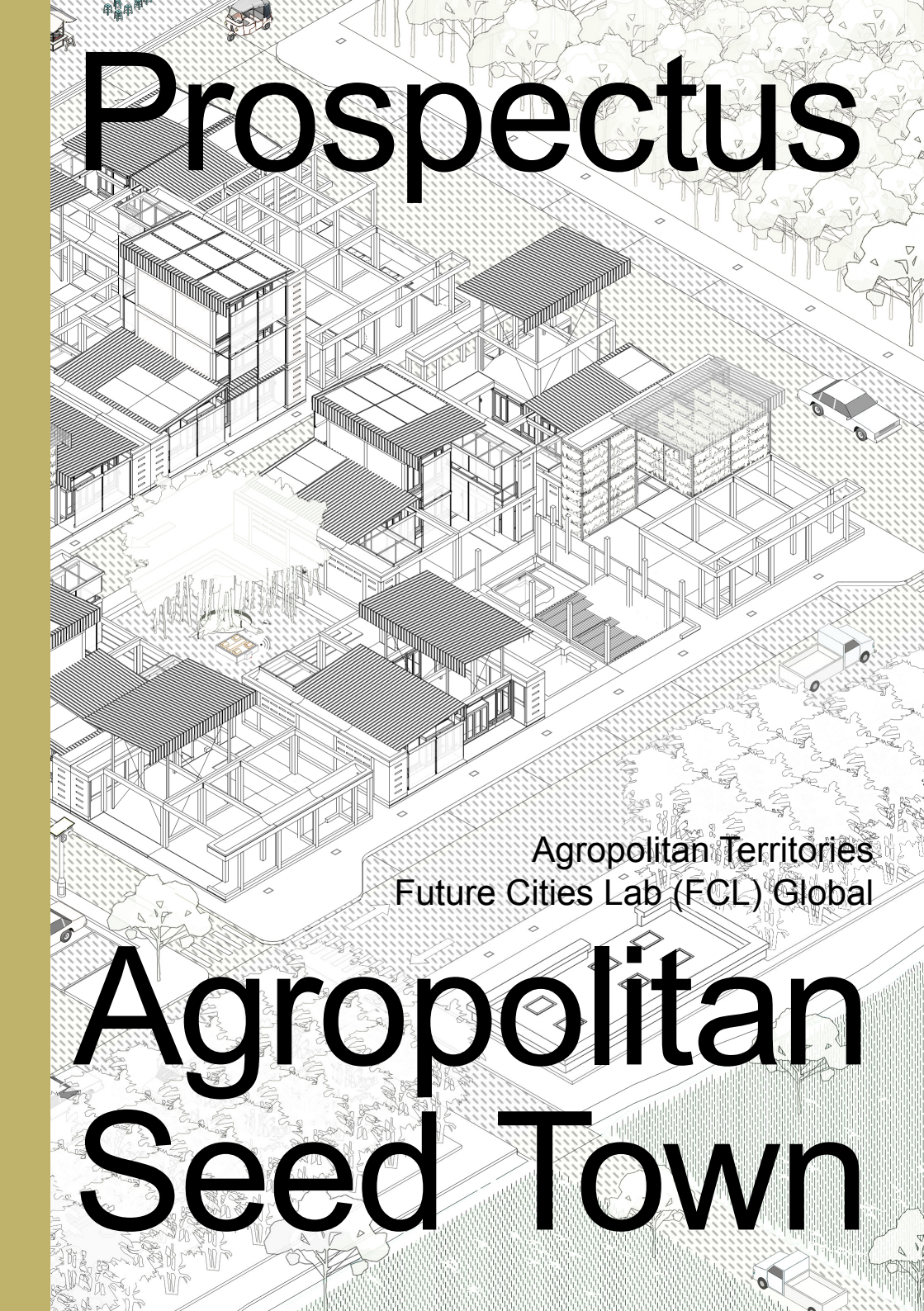The Agropolitan Seed Town is an innovative prototype settlement designed for rapidly urbanising food regions in Monsoon Asia. It integrates high-density, mixed-use eco-neighbourhoods, vertical gardens, and community-supported farms. It showcases advanced biomaterials, smart technology and blue-green infrastructure on a 14-hectare site in West Java within a bioregional development framework.
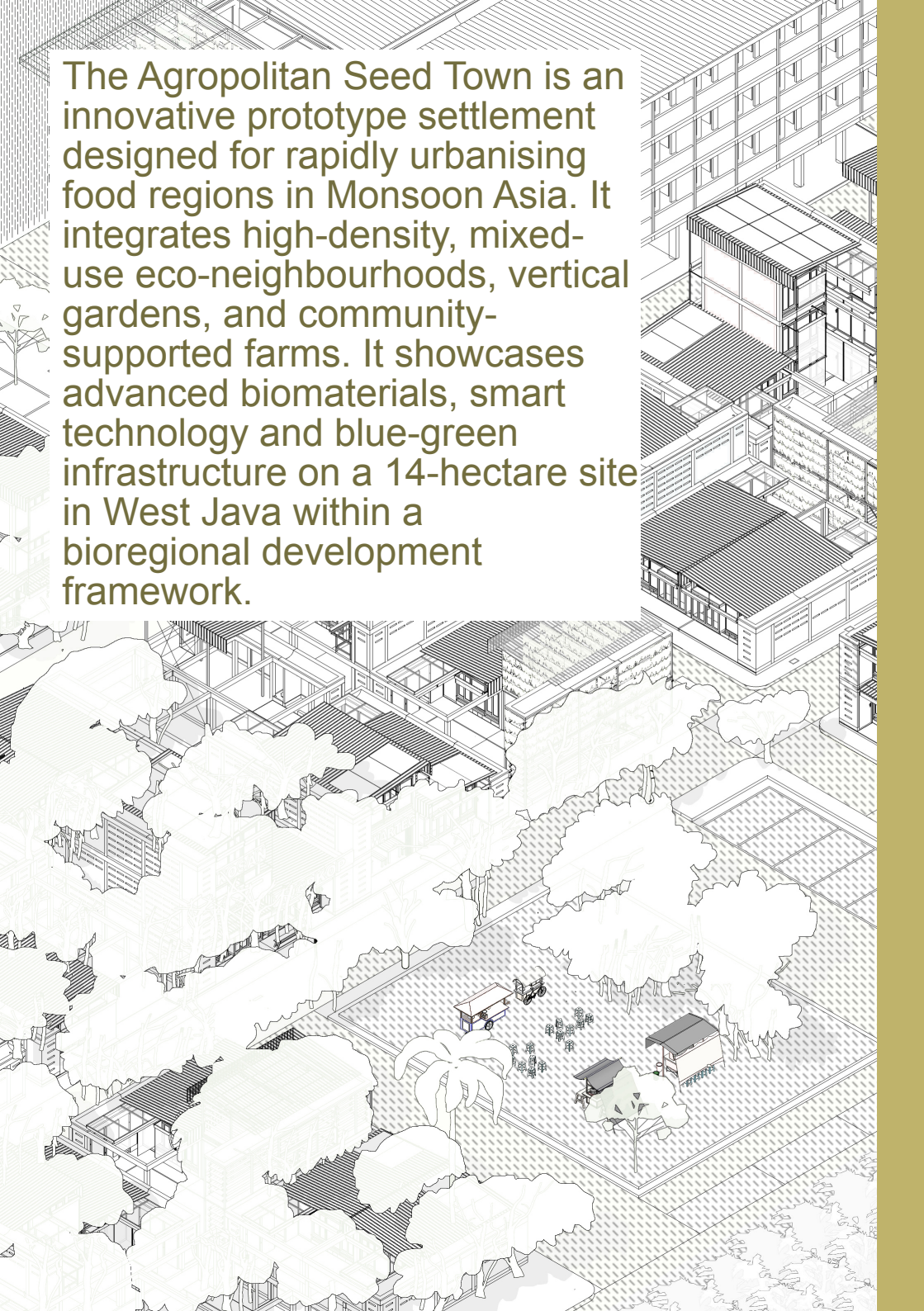
Prospectus

Agropolitan Territories
Future Cities Lab (FCL) Global

Agropolitan Seed Town

Draft only
Not for circulation
July 2022

(FCL) **FUTURE**
CITIES
LABORATORY

(SEC) **SINGAPORE-ETH**
CENTRE

Future Cities Lab (FCL) Global is a research collaboration between ETH Zurich and the Singapore universities – National University of Singapore (NUS), Nanyang Technological University, Singapore (NTU Singapore) and the Singapore University of Technology and Design (SUTD) – with support from the National Research Foundation (NRF). It operates under the auspices of the Singapore-ETH Centre (SEC).

