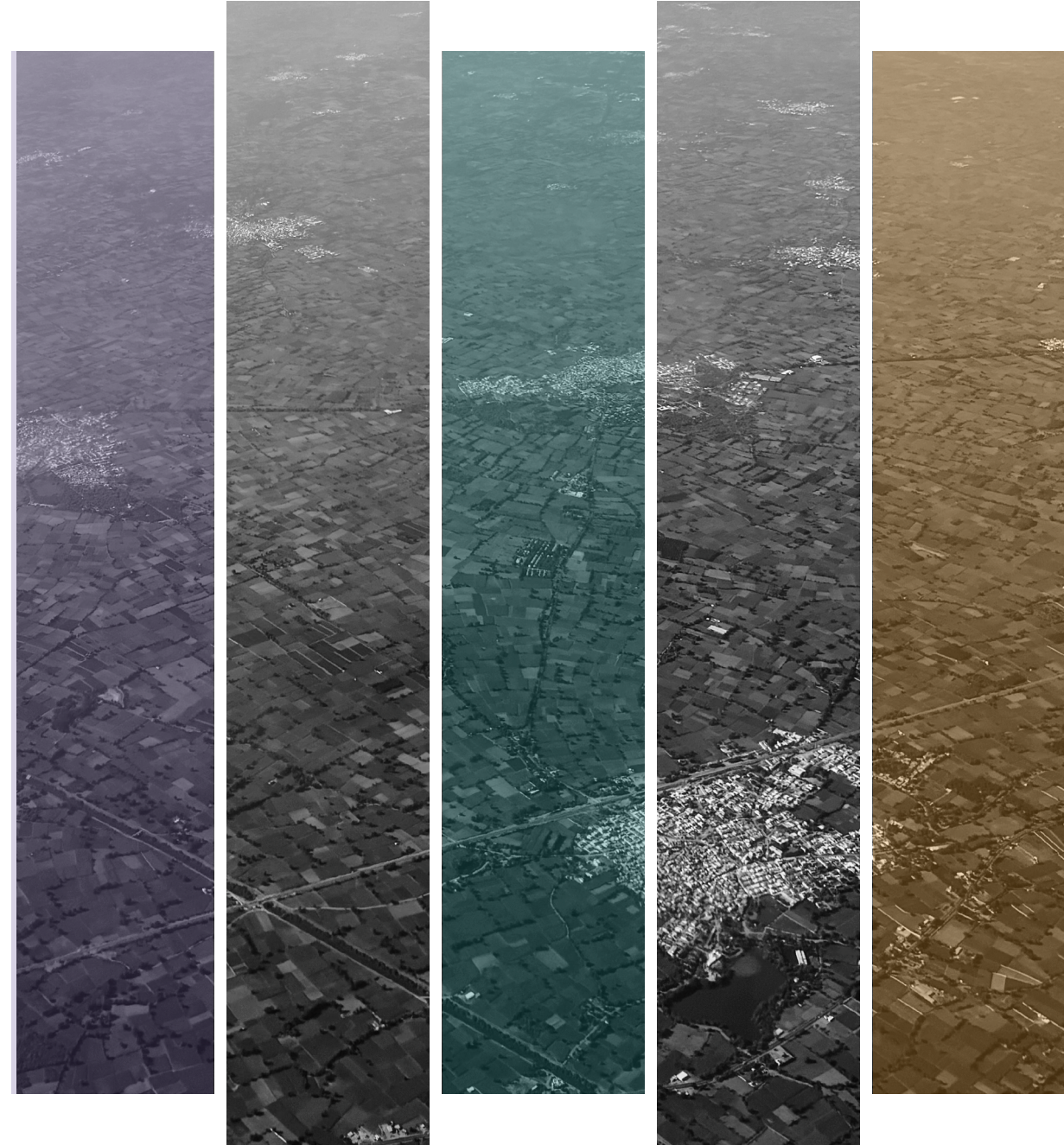




VISIONING INDIAN AGRO-URBANISM MODELS

Futuring Indian agricultural system paradigms for food sovereignty, security, and justice

Aparnaa Chandrasekaran
Mentors: Víctor Muñoz Sanz and Daniele Cannatella



WHY LOOK AT FOOD PRODUCTION

annadata sukhino bhavantu
‘May the provider of food be happy’

Farmer suicides: Small farms at the heart of distress

Policy Circle Bureau — May 20, 2026



India's farm crisis stems from shrinking size of land holdings and the resultant weak incomes.

image source: Policy Circle Bureau (2026)

some providers are far from being happy

Household food and nutrition insecurity in four drought-hit Indian states: A study in Bihar, Chhattisgarh, Rajasthan and Telengana

Geographies India

Related Topics

Nutrition

UNICEF

Updated 12 Dec 2023



image source: UNICEF India (2016)

the consumers are also far from being happy

Over 33 lakh children in India malnourished, 17.7 lakh of them severely malnourished: Govt data

Also, India has slipped to the 101st position in the Global Hunger Index (GHI) 2021 of 116 countries, from its 2020 position of 94th and is behind its neighbours Pakistan, Bangladesh and Nepal.

By: PTI 6 min read New Delhi Nov 7, 2021 07:08 PM IST



There are 17,76,902 (17.76 lakh/1.7 million) severely acute malnourished children (SAM) and 15,46,420 (15.46 lakh/1.5 million) moderately acute malnourished (MAM) children as of October 14, 2021. (File)

Make us preferred source on Google



Over 33 lakh children in India are malnourished and more than half of them fall in the severely malnourished category with Maharashtra, Bihar and Gujarat topping the list, the WCD ministry has said in response to an RTI query.

Childhood obesity: Why are Indian children getting fatter?

29 July 2022 Share Save Add as preferred on Google

Geeta Pandey
BBC News, Delhi



After weeks of treatment and a gastric bypass surgery in 2018, 14-year-old Mihir Jain's weight came down to 165kg from 237kg

India has long topped the list of countries with the highest number of malnourished children in the world. It's now increasingly also reporting alarming levels of childhood obesity which, experts say, could take on the form of an epidemic if not tackled urgently.

image source (L-R): Press Trust of India (2021); Sebastian, 2022

double-burden of malnutrition & obesity

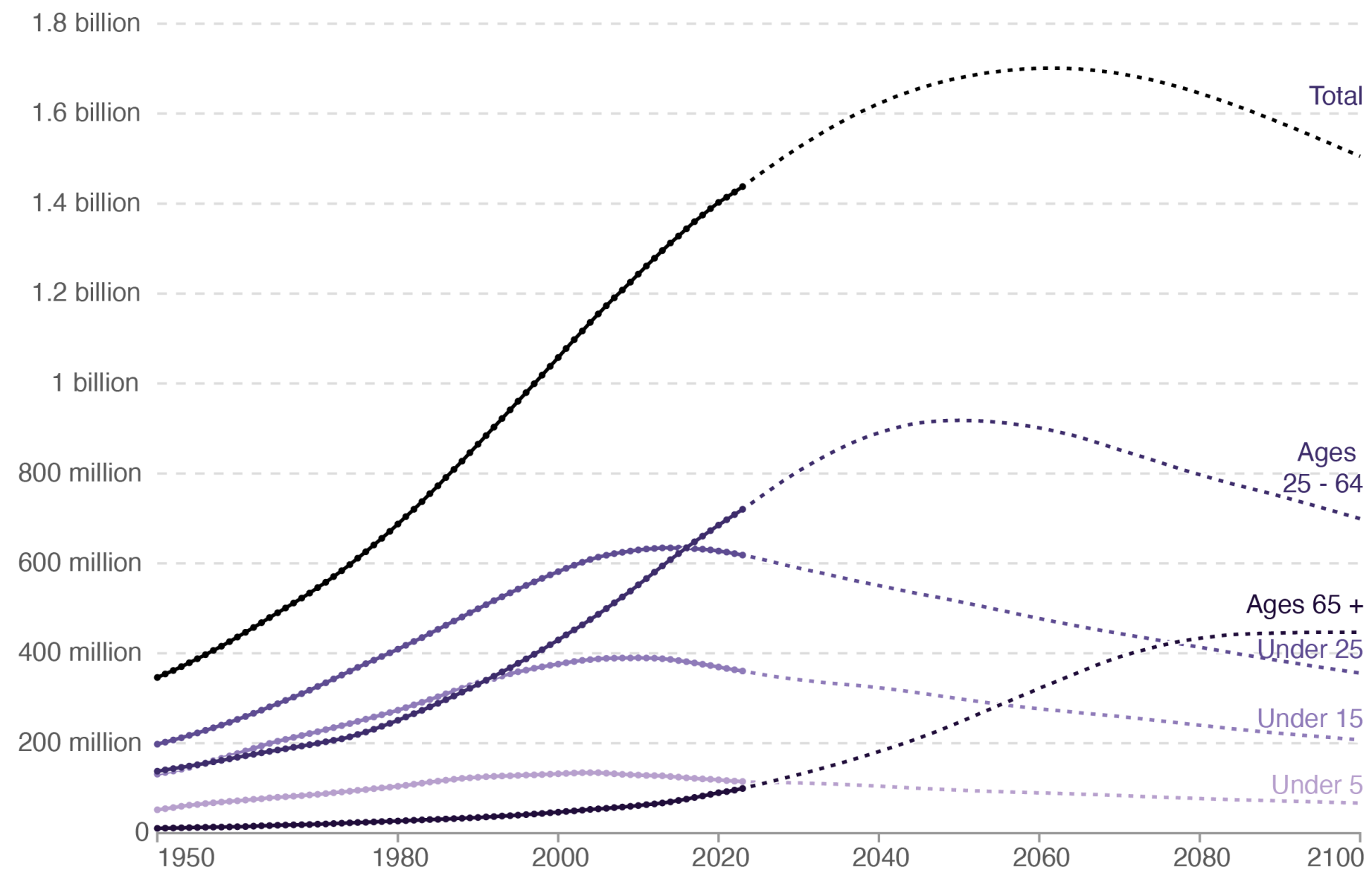
PM Modi And Netherlands' PM Discuss Strengthening Ties In Water, Agriculture & Health



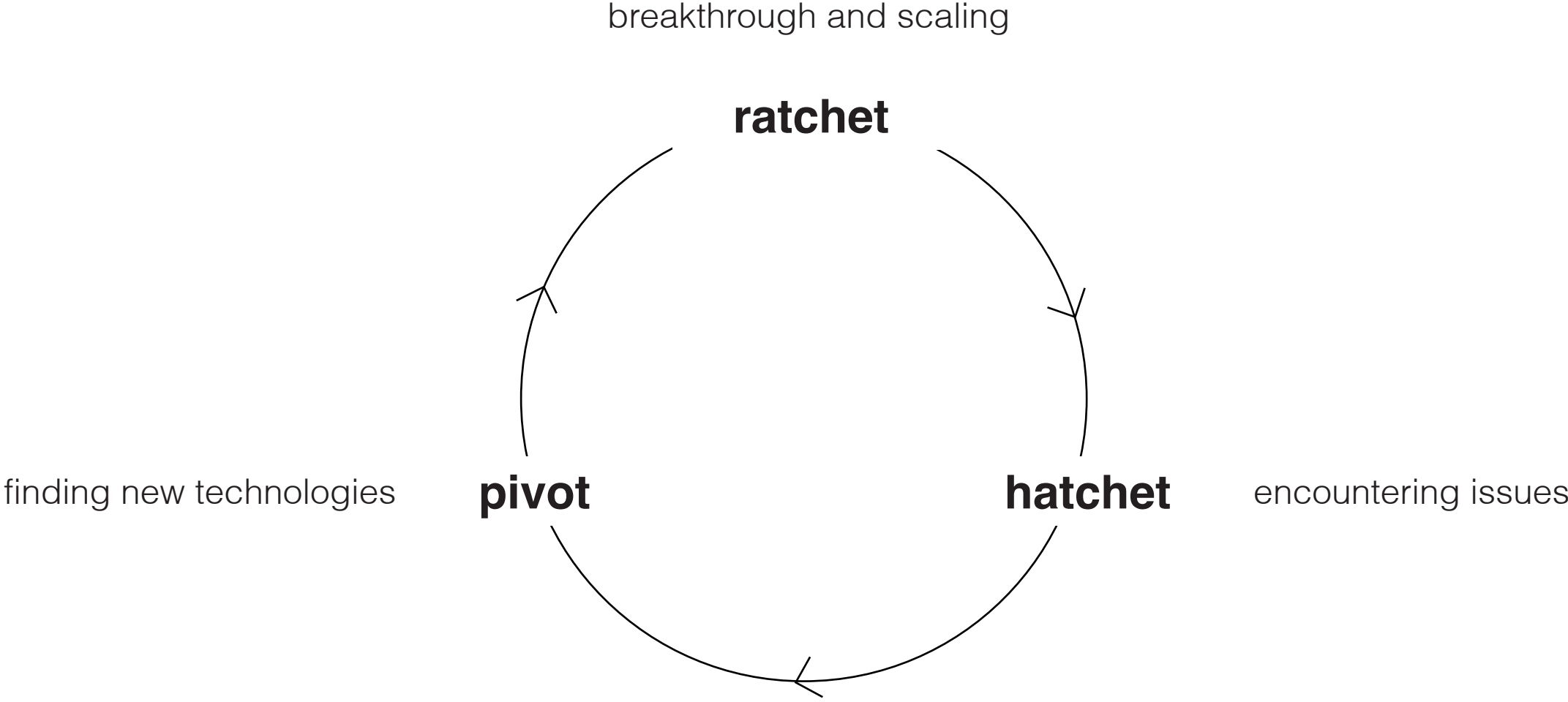
Prime Minister Narendra Modi and his Netherlands counterpart Dick Schoof today discussed ways to further deepen the existing cooperation in the sectors of water, agriculture, and health. Mr Modi received a telephone call

image source:

