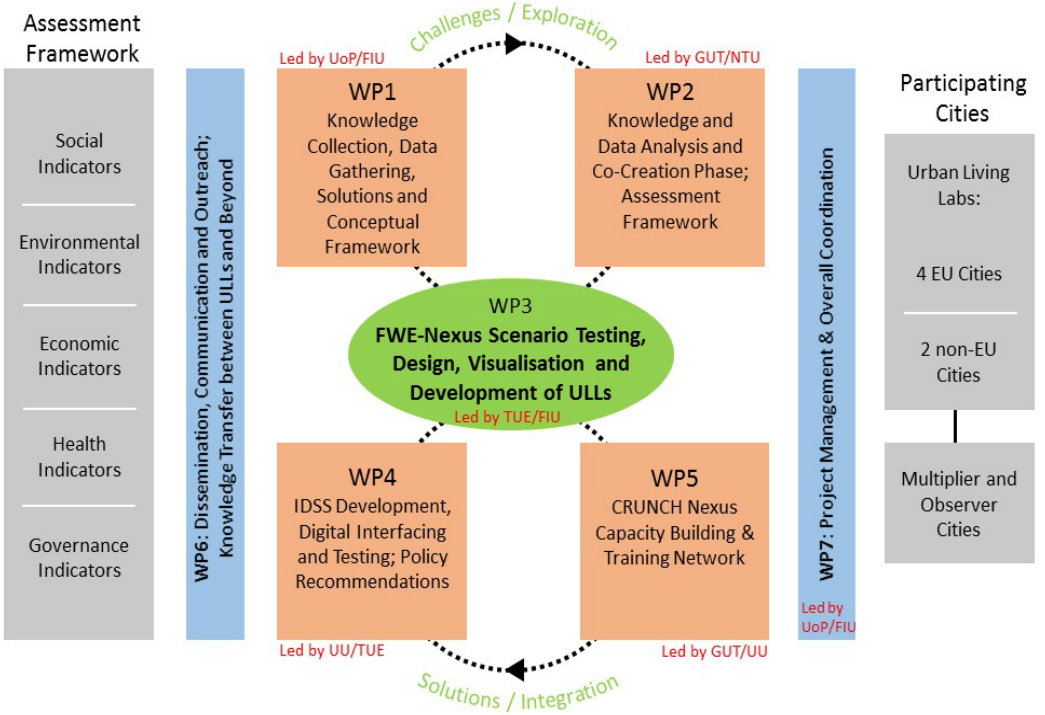
CRUNCH has an integrated approach to facilitate decision-making for cities

The aims of CRUNCH are:

1. CRUNCH will demonstrate how the Food-Water-Energy Nexus can strengthen urban resilience and resource efficiency of the participating cities.
2. Creating an interconnected knowledge platform with cross-sectorial indicators for a support tool and assessment framework(the **I**ntegrated **D**ecision **S**upport **S**ystem - IDSS).
3. The guiding tool will improve and support robust decision-making on future urban development.



CRUNCH
The Food-Water-Energy Nexus



Sustainable Urbanisation Global Initiative (SUGI)
FOOD-WATER-ENERGY NEXUS

BELMONT FORUM

URBANEUROPE

European Commission

IFWEN - Understanding Innovative Initiatives for Governing Food, Water and Energy Nexus in Cities

Project Partners

1) FGV/EAESP – Fundação Getulio Vargas (FGV), São Paulo, Brazil. portal.fgv.br/en

2) Yale University - Urbanization and Global Change Lab, New Haven (CT), USA

www.yale.edu and http://urban.yale.edu

3) The Nature of Cities – TNOC, New York (NY), USA www.thenatureofcities.com

4) The Stockholm Resilience Center, Stockholm, Sweden www.stockholmresilience.org

5) Ming-Chuan University (MCU), Department of Urban Planning and Disaster Management (UPDM), Taipei, Taiwan (China) http://web.updm.mcu.edu.tw/en

6) ICLEI – Local Governments for Sustainability –World Secretariat (ICLEI-W), Bonn, Germany www.iclei.org

7) The Africa Secretariat of ICLEI - Local Governments for Sustainability (ICLEI-A), Cape Town, South Africa www.africa.iclei.org

Institutional support of:

- SCBD - Secretariat of the Convention on Biological Diversity (SCBD),
- RUAF-Foundation (Global partnership on Sustainable Urban Agriculture and Food systems),
- FAO - Food and Agriculture Organization of the United Nations (FAO),
- ESCAP - UN Economic and Social Commission for Asia and the Pacific (UNESCAP),
- ICLEI South Asia Office

Sustainable Urbanisation Global Initiative (SUGI)
FOOD-WATER-ENERGY NEXUS

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Objectives

- To assess the changes in trade-offs of Food-Water-Energy Nexus (FWEN) in Green and Blue Infrastructure (GBI) and their association with spatial planning and governance in cities using empirical cases (TBD);
- To understand the barriers that hinder innovative and integrated FWEN approaches using GBI at different scales; and specifically look for the common features of diverse interventions;
- To understand empirically how successful GBI-based innovations that changed the FWEN took place, which capabilities cities had to innovate and how they develop those capabilities, and approaches used to overcome the barriers that make IFWEN implementation more difficult in practice;
- To design a framework, guide of best practices and tools to foster IFWEN using GBI with better urban interventions and decision-making processes.