CREATE **ETH** *zürich*

NANYANG
TECHNOLOGICAL
UNIVERSITY
SINGAPORE

NUS
National University
of Singapore

SUTD
SINGAPORE UNIVERSITY OF
TECHNOLOGY AND DESIGN

Prospectus

Agropolitan Territories
Future Cities Lab (FCL) Global

Agropolitan Seed Town

Invitation

Future Cities Lab (FCL) Global in association with PT Jababeka and _____ invites partners to join the consortium developing the Agropolitan Seed Town.

The Agropolitan Seed Town is an innovative prototype settlement designed for rapidly urbanising food regions in Monsoon Asia. It integrates high-density mixed-use eco-neighbourhoods, vertical gardens, and community-supported farms. It showcases advanced biomaterials, smart technology and blue-green infrastructure within a bioregional development framework.

It will be constructed on a 14-ha site in West Java and planned to be scaleable to five other sites in Monsoon Asia.

Under developm

Multifunctional ramp (exhibition, market

Gubuk/ shed

BSF unit

Jun   Jul   Aug   Sep   Oct   Nov   Dec   Jan   Feb   Mar   Apr   May   Jun

2022   2023

ANALYSIS & PLANNING

SITE PREPARATION & CONSTRUCTION

ment

Rubah 2-storey + bunsun

Agro plots +   Mock public spaces incl playground

Rubah 'alley' 1:1 or 1:2 (incl shop/ activities)

Jul Aug Sep Oct Nov Dec Jan Feb Mar

2024

FIELD SCHOOL & EXHIBITION OPERATION

SCALING UP

Fig 1. Monsoon clouds over Medan

Contents

Challenges

Rapid urbanisation, sprawl, vulnerable supply chains and industrialised agriculture are threatening food security, biodiversity and livelihoods across Asia.

Rapid urbanisation is increasingly threatening food security across Asia (FAO). Cities are sprawling at unprecedented rates, consuming fertile agricultural land and reducing the capacities of farmers to produce food in the process. At the same time, already stretched and vulnerable supply chains are increasingly threatened by local and global stresses and shocks — conflicts, natural hazards, climate change, and pandemics. Attempts to keep pace with the rising food needs of urbanising populations by industrialising agriculture are devastating biodiversity, habitats, traditional landscapes and ecosystem services.

Together, these processes heighten social, economic and environmental vulnerabilities, lock cities and towns into carbon path dependency, and ultimately threaten livelihoods both in cities and rural areas. A future based on these current realities would be disastrous not only for already vulnerable regions in Asia but for the planet.

Scientific and policy responses to this complex challenge have been gathering momentum. The science on urbanisation and food security is developing, and is informing research on climate change, environmental degradation and social equity. These efforts are reflected in the emergence of evidence-based policy frameworks and compelling development goals at local, regional and global scales.

Despite this progress, bridging research, policy and action remains difficult. While innovations are emerging, and there are increasingly sophisticated ways of tracking policy effects, many governmental, intergovernmental and non-state actors lament the lack of practical models, prototypes and tools that can translate sustainable science and policy into practical actions on the ground. Practical guidance on implementing policy aspirations is still needed.

Seeding Solutions

Agropolitan Seed Town is designed to be a practical and adaptable response to the challenges of rapid urbanisation and food security.
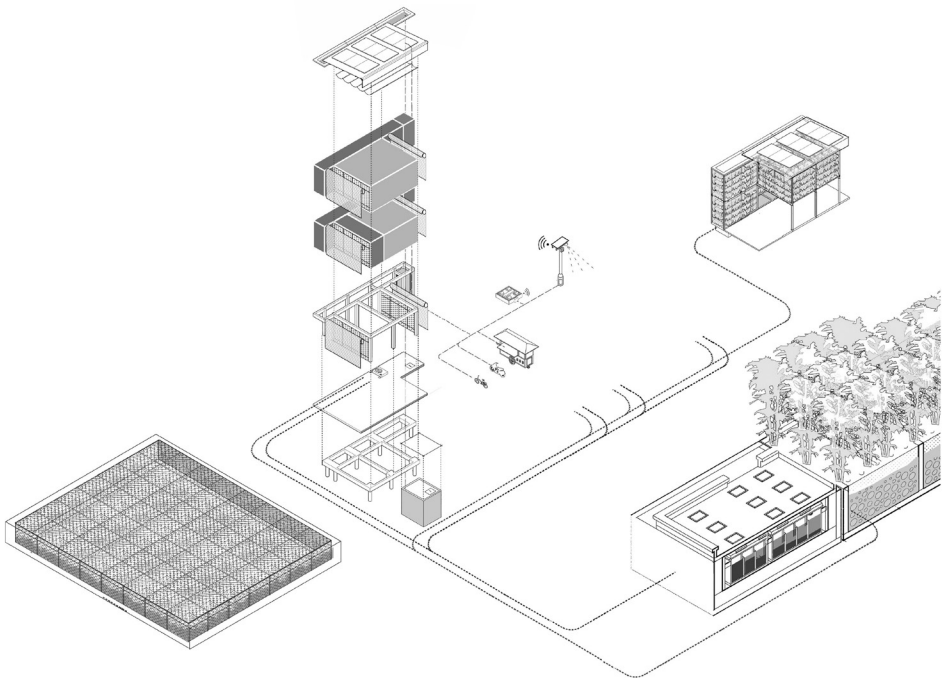

Fig. 2 Expandable house and vertical garden systems diagram, with structure and decentralised energy, water, waste and information technology.

The Agropolitan Seed Town is an innovative prototype settlement designed for rapidly urbanising food regions in Monsoon Asia to be constructed on a 14-hectare in the municipality of Cikarang, West Java, some 40 km from downtown Jakarta.

The Seed Town integrates high-density, mixed-use eco-neighbourhoods, vertical gardens, community-supported farms and mobile produce markets within a bioregional development framework. The Seed Town will showcase innovative biomaterials, smart technology and blue-green infrastructure.

The Seed Town will be developed around collaborative, ecologically-sensitive and evidence-based design processes. It will be animated by an exhibition programme and field school for a period of three months.

The Seed Town aims to:

1. Demonstrate integrated circular food systems, high-density and mixed-use building types, smart technologies and sustainable blue-green infrastructure
2. Serve as a knowledge exchange platform combining evidence-based design and planning, community participation, advanced digital tools and material strategies
3. Convene a broad-based stakeholder consortium including government agencies, industry, civil society and community actors, and academia
4. Seed five full-scale agropolitan developments in other parts of Java, Indonesia, and Monsoon Asia.