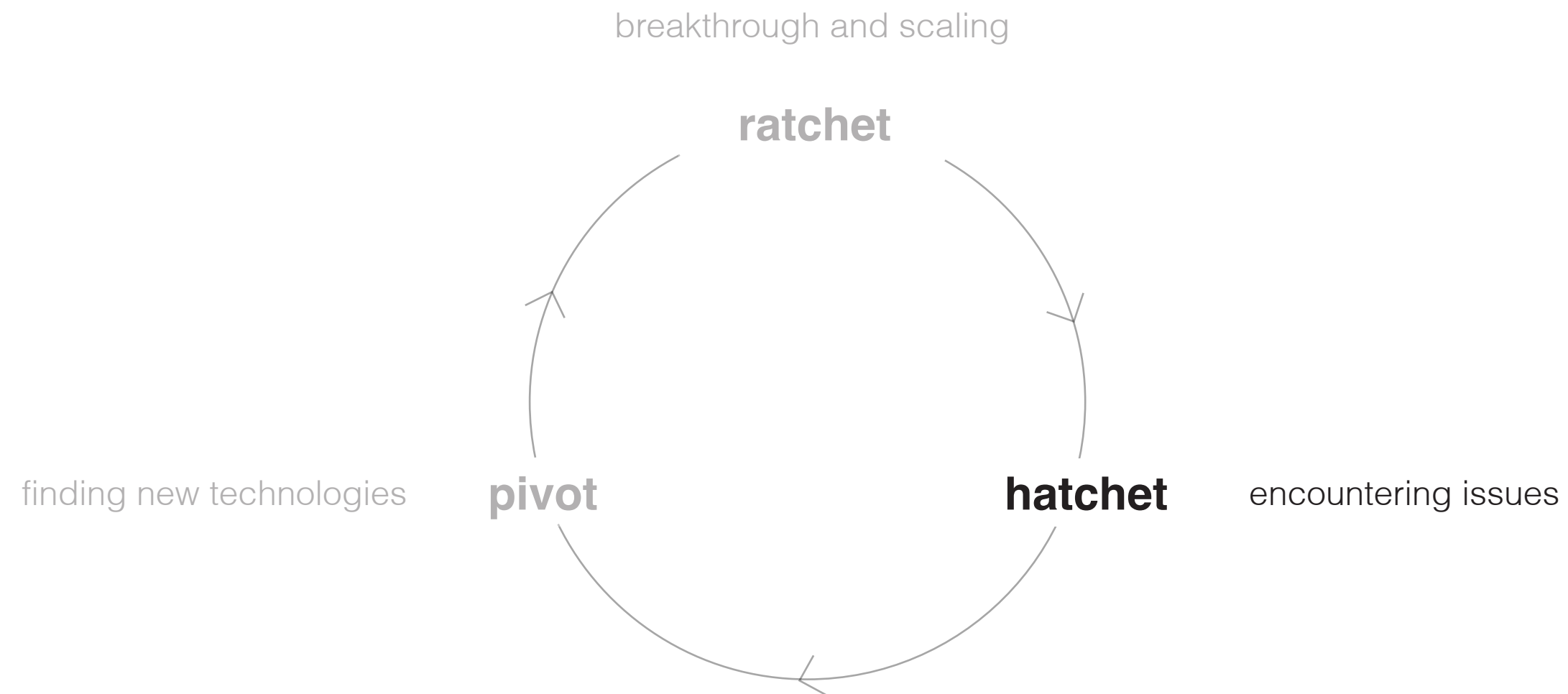
global partnerships for agriculture



How are we going to meet the nutritional requirements of the most populous country in the world?



source: DeFries (2014)
The Big Ratchet



source: DeFries (2014)

conventional farming has reached the hatchet stage

Climate change impact harsher on poorer farmers in India: FAO report



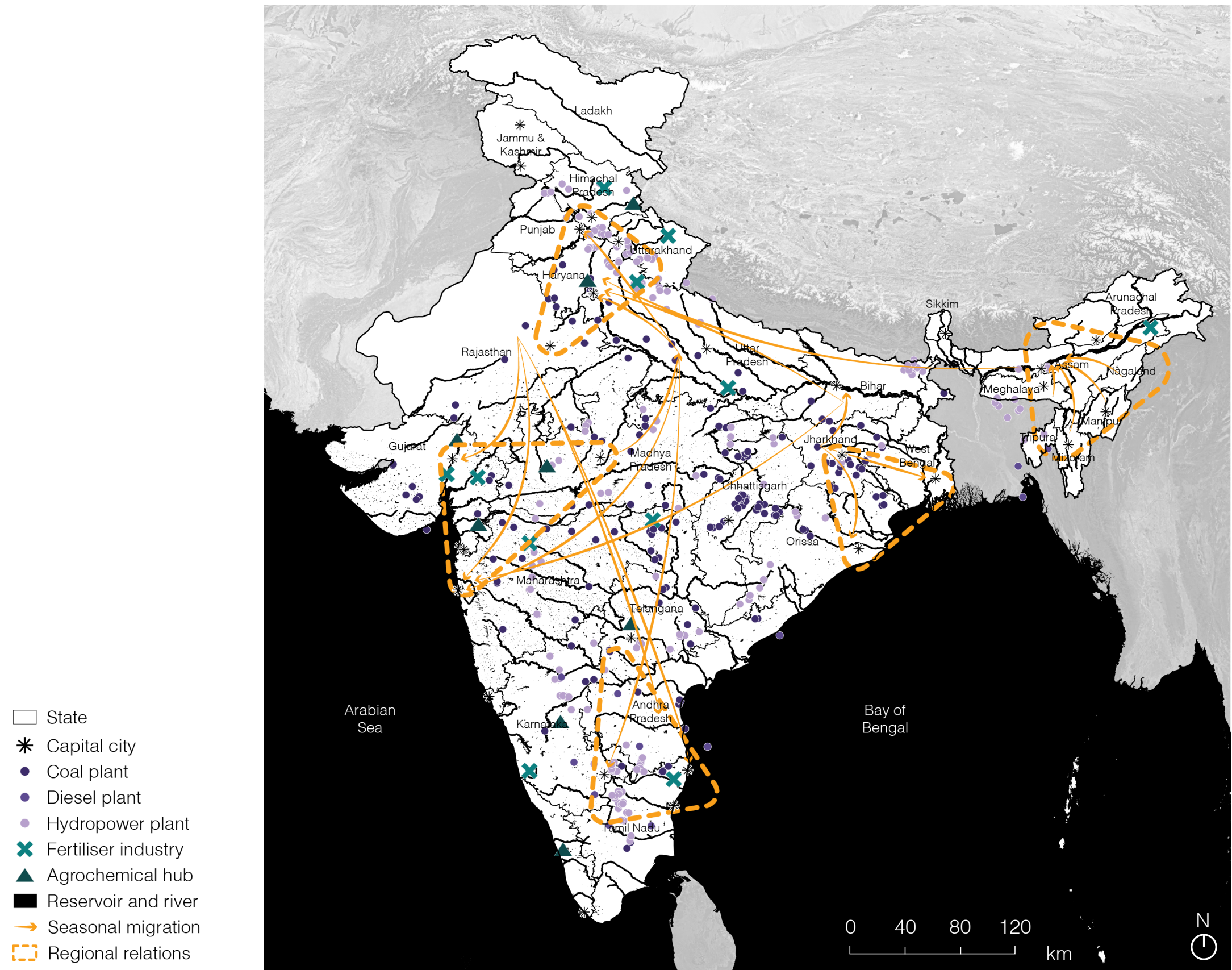
image source: FAO (2021)

injustice to farmers and the environment



image source: Bolhuis et al. (2026)

competing interests



contestation over agricultural land

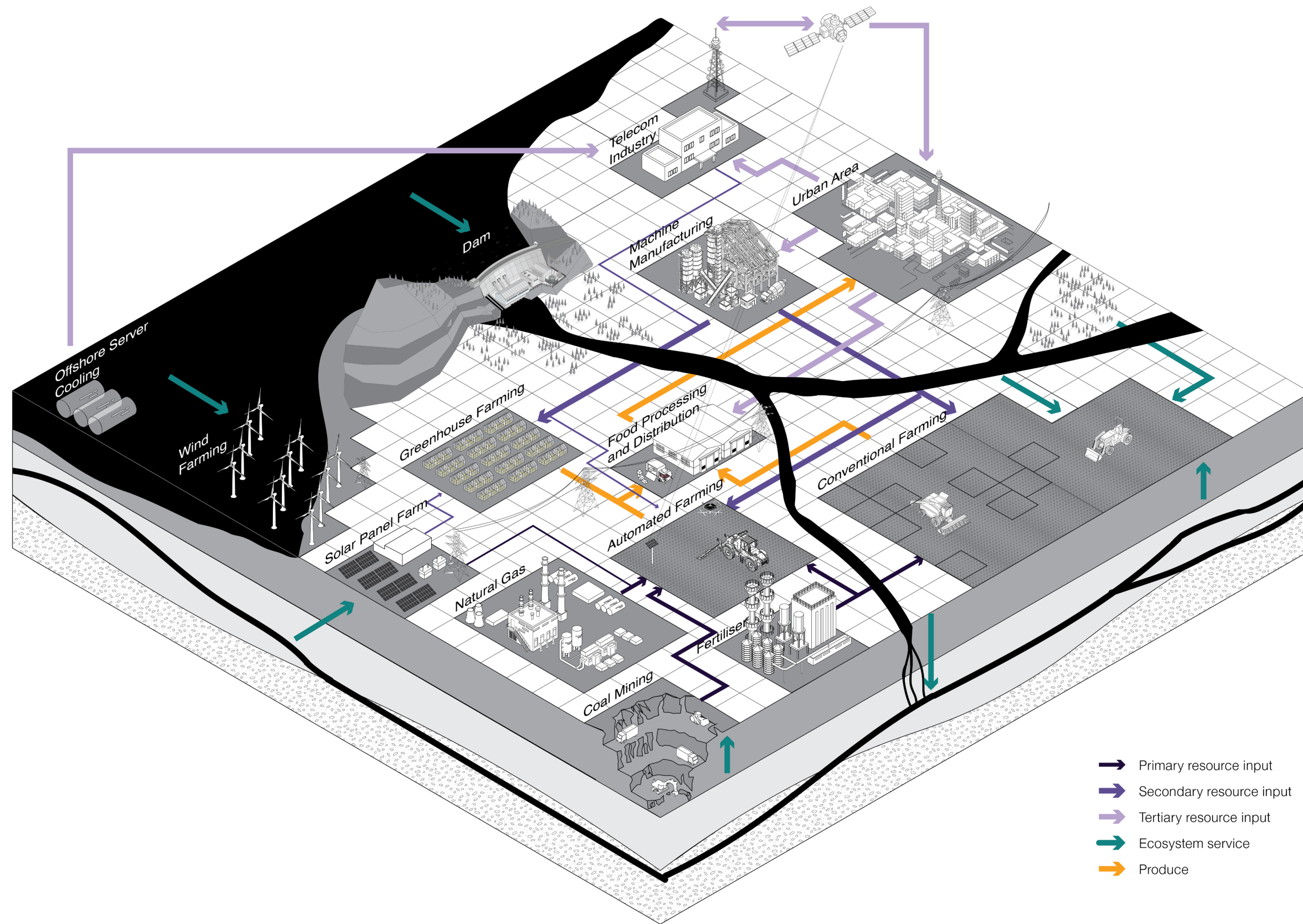
Privacy concerns, no consultation: Farmer and digital rights groups write to Centre on AgriStack

The current framework is not in the best interests of the farmers, says letter



image source: DTE Staff (2021)

socio-cultural and environmental concerns regarding automated agriculture



resource input and land allocation

RESEARCH QUESTION

How can India's food production achieve resilience in a just manner, improving agricultural productivity to meet the nutritional security, while also ensuring the producers' liveability and ecological sensibility?

WHAT: REVIEW

- What are the **systems and subsystems** related to agricultural practices and food systems in India?
- What is the **current global discourse** on agro-urbanism models aimed at achieving food system resilience?

WHY: REASON

- What are the current **environmental, spatial, hydrological, social, and economic characteristics** that impact food production in India?
- What are the **complexities within the current spatial governance framework** that impede food production resilience?

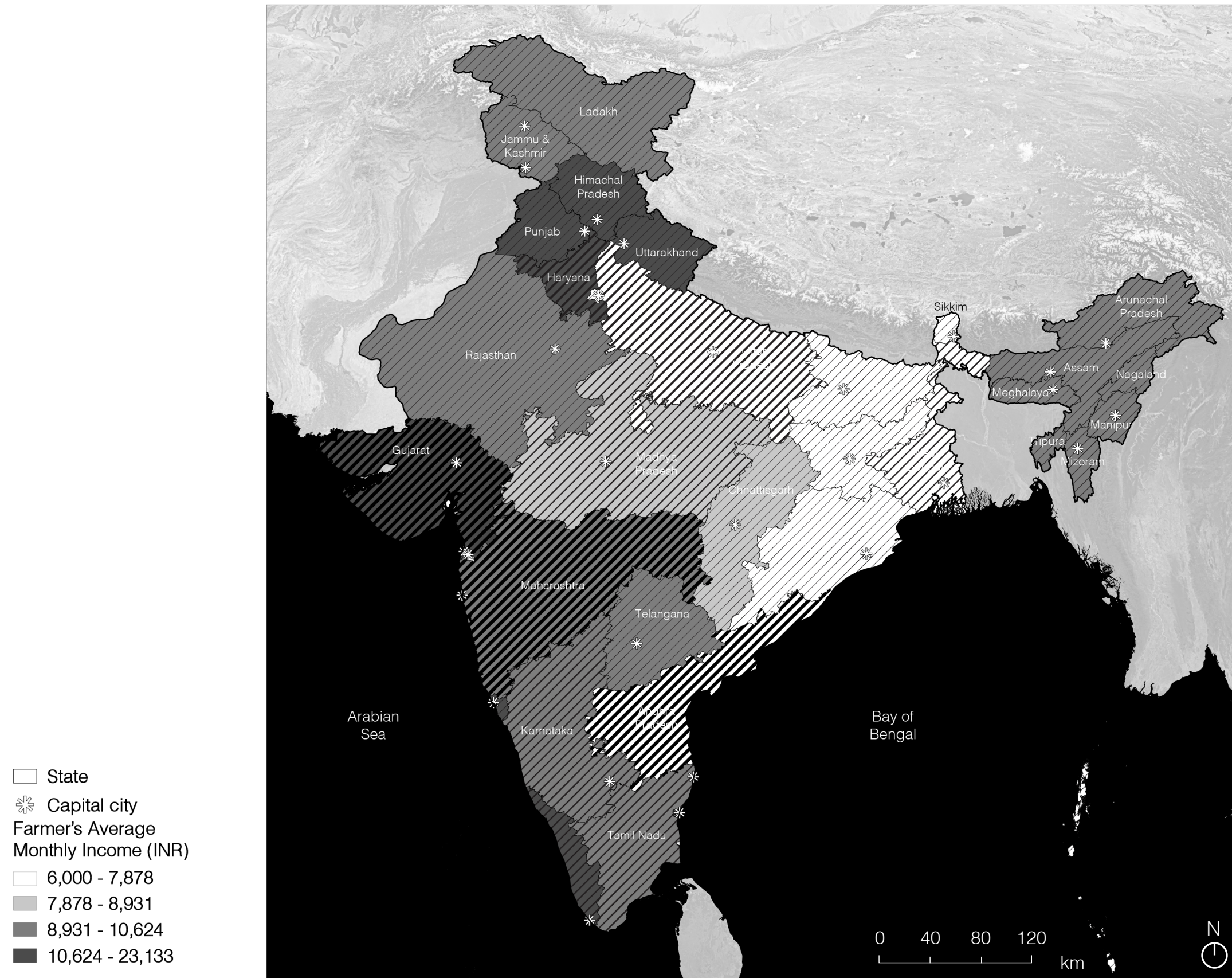
WHERE: REGION

- What are the various **agricultural spatial typologies** in India?
- What are the **biophysical considerations** for the typologies to make the transformation process of the food production practices **across seasons and scales** feasible?

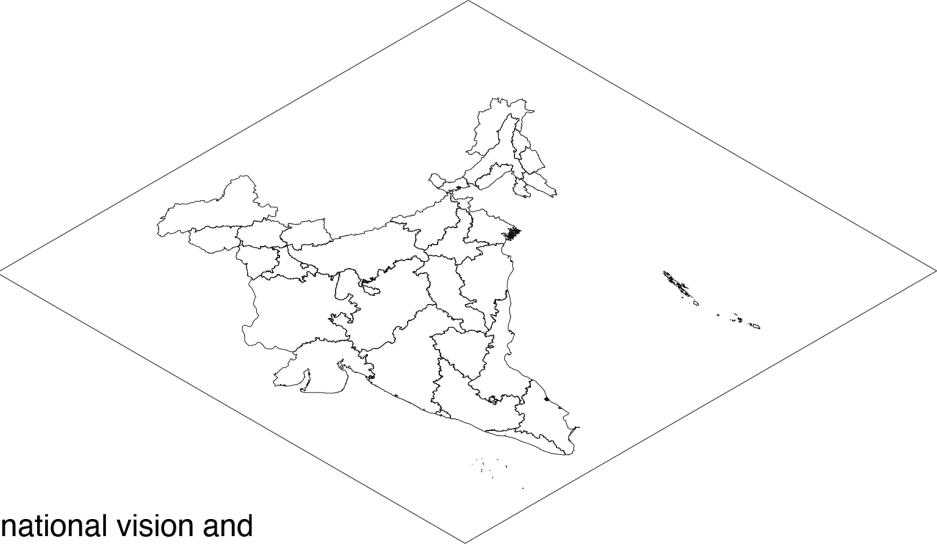
HOW: REDEFINE

- What **agro-ecotechnological solutions** can enhance food production resilience to meet food demand?
- What are the **actions required in urbanised spaces** of consumption to establish a symbiotic nature with spaces of production?
- Why are the **key actors to be introduced and/or empowered** in the governance framework?
- What is a **context-sensitive Indian agro-urbanism model**?

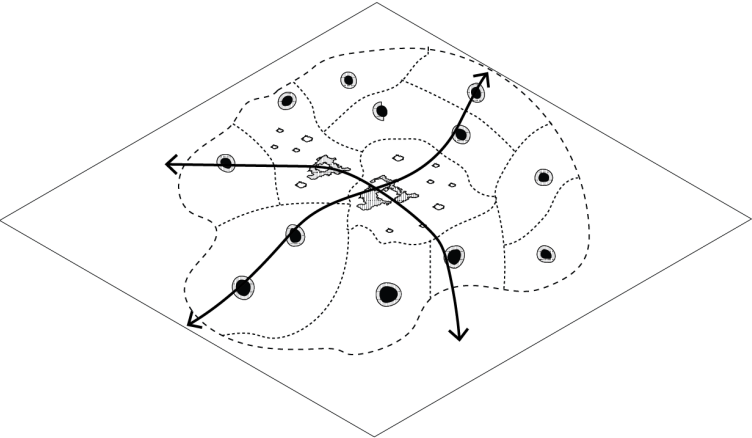
DECODING INDIAN AGRO - URBANISM



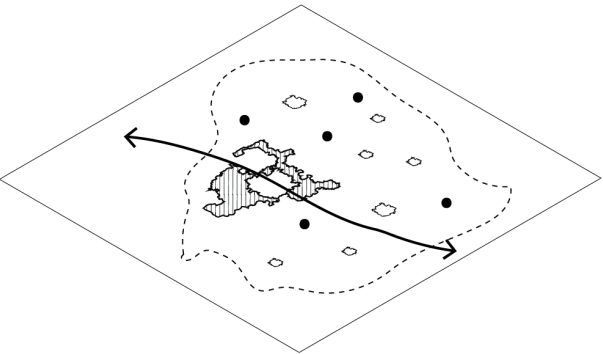
current state



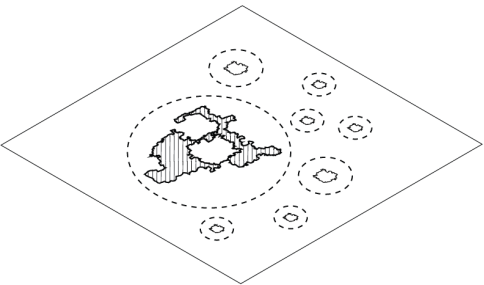
national vision and schemes



state level infrastructure



district level coherent plan



development plan (rural and urban)

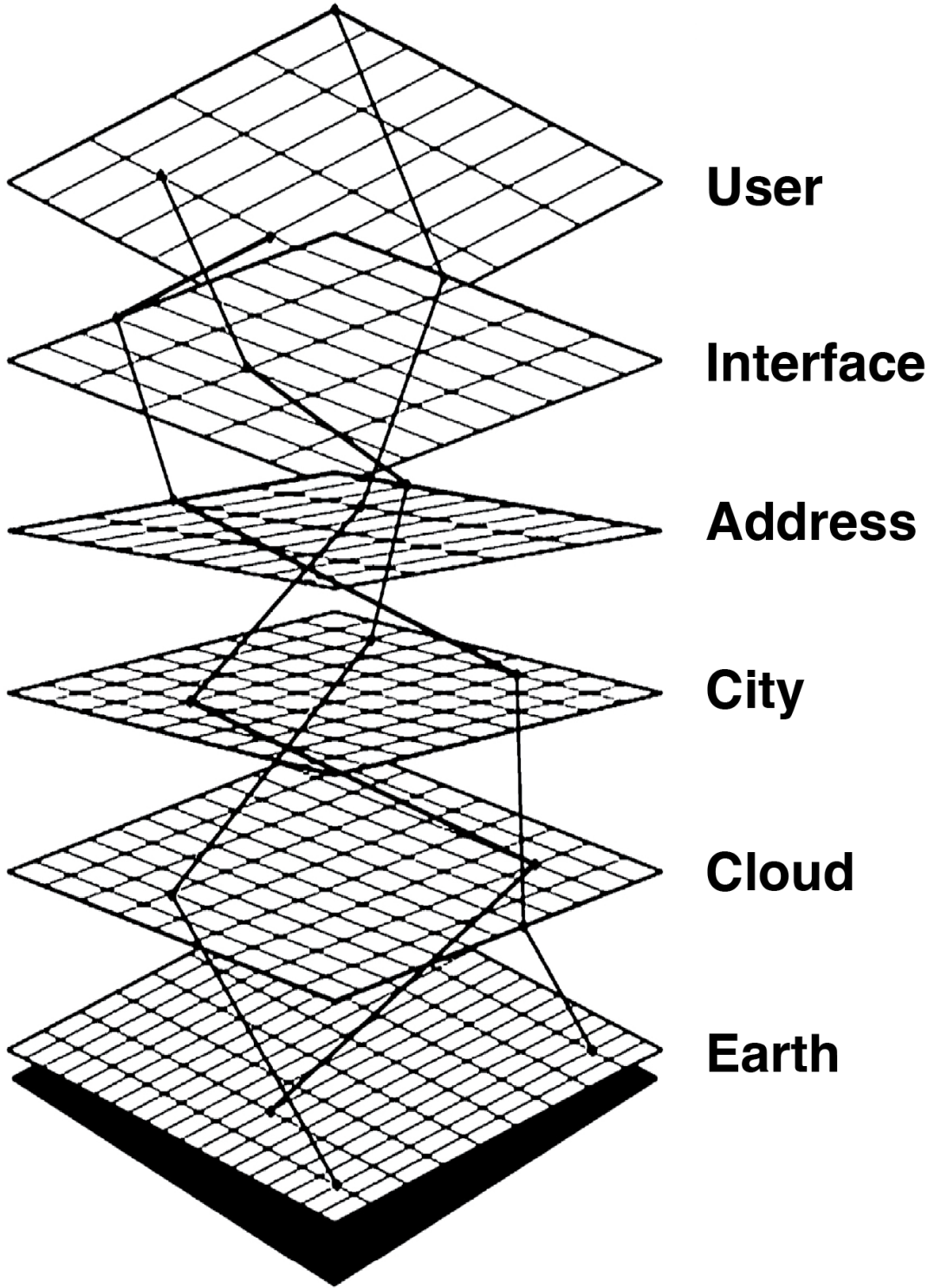
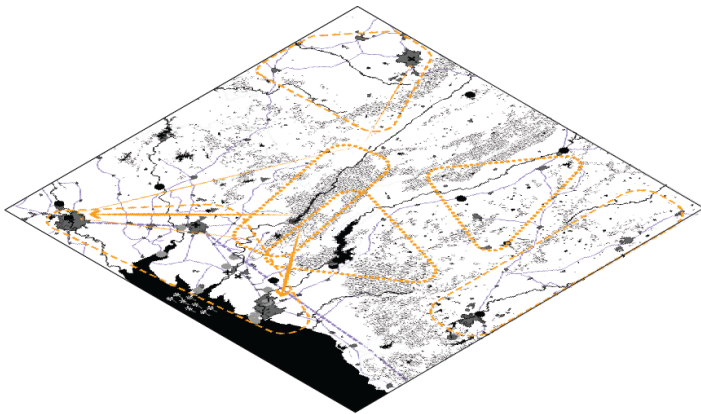
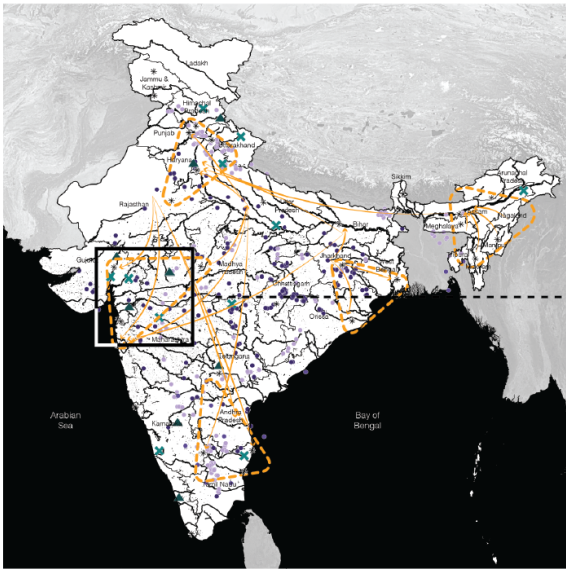
national →