Agropolitan Development Actions

The Seed Town project is guided by nine Agropolitan Development Actions (ADAs) which complement six Sustainable Development Goals (SDGs).
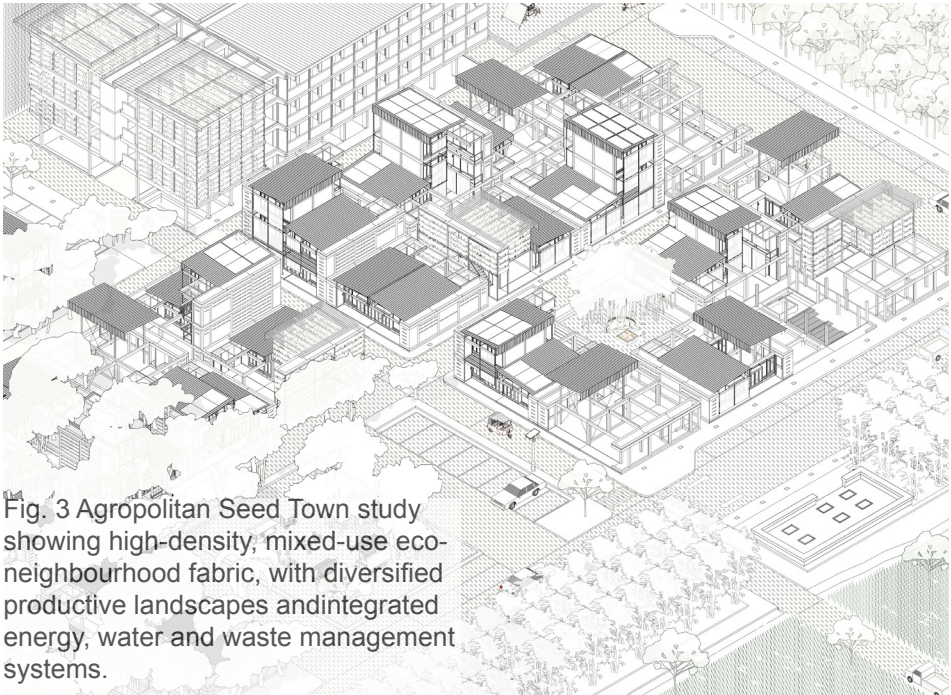

Fig. 3 Agropolitan Seed Town study showing high-density, mixed-use eco-neighbourhood fabric, with diversified productive landscapes andintegrated energy, water and waste management systems.

The Agropolitan Seed Town is the centrepiece of research on 'Agropolitan Territories' at Future Cities Lab (FCL) Global.

The research concerns urban-rural linkages and sustainable settlement systems in rapidly urbanising Asia, and draws on multiple disciplines, including architecture, urban design, landscape architecture, environmental science, agroecology and geospatial analytics.

The research underpins a set of Agropolitan Development Actions (ADAs) that complement six Sustainable Development Goals (SDGs) and will guide the development of the Seed Town.

Our Agropolitan Development Goals (a-i) are:

a. Food security. Achieve food security and promote agroecology, including improving access to food, sustainable food production systems, community supported agriculture, and resilient foodscapes (SDG 2)
b. Sustainable settlement. Make cities and human settlements inclusive, safe, resilient and sustainable, including accessible and affordable housing with reliable services, access to green public space, waste management, sustainable building technology, local materials and reduced environmental impact (SDG 11)
c. Linking urban, peri-urban and rural areas. Support complementary economic, social and environmental links between urban, peri-urban and rural areas, including developing new prototypes for integrated bioregional development (SDG 11, 12)
d. Innovative design and participatory planning. Enhance innovative, evidence-based and inclusive approaches to human settlement design and planning that leverage on smart technology and advances in AI (SDG 11, 17)
e. Efficient resource metabolism. Support cities and human settlements to improve climate change adaptation with smarter resource flows, use of local biomaterials and agricultural waste in mainstream construction (SDG 11, 12, 15)
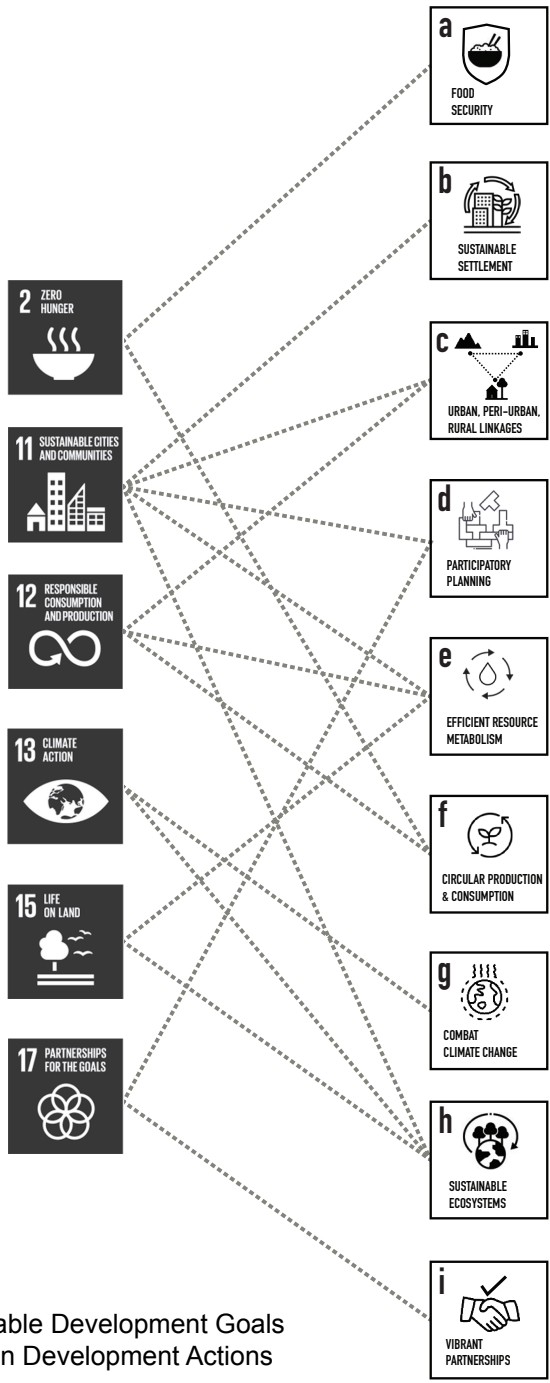
Fig. 4 Sustainable Development Goals and Agropolitan Development Actions

f. Circular production and consumption. Tighten food system circularity with sustainable production, distribution, consumption and waste patterns, including efficient use of natural resources and reduction of food losses (SDG 2, 12)

g. Combat climate change. Mitigate climate change and its impacts by demonstrating integration of renewable energy, low-carbon construction materials and high-density and walkable settlement patterns (SDG 13)

h. Enrich human-environment relationships. Protect, restore and promote sustainable use of terrestrial ecosystems and bioregions, reduce development pressure on forests and wilderness areas, and halt and reverse land degradation and halt biodiversity loss (SDG 11, 13, 15)

i. Vibrant partnerships. Initiate partnerships phased sustainable pathway development, including developing multi-stakeholder consortia to share systems-based and situated knowledge, expertise, technology and financial support, improving North-South and South-South cooperation, public-private partnerships which involve civil societies (SDG 17).

Seed Town Elements

Agropolitan Seed Town is composed of innovative eco-neighbourhoods, an international exhibition and field school with in-situ knowledge exchange
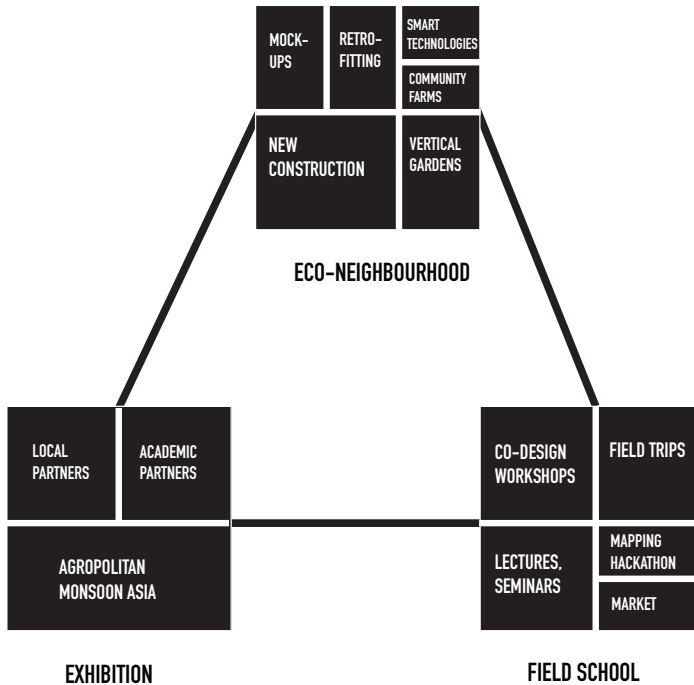

Fig. 5 Three complementary elements of the Seed Town project

The Agropolitan Seed Town is composed of three complementary elements:

1. Eco-neighbourhoods
- Newly constructed expandable houses, vertical gardens, exhibition pavilion and neighbourhoods
- Retrofitted existing buildings in villages neighbouring the site
- Mocked-up eco-neighbourhoods and indicative town fabric with bamboo scaffolding and printed fabric
- Vertical gardens
- Community-supported farms (based on agroecological principles, including water irrigation and circular resource systems
- Smart technologies such as solar panels, septic tanks, and rainwater harvesting systems

2. International Exhibition
- Comparative agropolitan case studies from other sites in Monsoon Asia such as Bangalore, Kolkata, Chengdu, Dhaka and Tokyo
- Local partners best practice showcase from civil society and community groups
- New research directions in sustainable construction, design and bioregional planning from local, regional and international academic partners

3. Field School
- Design workshops
- Lectures and seminars
- Field trips to other sites in West and Central Java
- Hackathons and neighbourhood mapping events
- Emerging sustainable technology demonstrations
- Market featuring local produce, food demonstrations.