← local

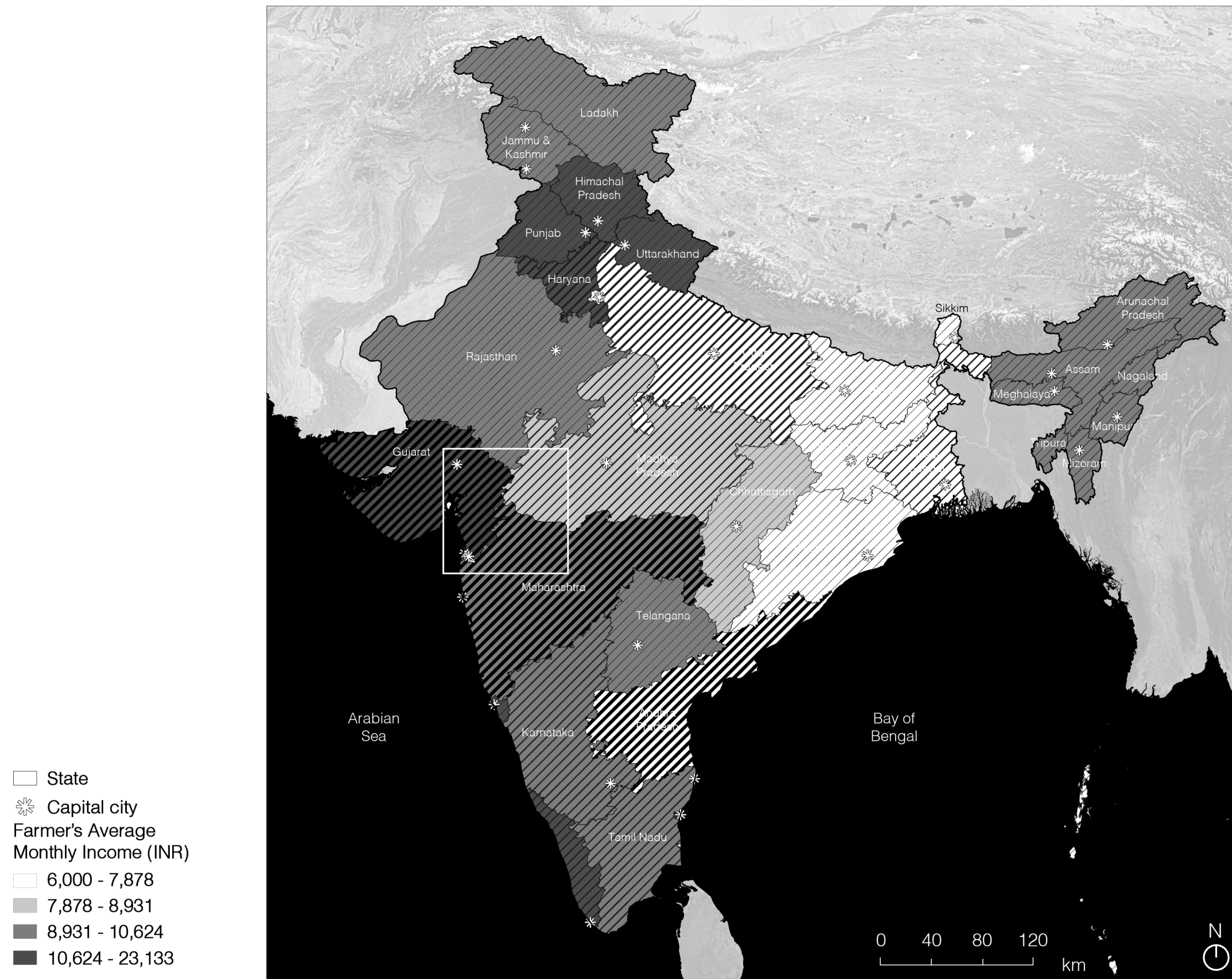
national funding vs. local implementation

inserting a regional layer

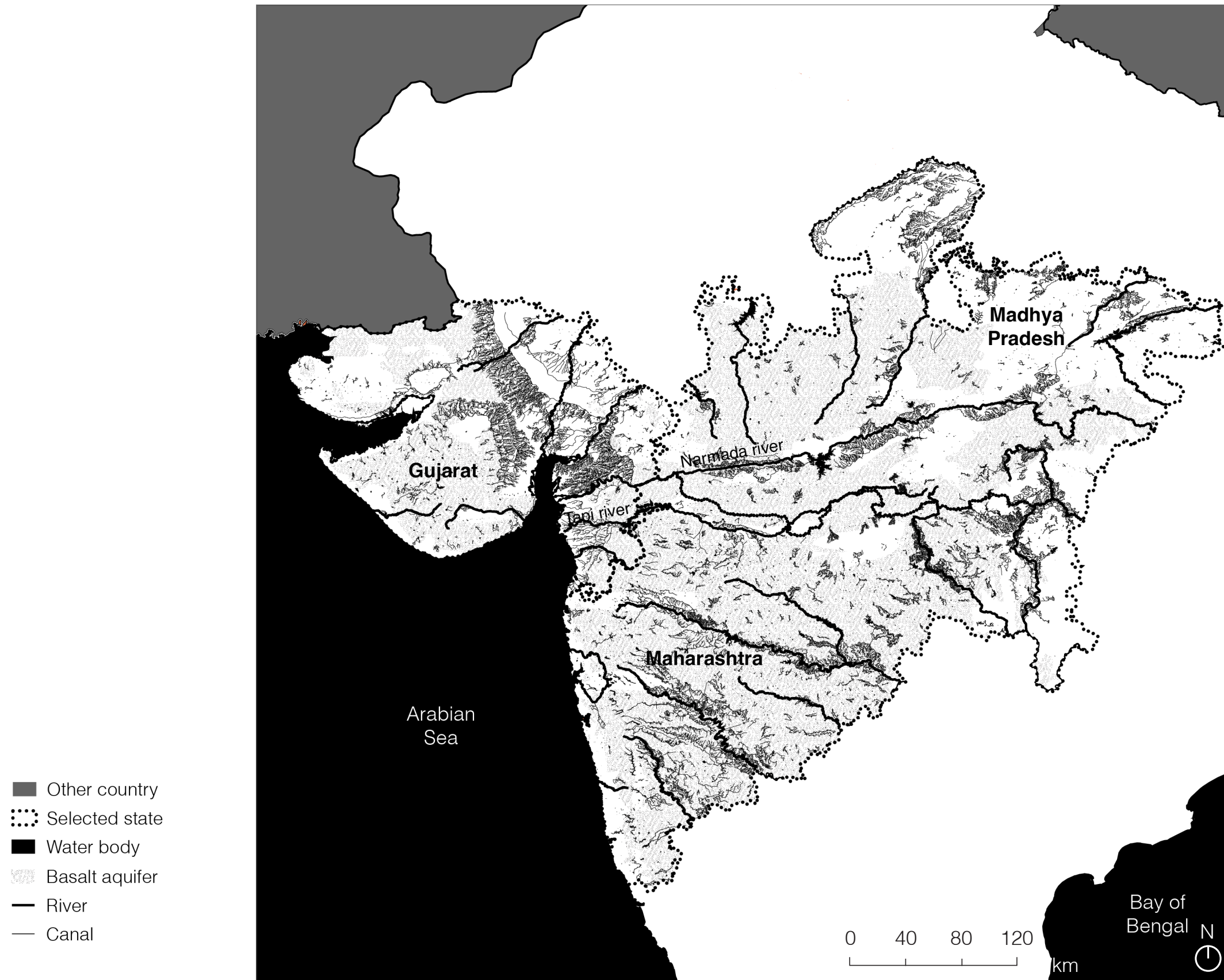
Position as an urbanist to use the regional scale as a transition between the city and cloud to ensure food sovereignty.



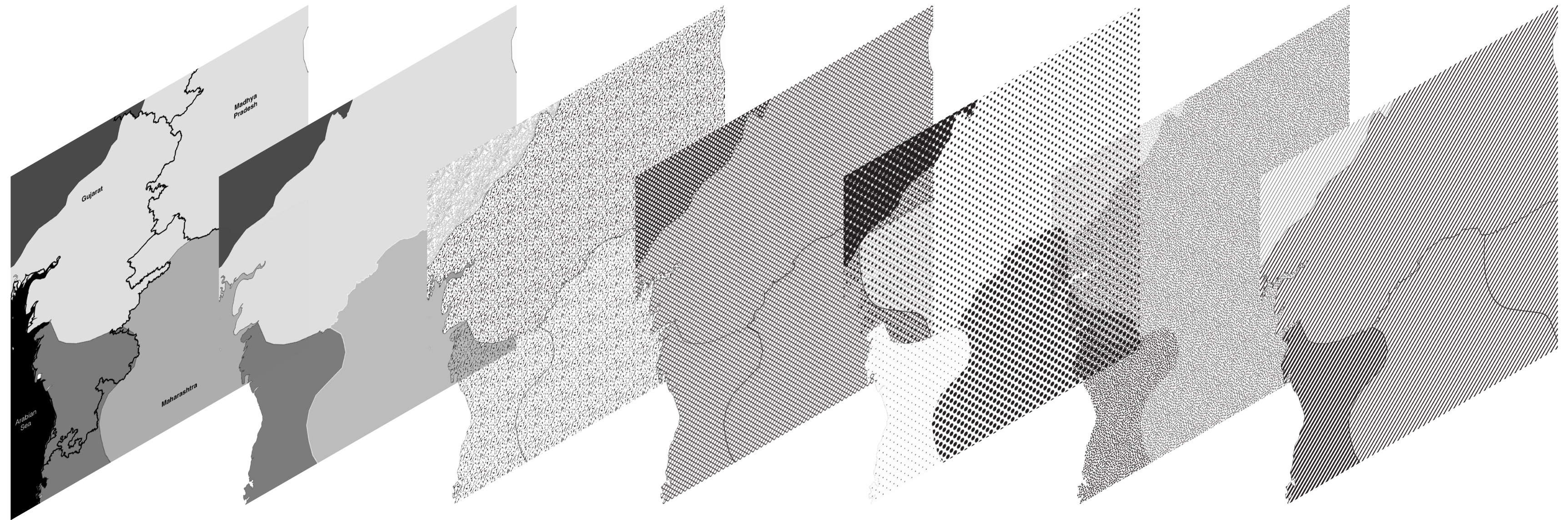
the in-between regional scale



scope: India's western region



shared hydrogeological features



Agro-climatic zones

- State boundary
- Western Ghats and Coastal Plain
- Central Highlands (Malwa)
- Northern Plain (and Central Highlands)
- Deccan Plateau

Agro-climatic sub-zones

- Western Ghats and Coastal Plain
- Central Highlands (Malwa)
- Northern Plain (and Central Highlands)
- Deccan Plateau: Central and Western Maharashtra
- Deccan Plateau: Eastern Maharashtra Plateau

Available water content (AWC)

- Medium to high
- Medium

Soil depth

- Deep
- Medium to deep
- Shallow to medium

Soil type

- Loamy grey brown and alluvium-derived soil
- Loamy to clayey black soil
- Clayey black soil
- Loamy to clayey mixed red and black soils

Weather type

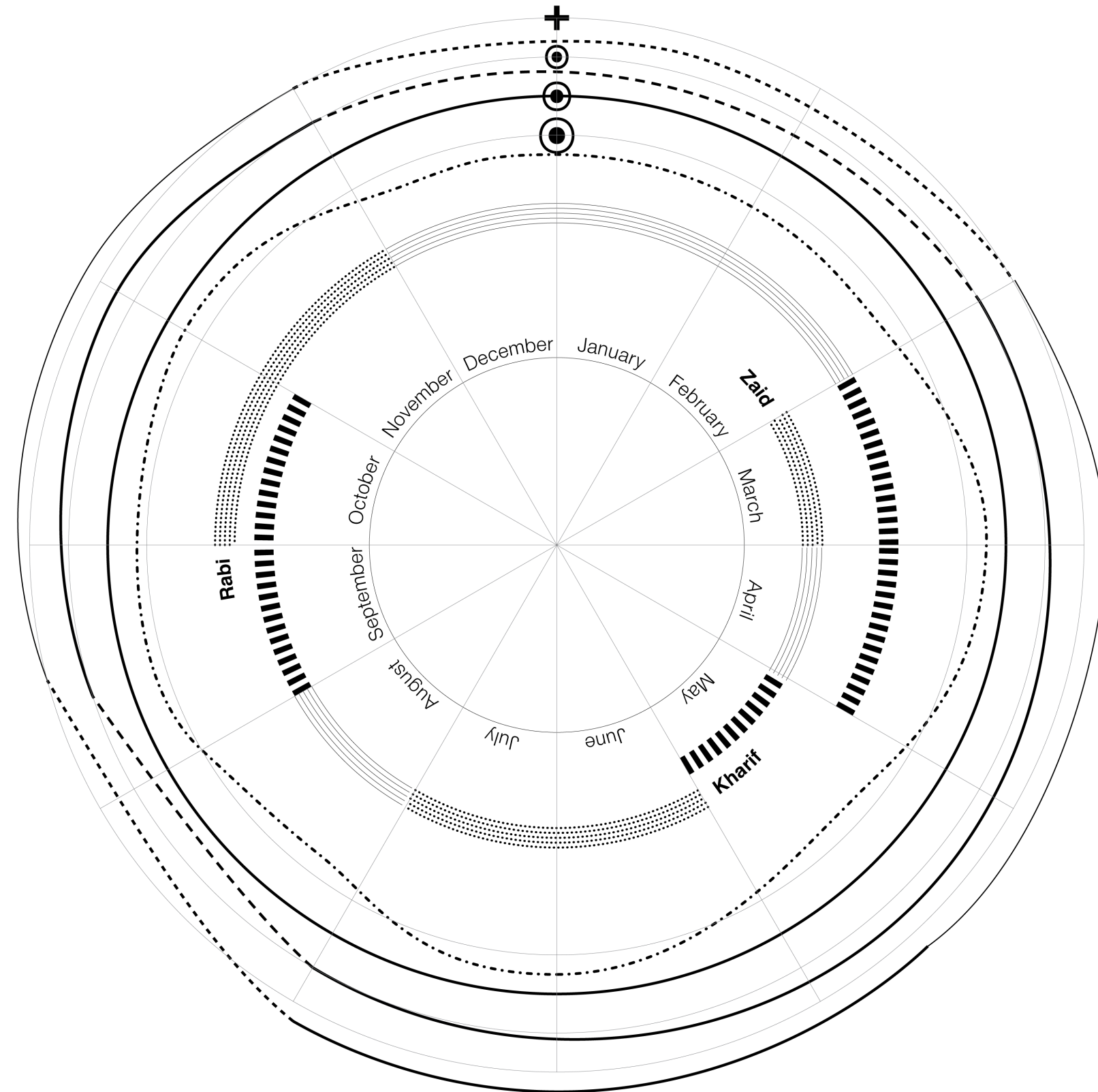
- Hot moist subhumid
- Hot moist semi arid
- Hot dry semi-arid

Length of Growth Period (LGP)

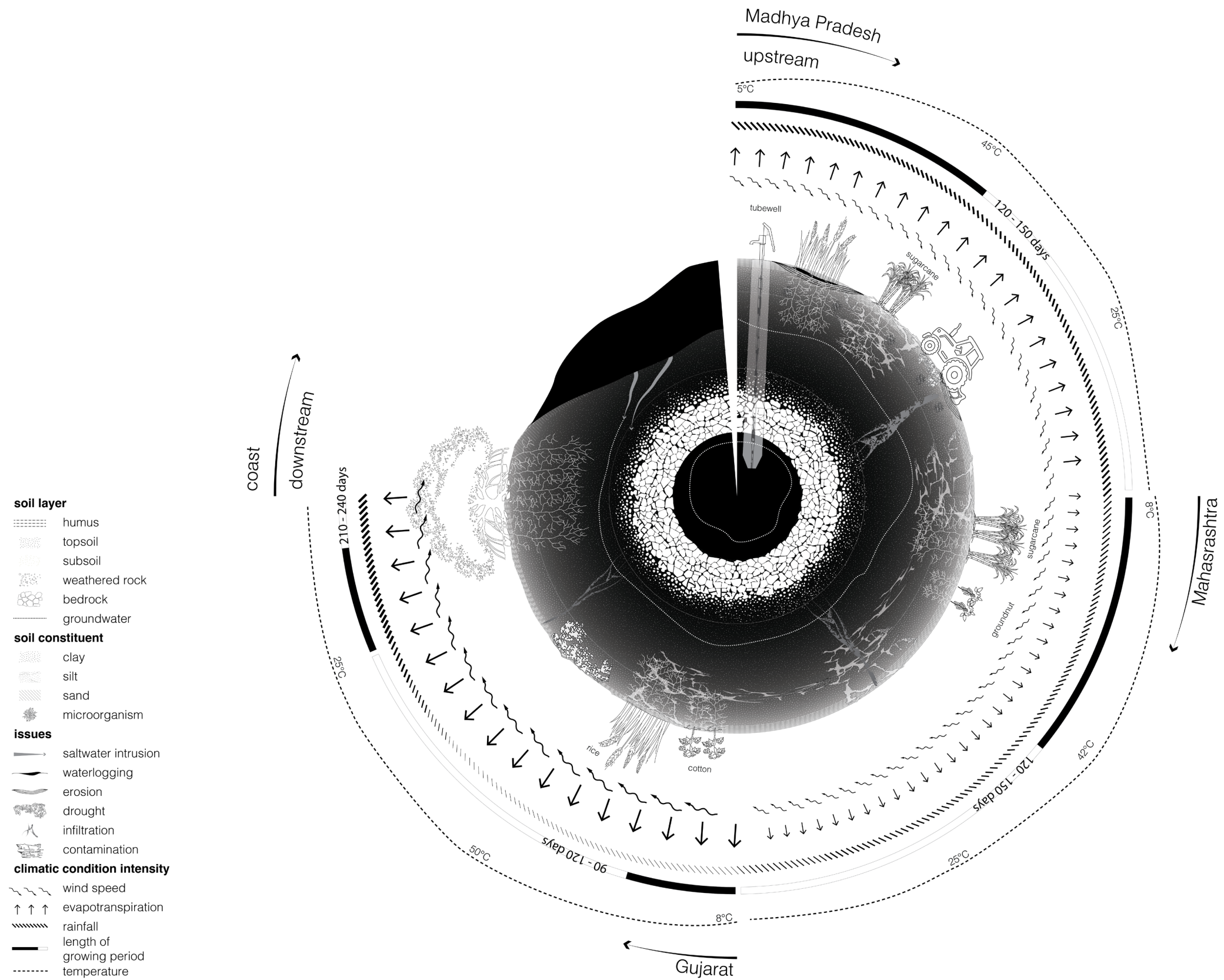
- 210 - 240 days
- 120 - 150 days
- 90 - 120 days

agro-climatic zone characteristics

- farm activity**
- ||||| sowing
 - ==== crop period
 - ||||| harvesting
- farmer type**
- + tribal farmer
 - ◉ marginal, small
 - ◉ semi-medium, medium
 - ◉ large
- farm presence**
- wage labourer
 - agri labourer
 - agri owner
 - owners
 - ⌒ rural area
 - ⌒ urban area



urban-rural movement of 6 farmer typologies



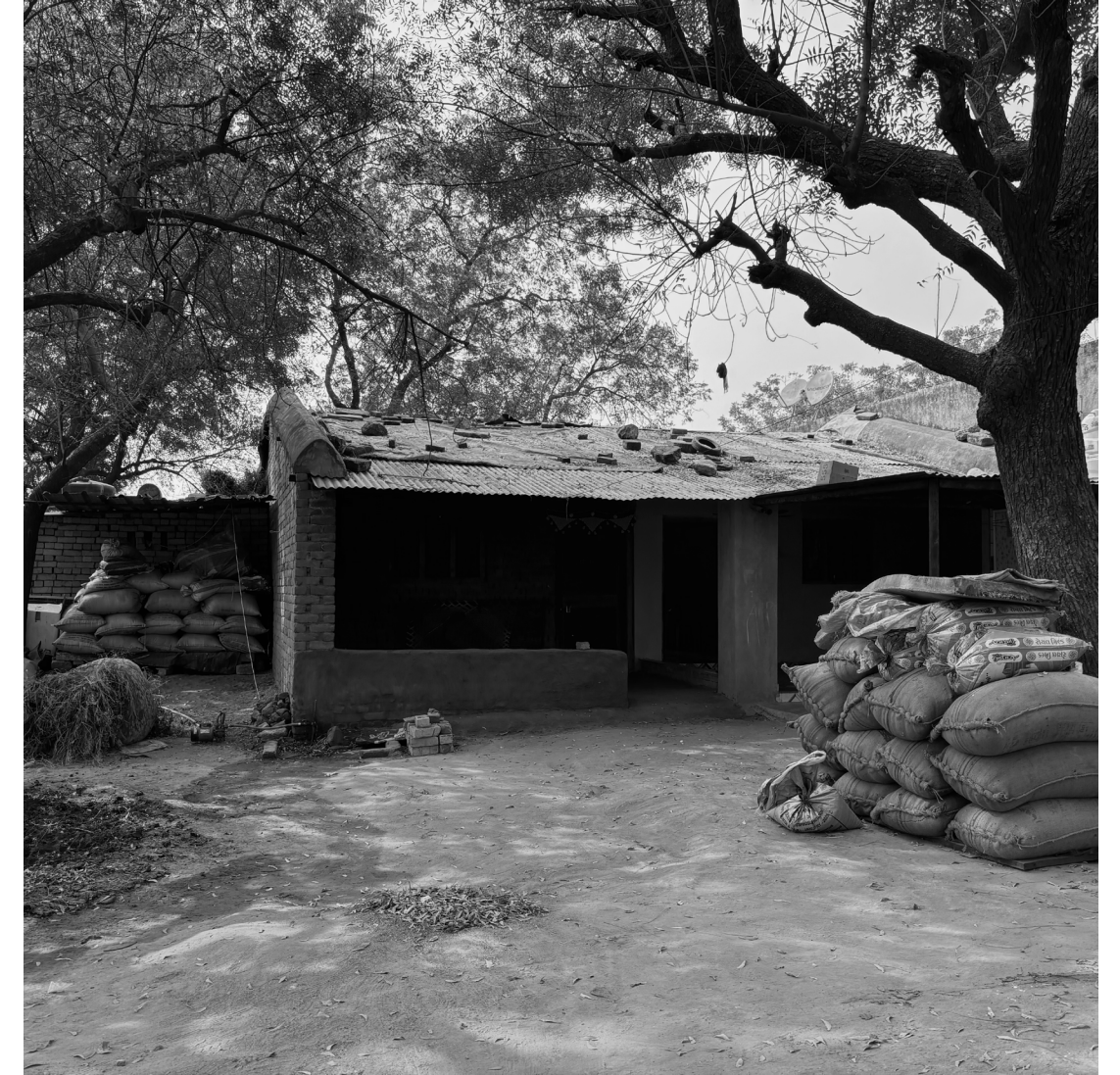
regional impacts of anthropogenic activities and climatic conditions



APMC Market in Surat for storage and trade



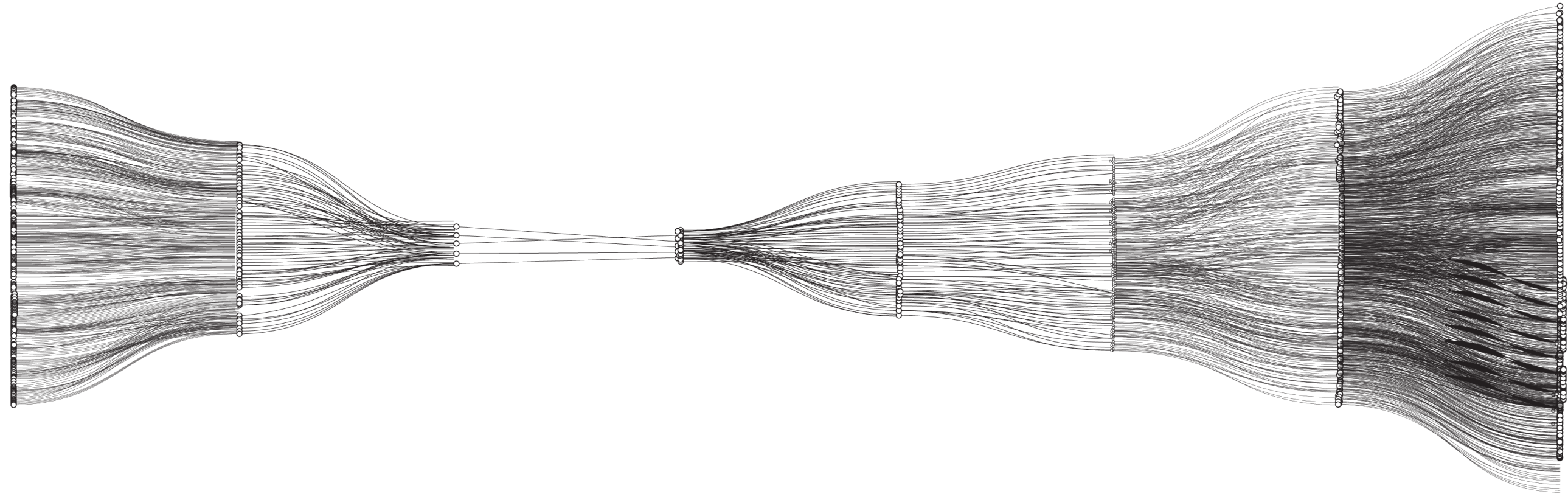
Central Warehouses for non-perishable produce , Nashik



Farmers storing grains in their houses.

formal and Informal storage systems

35% of share	12.5% of share	5% of share	12.5% of share	10% of share	30% of share		
9 - 10 Million	1.5 - 2.5 Lakh	750 - 1000	3 - 5 Lakh	5 - 8 Lakh	2 - 3 Lakh	30 - 40 Million	130 - 160 Million



PRODUCTION AND CONSUMPTION STATISTICS

“Agriculture should not be viewed merely as subsistence but as an enterprise requiring knowledge, skill, and innovation.”