Site

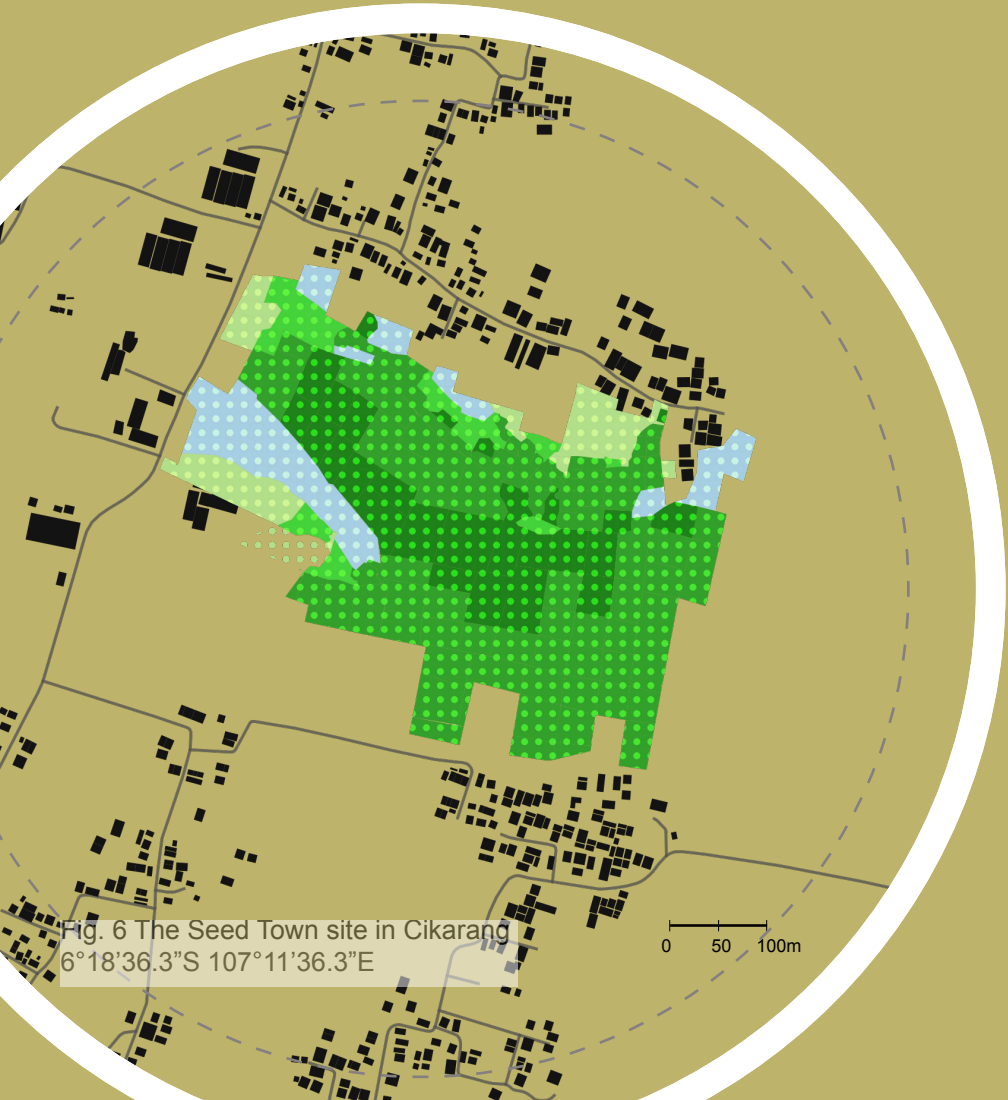Our site is located in Cikarang, West Java, 40 km from down-town Jakarta and owned by PT Jababeka.

Fig. 6 The Seed Town site in Cikarang
6°18'36.3"S 107°11'36.3"E

0   50   100m

The Seed Town site measures 14 hectares and is located in the Cikarang municipality, West Java (on the fringe of Jakarta) Indonesia and is owned by PT Jababeka.

The site currently supports rice paddies, fish ponds and allotment plots producing seasonal crops including soybean, corn, yellow cucumber and cassava. It is adjoined by a mixed-use *kampung* settlement which includes dwellings, factories, cottage industries, schools, mosques, and a cemetery.

The Seed Town project will be designed in close collaboration with local neighbourhood representatives and farmers who are represented in the Seed Town consortium.

Agropolitan Potentials

The selected Seed Town site is typical of conditions found in rapidly urbanising food regions throughout Monsoon Asia.

Fig. 7 Map showing concentration of potential agropolitan regions in Monsoon Asia based on population density, crop productivity and GDP. (FCL/ur-scape)

All cities have associated food-producing regions of one kind or another. We are interested in the hinterlands of cities in Monsoon Asia, where agriculture is under sustained pressure from urbanisation. Such regions have very specific ecological, economic and demographic characteristics, which mean they interact with nearby urban centres in distinctive ways.

When urbanisation processes interact with such areas in Monsoon Asia, the rural does not immediately give way to the urban and instead a hybrid rural-urban typology emerges. Sometimes dubbed *desakota* landscapes (Indonesian for 'village' and 'city'), they are neither strictly urban nor rural in character, but a mixture of both.

Such areas typically support relatively high population densities on small land holdings (under 1 ha), which typically produce rice, wheat, higher value vegetables, fruit and fish. This pattern places stresses upon women, who represent the largest proportion of the labour force, and youth, who are statistically over-represented in rural-urban migration figures which impacts both rural depopulation and growth of urban slums.

At the same time, scholars note that these landscapes contain the potentials for new kinds of sustainable and equitable settlement patterns which are particularly suited to the cultures, geographies and histories of development in Monsoon Asia.

The Agropolitan Territories team have developed a geospatial analytical and planning support tool, called ur-scape. This open-source tool is designed to better understand the existing conditions of urban-rural regions in Monsoon Asia, as well identify those zones where sustainable 'agropolitan' modes of urbanisation might be feasible. The maps on this and following pages are produced in ur-scape, and show how the site we have selected with PT Jababeka in Cikarang, West Java, features characteristics that are recognisable in other parts of Monsoon Asia.