“Limited access to institutional credit remains one of the most critical constraints to agricultural investment among smallholder farmers.”

“Watershed degradation undermines both ecological sustainability and human resilience in rainfed agricultural systems.”

“Large infrastructure projects often transform riverine and forest ecosystems, affecting livelihoods that depend on these landscapes.”

Agriculture continues to employ nearly half of India’s workforce while contributing a much smaller share to GDP, reflecting low productivity and persistent rural income challenges.

“Cities cannot be understood in isolation from the rural regions that sustain them; food systems connect urban consumption to rural production.”

“Improving farm incomes alone is insufficient; rural well-being depends equally on education, healthcare, infrastructure, and access to markets.”

“Rural and peri-urban communities are among the most vulnerable to climate variability because their livelihoods depend directly on ecological systems.”

“Limited access to institutional credit remains one of the most critical constraints to agricultural investment among smallholder farmers.”

“Planning practice is deeply embedded in political processes, and planners frequently operate within constraints imposed by short-term political priorities rather than long-term spatial strategies.”

“Mixed crop-livestock systems are among the most resilient agricultural models, particularly in regions exposed to climate variability.”

“Climate change is expected to reduce water availability and increase the frequency of extreme weather events in semi-arid regions.”

“Farmers’ knowledge systems are deeply rooted in ecological understanding and must be recognised as valuable forms of expertise.”

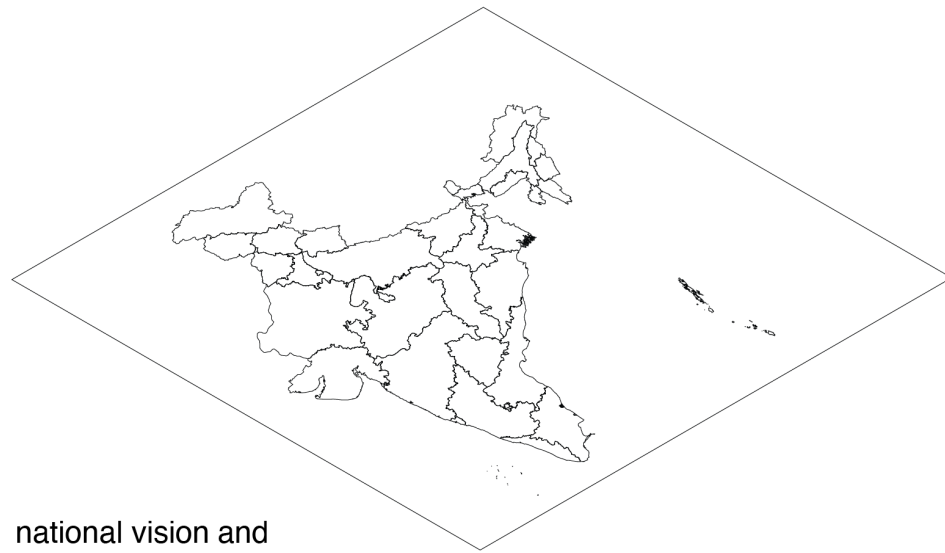
“Rural households increasingly rely on non-farm income sources, including construction labour, as agriculture alone cannot sustain household aspirations. Migration is often not a choice but a compulsion driven by limited local opportunities and inadequate rural services.”

“Modernist land-use zoning often fails to address the complexity of contemporary landscapes, particularly where rural and urban functions overlap.”

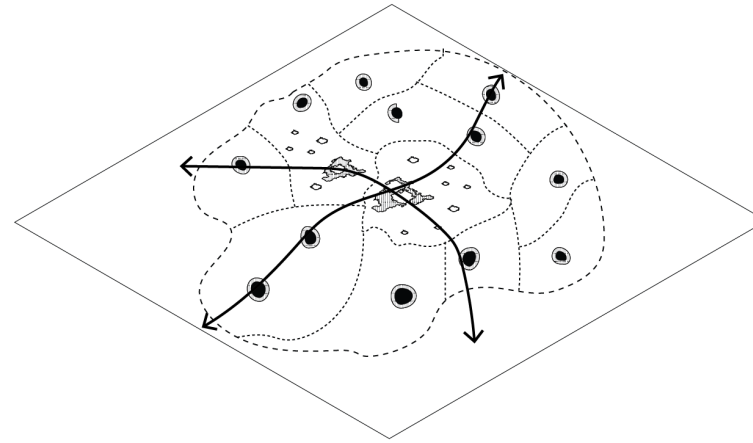
“Planners are often positioned between competing interests and are expected to mediate conflicts, even when the underlying decisions are shaped by political authority.”

“Loss of biodiversity in agricultural landscapes reduces resilience to pests, climate variability, and soil degradation.”

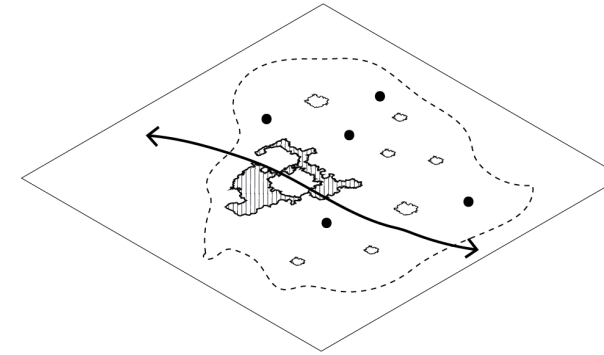
LIVED REALITIES



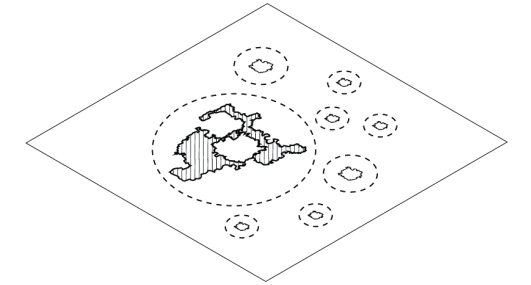
national vision and schemes



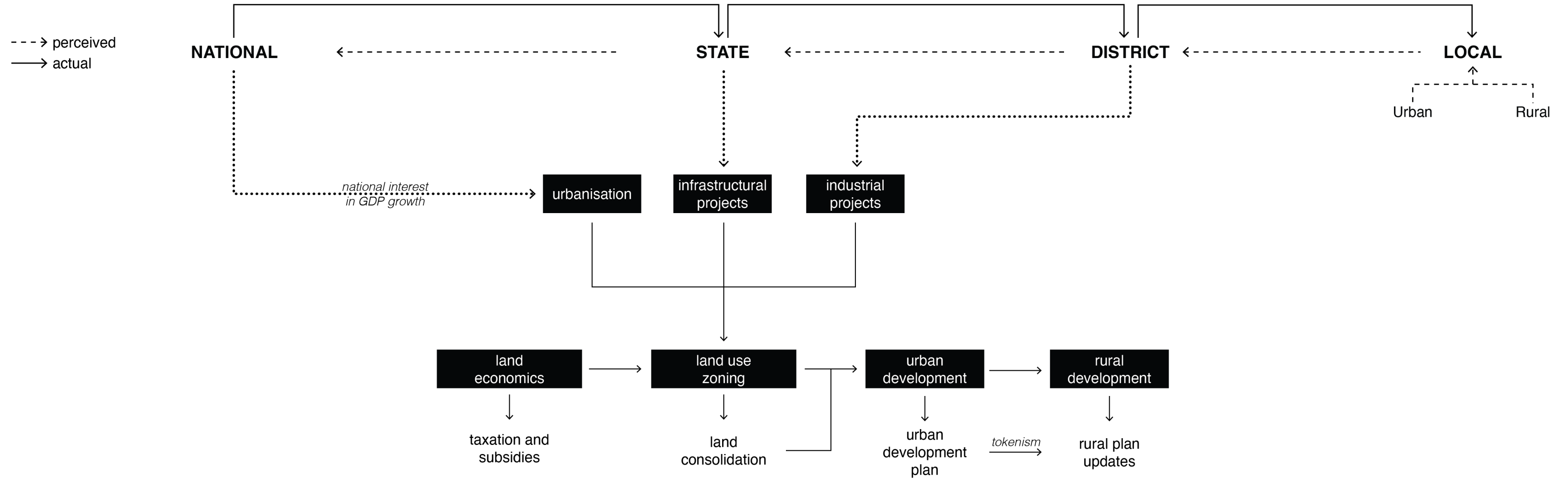
state level infrastructure



district level coherent plan



development plan (rural and urban)

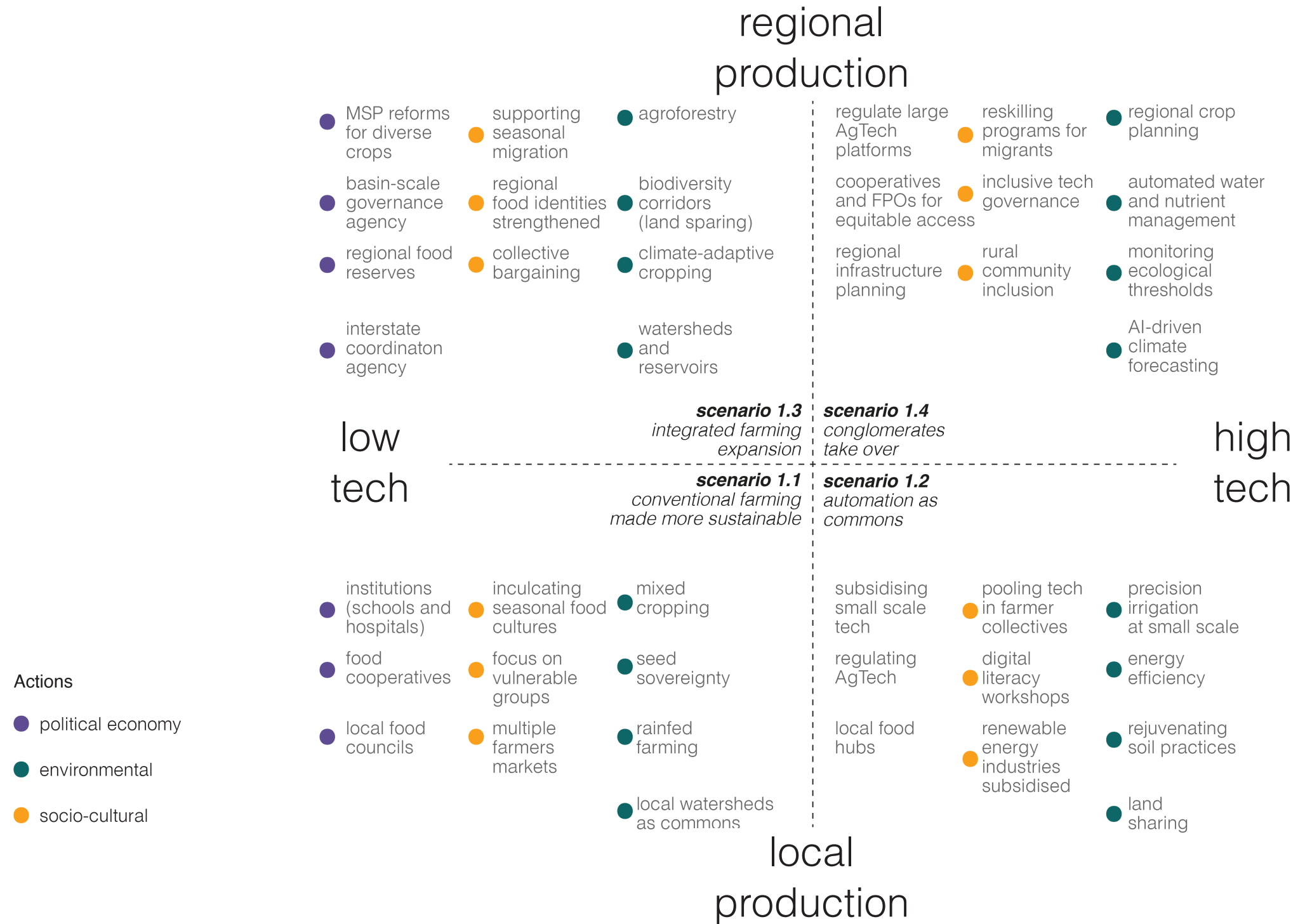


current spatial planning framework

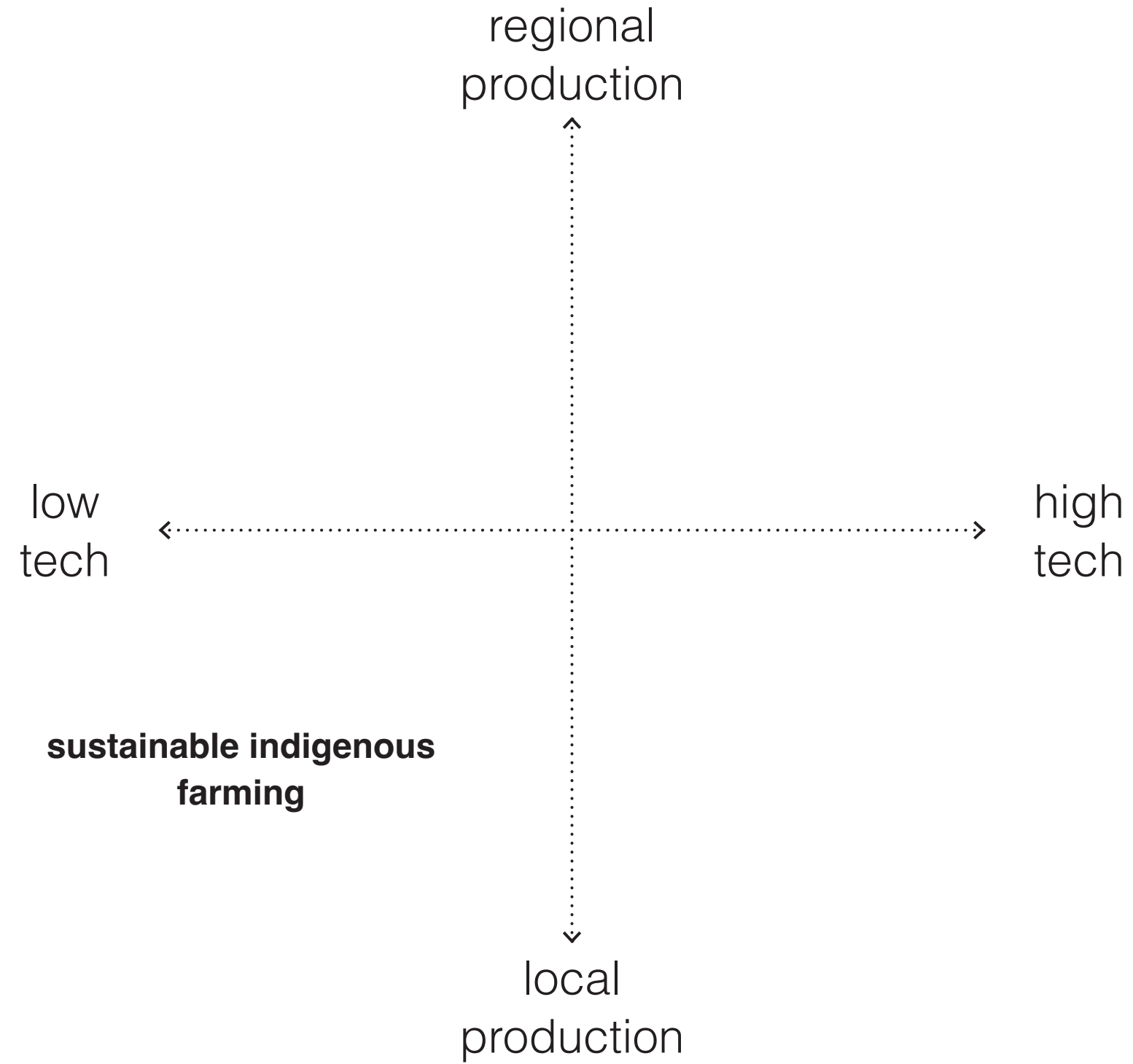
**agricultural production is an urbanisation and planning problem,
not just an economic issue.**

FUTURING INDIAN AGRO - URBANISM

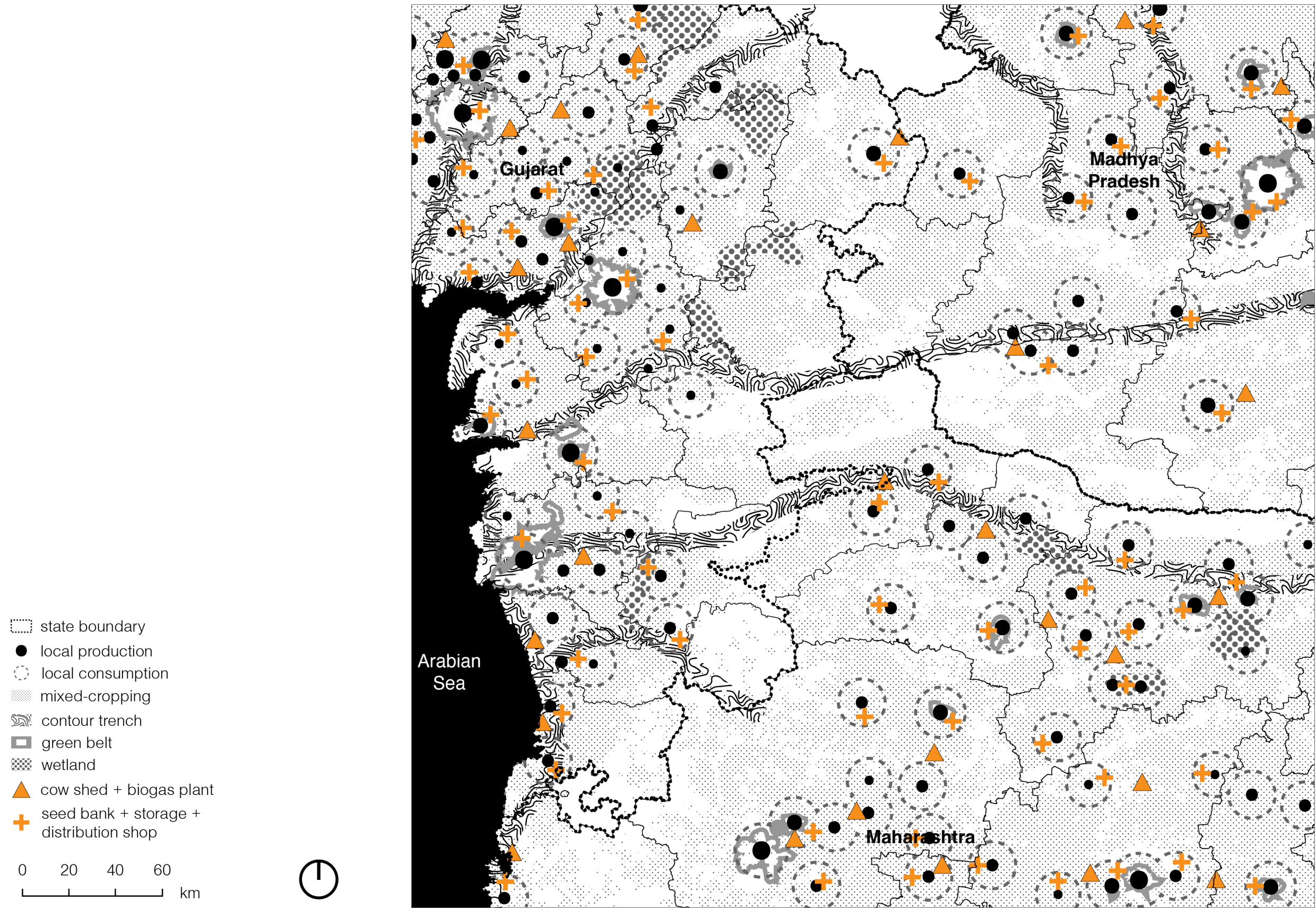




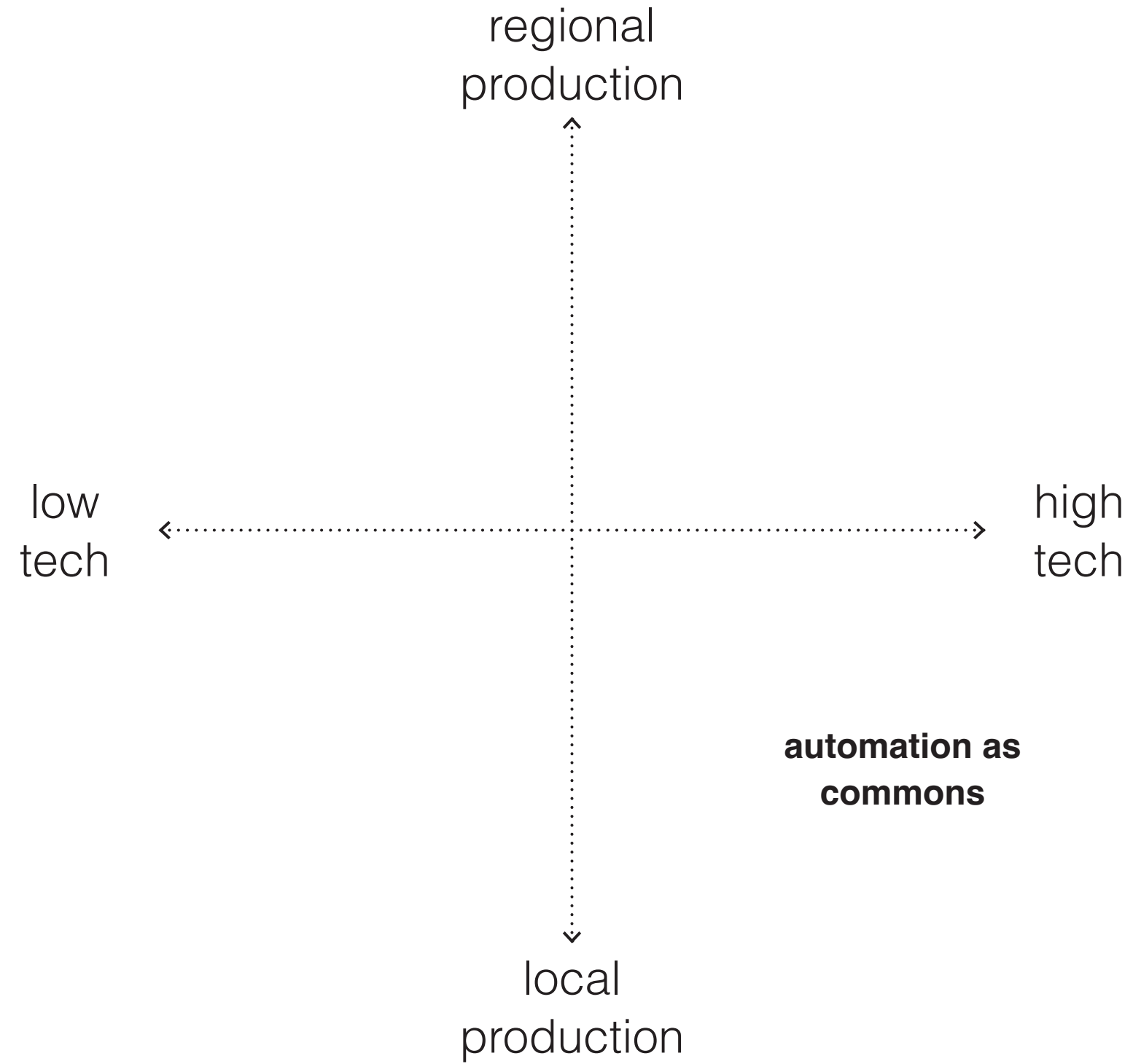
scenario mapping as tool to identify potentials