We hope that diverse agropolitan territories will grow in different parts of Monsoon Asia from the Seed Town developed in Cikarang, West Java.
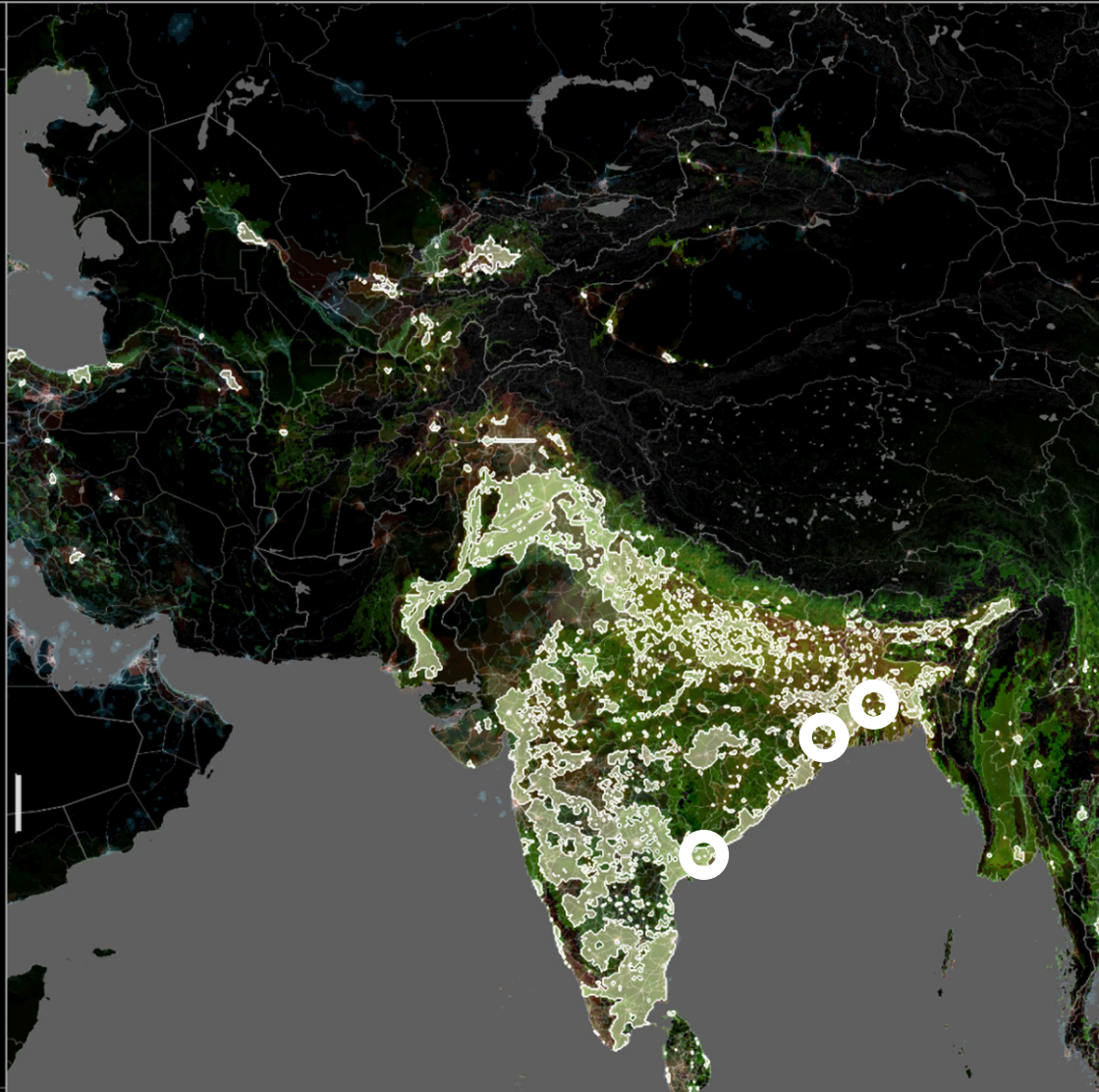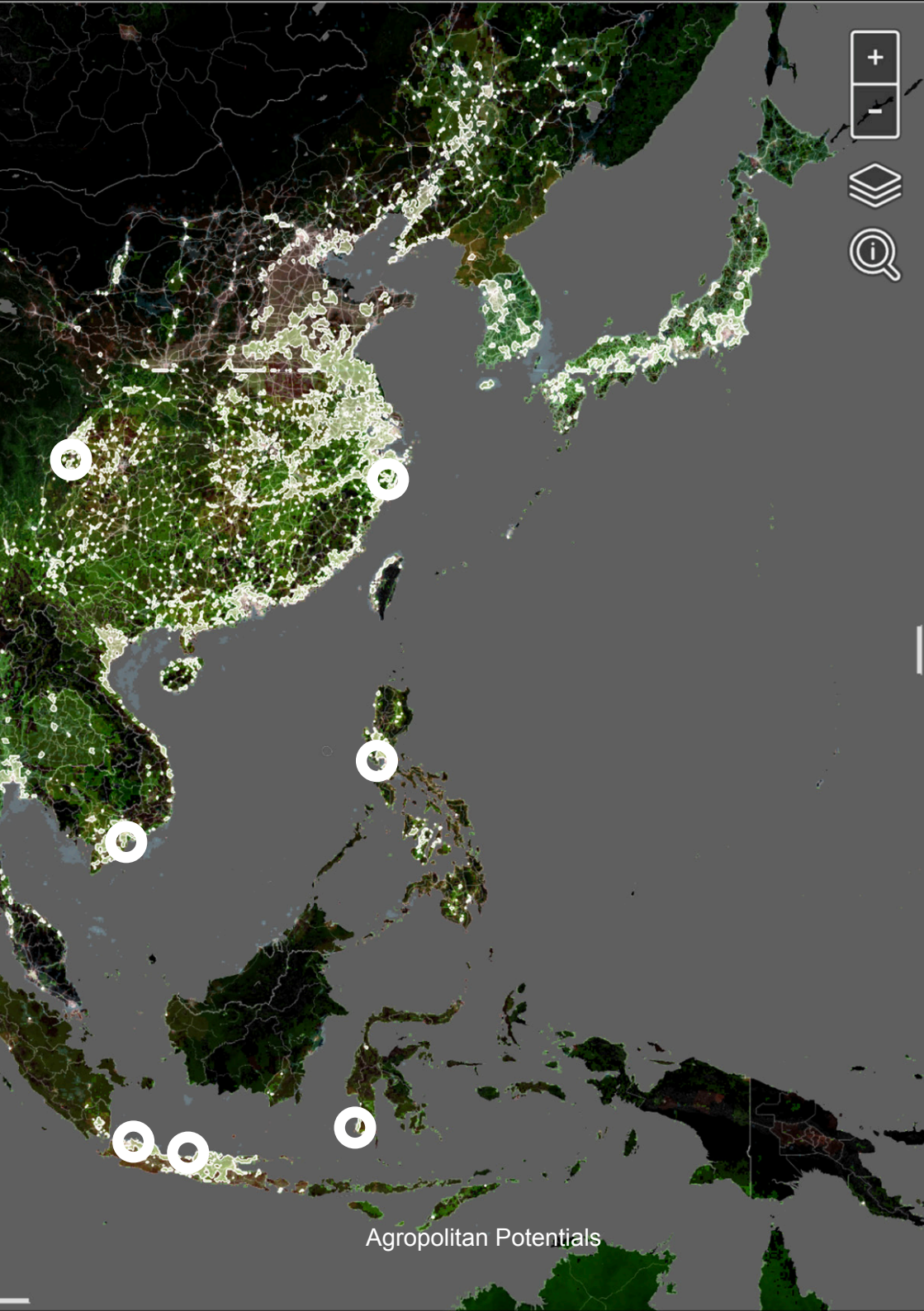
Fig. 8 Map focussing on Monsoon
Asia and patterns of settlement that
mix fertile food-producing regions and
relatively high population densities.
Areas highlighted are being studied in
the Agropolitan Territories module at
FCL Global, and are candidate areas
for Agropolitan development
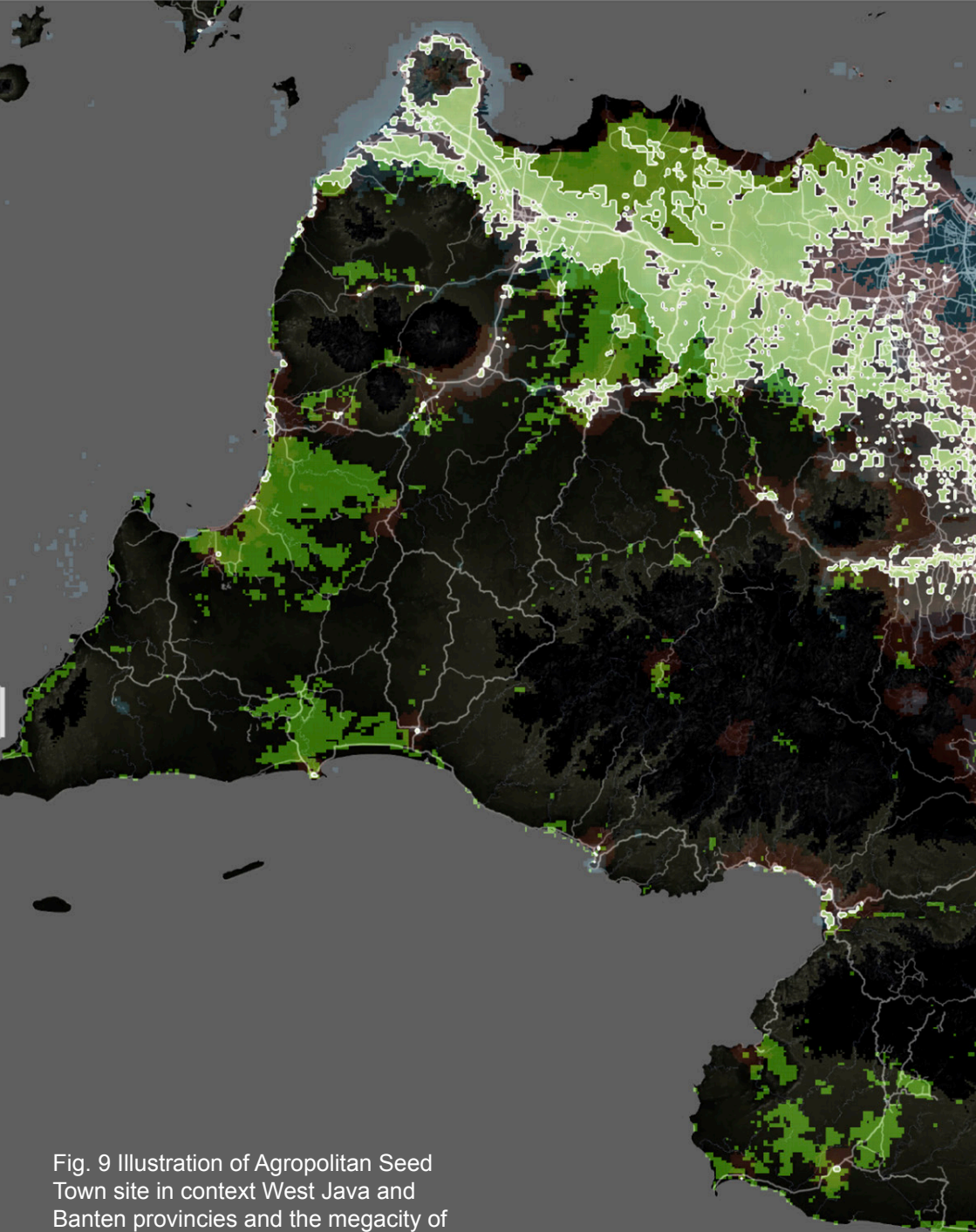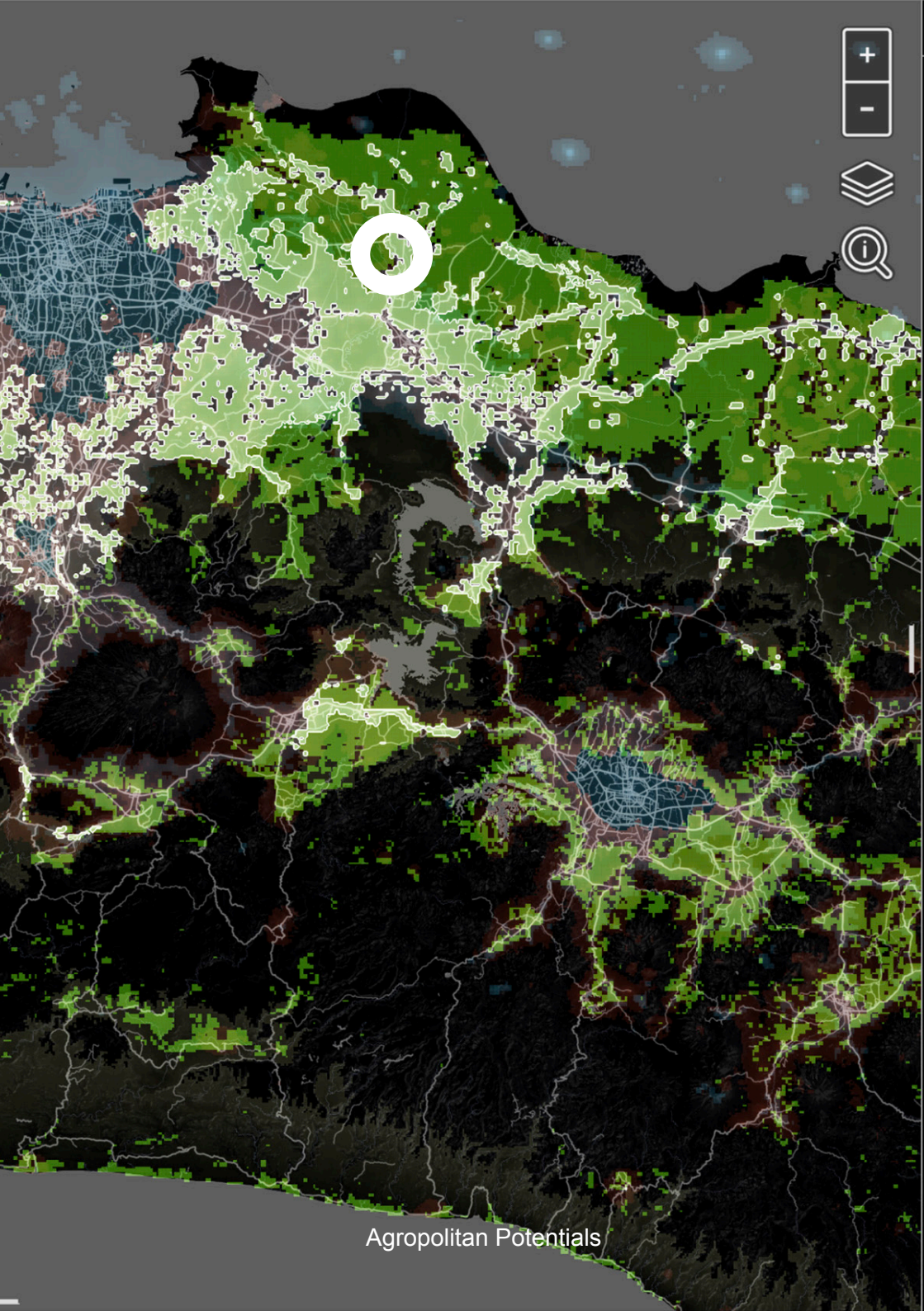(FCL/ur-scape 2022)

Agropolitan Potentials

Fig. 9 Illustration of Agropolitan Seed Town site in context West Java and Banten provincies and the megacity of Jakarta and city of Bandung (FCL/ur-scape 2022)
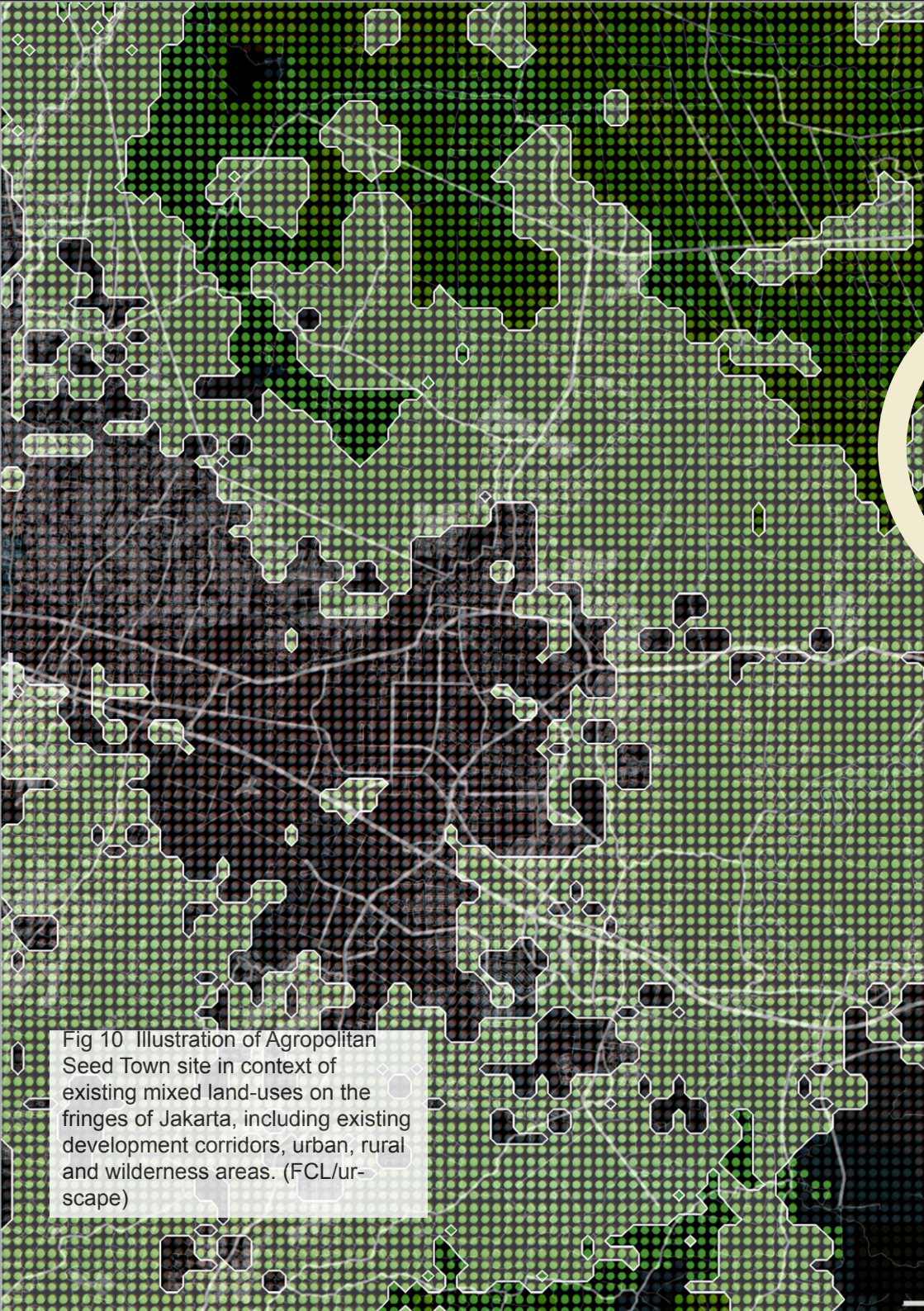
Agropolitan Potentials

Fig 10 Illustration of Agropolitan
Seed Town site in context of
existing mixed land-uses on the
fringes of Jakarta, including existing
development corridors, urban, rural
and wilderness areas. (FCL/ur-
scape)

Agropolitan Potentials
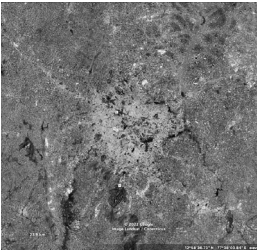
Situating Agropolitan Towns

Agropolitan Town is designed
as an urban-rural settlement
type capable of being adapted
to different settings.

Bangalore, INDIA
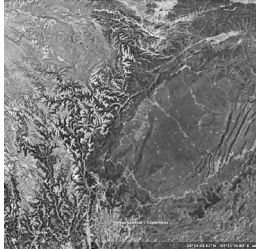Regional Scale (1000 x 1000 km)

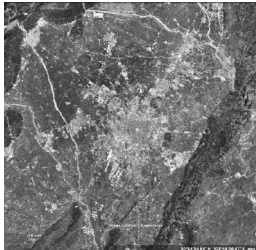City Scale (100 x 100 km)

Local Scale (1x1 km)

Chengdu, CHINA
Regional Scale (1000 x 1000 km)

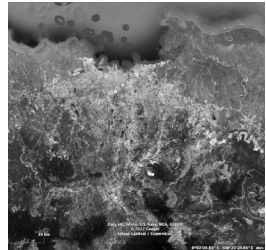City Scale (100 x 100 km)

Local Scale (1x1 km)

Jakarta, INDONESIA
Regional Scale (1000 x 1000 km)

City Scale (100 x 100 km)

Local Scale (1x1 km)

Fig 11 Scale study on 3 cities:
Jakarta, Chengdu and Bangalore

Sampling and evaluations of Agropolitan empirical examples are approached in different scales, dissecting the complexity of settlement systems into uniquely identifiable scales, meanwhile informing integrated planning & design strategies and technology innovations through different spatial hierarchies, from zoning scale (10x10km) to local scale (1x1km).

Design prototypes and technology matrix proposed at diverse scales are intended to not only allow adequate flexibility and adaptability to be translated to different cities in Monsoon Asia for different levels of interventions, but as a common base to facilitate coordination of multiple stakeholders from local communities, developers, to state planning agencies and their diverse interests.

The following are 6 steps of Agropolitan territorial analysis and proposition for wide application in Monsoon Asia regions:
1. Identify potential agropolitan area using ur-scape™ based on three parameters: cropland, GDP and population density.
2. Conduct regional scale study using a 30-km transect spanning from urban to rural area to understand the spatial distribution highlighting settlements, productive landscapes and water bodies.
3. Conduct city scale in-depth research using databases and tools including ur-scape™ on 3 scales: 10kmx10km, 1kmx1km and 10-to-20-hectare building clusters and landscape patch levels. Collect relevant data on all scales covering soil quality, farming practice, land ownership, water availability, crop coverage, flooding map, settlement area, street and paths, socio-economic data.
4. Build a multi-stakeholder consortium of farming communities, government, developers, companies, NGOs, universities and researchers, design and planning practitioners.
5. Identify local potentials, needs, vulnerabilities of the site and people. Select elements from an innovative and contextual architectural and landscape typologies matrix. Design the site plan in phases suitable to the context.
6. Select applicable solutions from our decentralised technology matrix to cover energy-water-waste, farming, biomaterial and transportation needs.

IoT sensor + solar cell

Aquaponics

Rain cover

Under develop

Soil sensor

Net

Hydroponics

Gravity irrigation (subak)

Spraying drone

Drip irrigation

Linear/ pivot irrigation

Mosquito tra

Black soldier flies facility

Bugs drone pest control

Farming

Fig 12 Decentralised technology examples in four categories: farming, energy-water-waste, bio material and transportation
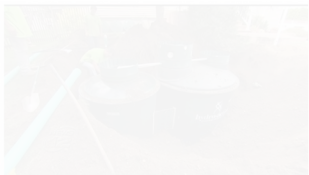
23

Solar PV cells

Mycellium structure

Transportation

Motorbike+cart

ment

Mycellium panel

Rainwater collector

Becak

Energy water wa...

Eco septic tank

Bacterial fabric

Bio-material

E-bike

Bamboo
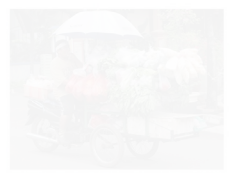
Manual composting

E-scooter

Consortium

Seed Town development is conceived around a multi-sectoral and multi-disciplinary consortium.
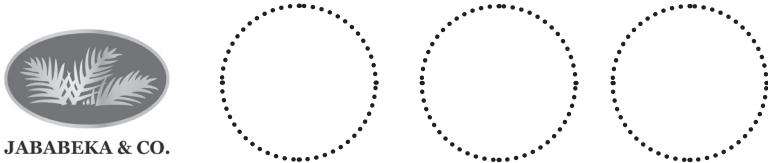
Civil Society Organisations

Professional Organisations

Academia

Industry & Philanthropic Organisations

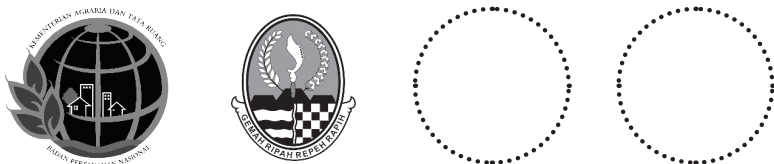## Government & Inter-Governmental Organisations

Fig. 13 Current consortium partners

The Seed Town consortium is growing around a number of core partners. To date these include Indonesia's national Ministry of Agrarian and Spatial Planning (ATR) and Provincial Government of West Java, the township developer Jababeka PT, well-known civil society organisations such as Waste4change, 1000Kebun and Indonesia Berkebun, along with Universitas Indonesia (UI), Universitas Diponogoro (UNDIP) and Institut Pertanian Bogor (IPB).

We invite complementary partners to:

- Bridge the gap between research, policy and action
- Collaborate through evidence-based design and planning
- Catalyse new ideas and approaches for sustainable development
- Support cutting edge research on urgent issues
- Join a consortium for long-term sustainable action.

Fig. 14 Multi-sector stakeholder
design-research charrette focusing
on Bioregion Java and pathways for
sustainable urbanisation (FCL 2019)

Consortium

Ways to Contribute

Consortium partners are invited to contribute expertise, knowledge, skills and/or funds to help shape the Seed Town project.

Fig. 15 Agropolitan Seed Town development sequence showing constructed and retrofitted eco-neighbourhoods and integrated diversified crops (FCL/Urban-Rural Systems).

The Seed Town project requires a range of additional expertise, knowledge, skills and funds to support the following activities:

- Construct, retrofit and mockup eco-neighbourhoods
- Demonstrate vertical gardens and community-supported farms
- Pilot biomaterials, smart technologies and blue-green infrastructure
- Shape innovative dissemination and capacity building formats
- Strategising the adaptation of the Seed Town prototype to other sites in Indonesia and Monsoon Asia.
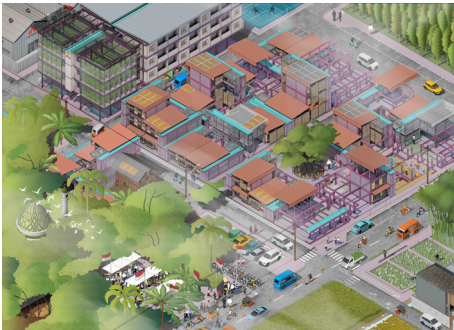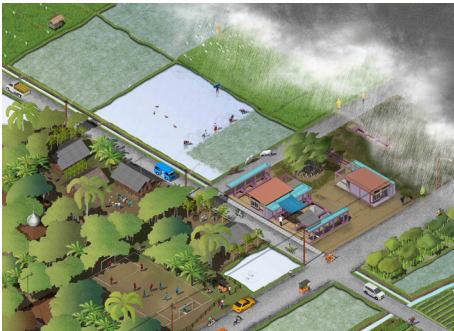
Fig. 16 Illustration of a number of Agropolitan Seed Towns inserted into an existing context on the fringes of Jakarta, featuring agroecological principles, high-density, mixed-use fabric in patch and corridor formation (FCL/Urban-Rural Systems).

Timeline

The Seed Town project will run for two years (2022-2024) and will culminate in detailed plans for adapting the prototype at scale to other sites in Monsoon Asia.

Fig. 17 Field School in *kampung* Dago Atas, Bandung (FCL/Urban-Rural Systems

The Seed Town project is planned around four overlapping phases:
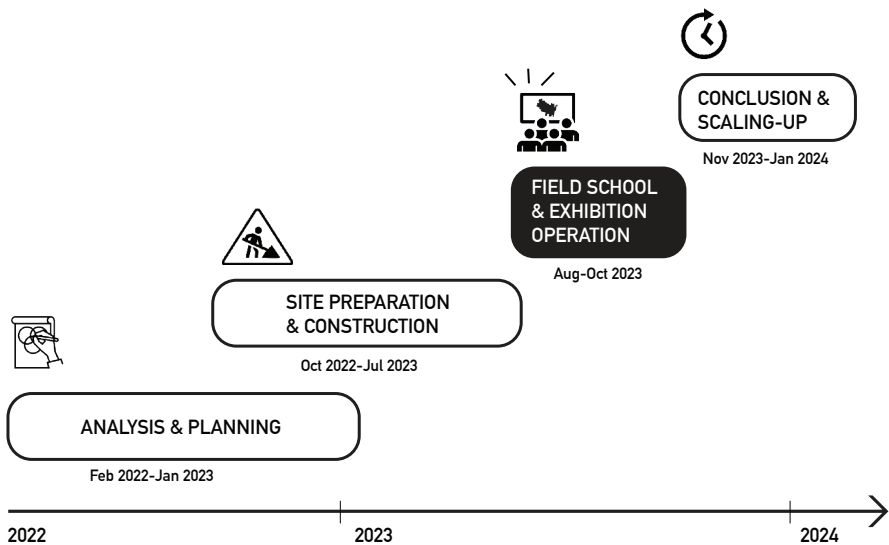
Phase 1   Analysis and planning
           Feb 2022-Jan 2023

Phase 2   Site preparation and construction
           Oct 2022-Jul 2023

Phase 3   Field school and exhibition operation
           Aug 2023-Oct 2023

Phase 4   Conclusion and scaling up
           Nov 2023-Feb 2024

The project will run for 24 months (Feb 2022 – Feb 2024). It will culminate in the field school and exhibition that will run on the site for three months (August to November 2023). Description, planning and responsibilities for these phases is set out below.

CONCLUSION &
SCALING-UP
Nov 2023-Jan 2024

FIELD SCHOOL
& EXHIBITION
OPERATION
Aug-Oct 2023

SITE PREPARATION
& CONSTRUCTION
Oct 2022-Jul 2023

ANALYSIS & PLANNING
Feb 2022-Jan 2023

2022   2023   2024

Timeline

About Us

We are passionate about translating research to action.

Fig. 18 (Clockwise from top left) Design-research workshop on agropolitan urbanisation; biomaterials lecture from Dirk Hebel (KIT/FCL); Expandable house and vertical garden pilot in Batam, Indonesia (front view); Expandable house pilot mobile domestic kitchen; Expandable house pilot side view showing composite bamboo cladding (Dirk Hebel's team).

The Seed Town project is led by the Agropolitan Territories research team at Future Cities Lab (FCL) Global in partnership with PT Jababeka, _____ and _____.

FCL Global is a research collaboration between ETH Zurich and the Singapore universities – National University of Singapore (NUS), Nanyang Technological University, Singapore (NTU Singapore) and the Singapore University of Technology and Design (SUTD) – with support from the National Research Foundation (NRF). It operates under the auspices of the Singapore-ETH Centre (SEC).

The Seed Town project builds upon a number of existing initiatives including:

- Agropolitan Territories research at the Future Cities Lab (FCL) supported by ETH Zurich, National University of Singapore (NUS) and Nanyang Technological University (NTU).
- Urban-Rural Systems (URS) design-research initiatives piloting the ur-scape planning support platform in five municipalities (Bandung, Palembang, Makassar, Jakarta and Ho Chi Minh City) (with ADB and World Bank).
- Urban-Rural Systems (URS) design-research charrette at Future Cities Lab (FCL) focussed on bioregional approaches to planning sustainable pathways for urbanisation in Java.
- Expandable House, an experimental high-density, mixed-use dwelling constructed in Batam, Indonesia. The project was undertaken at FCL with partners in Indonesia, and has attracted international attention being awarded the 'Best Indo-Pacific Living Space' by INDE (2021), and is nominated for the Aga Khan Award for Architecture (2022).

Fig. 19 Geospatial data analytics using ur-scape software developed by the Urban-Rural Systems (URS) group at Future Cities Lab, here being used to study productive land losses in Java (FCL 2019).

Agropolitan Territories Team

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