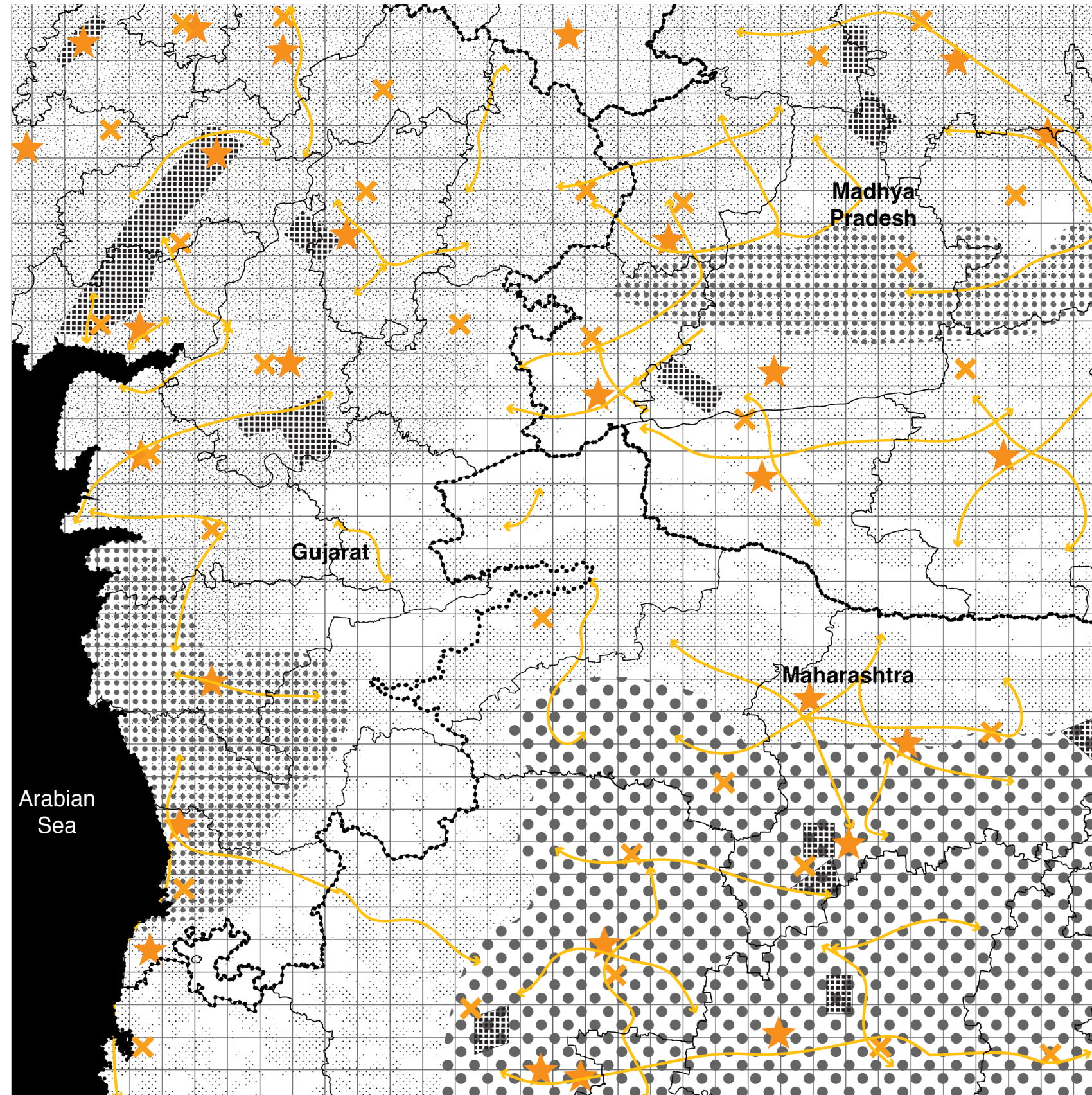
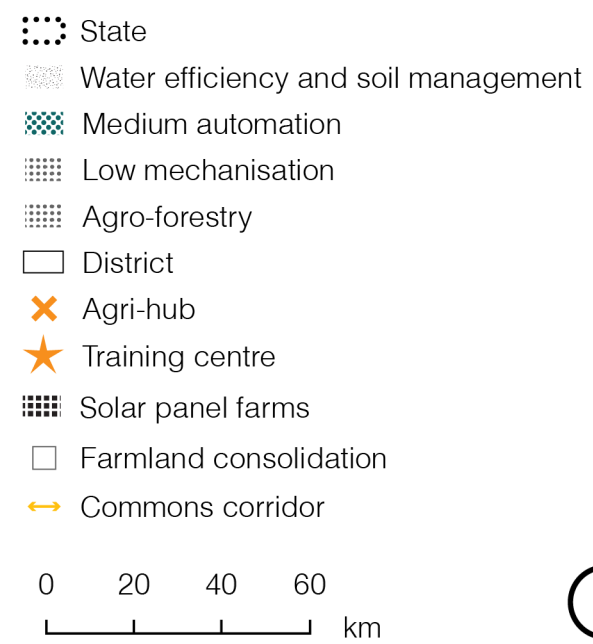
SCENARIO 1



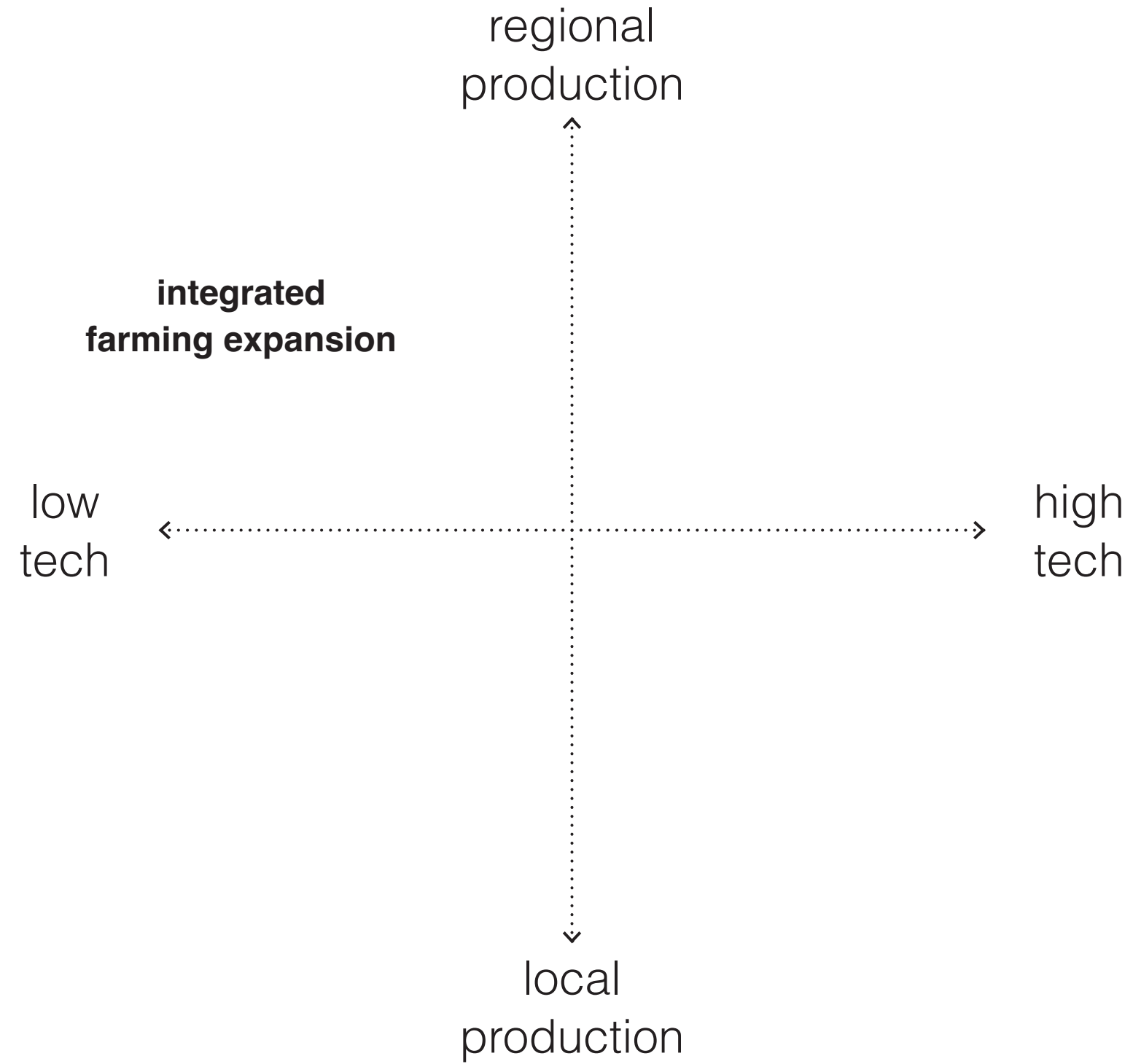
sustainable indigenous farming



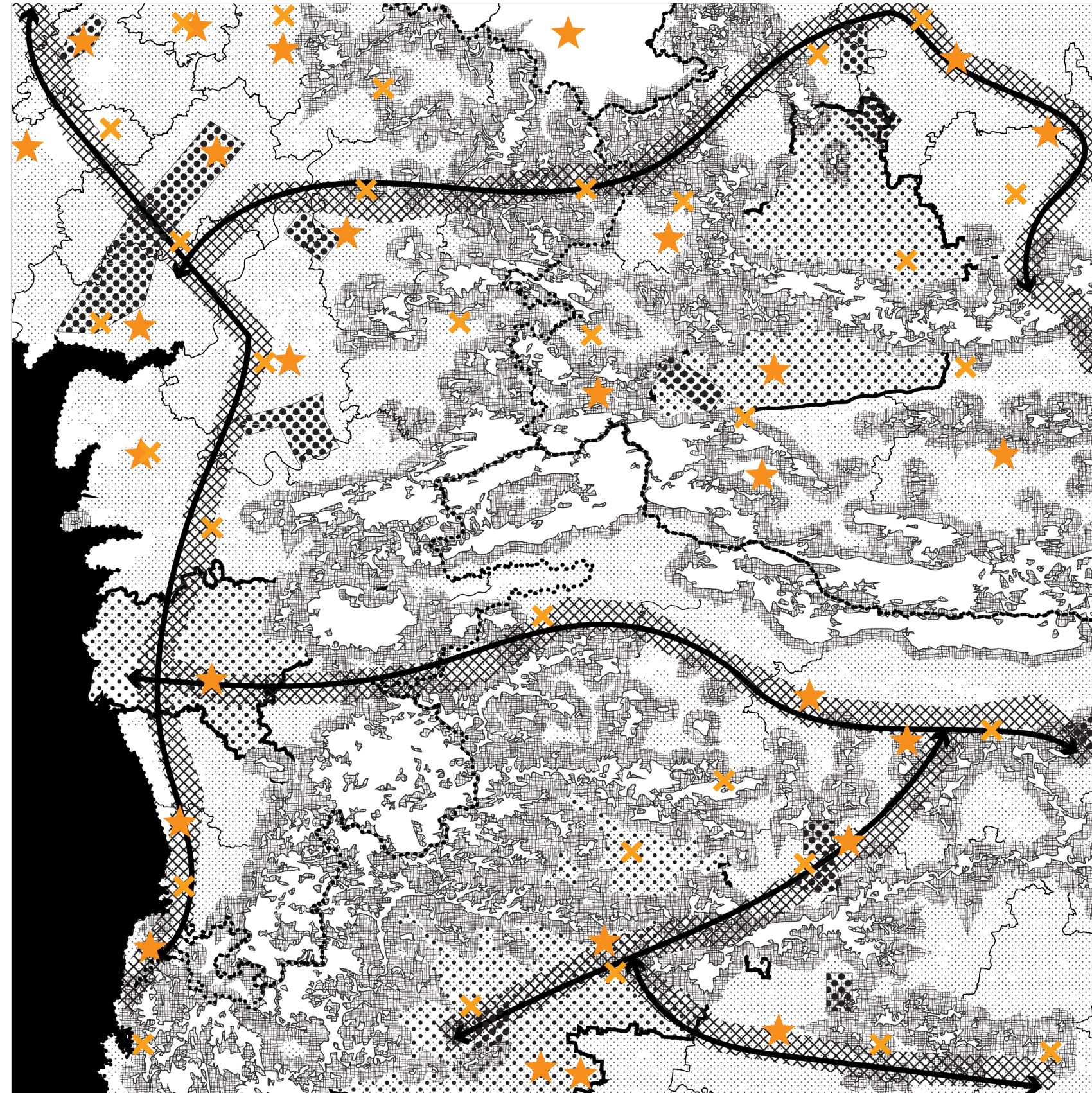
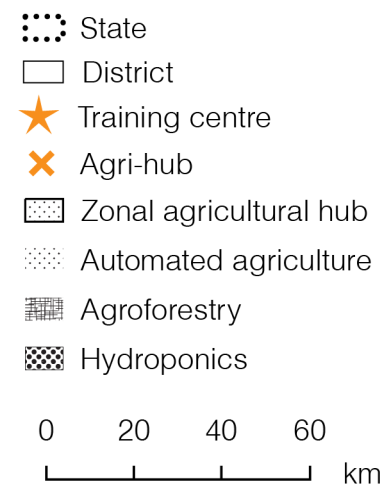
SCENARIO 2



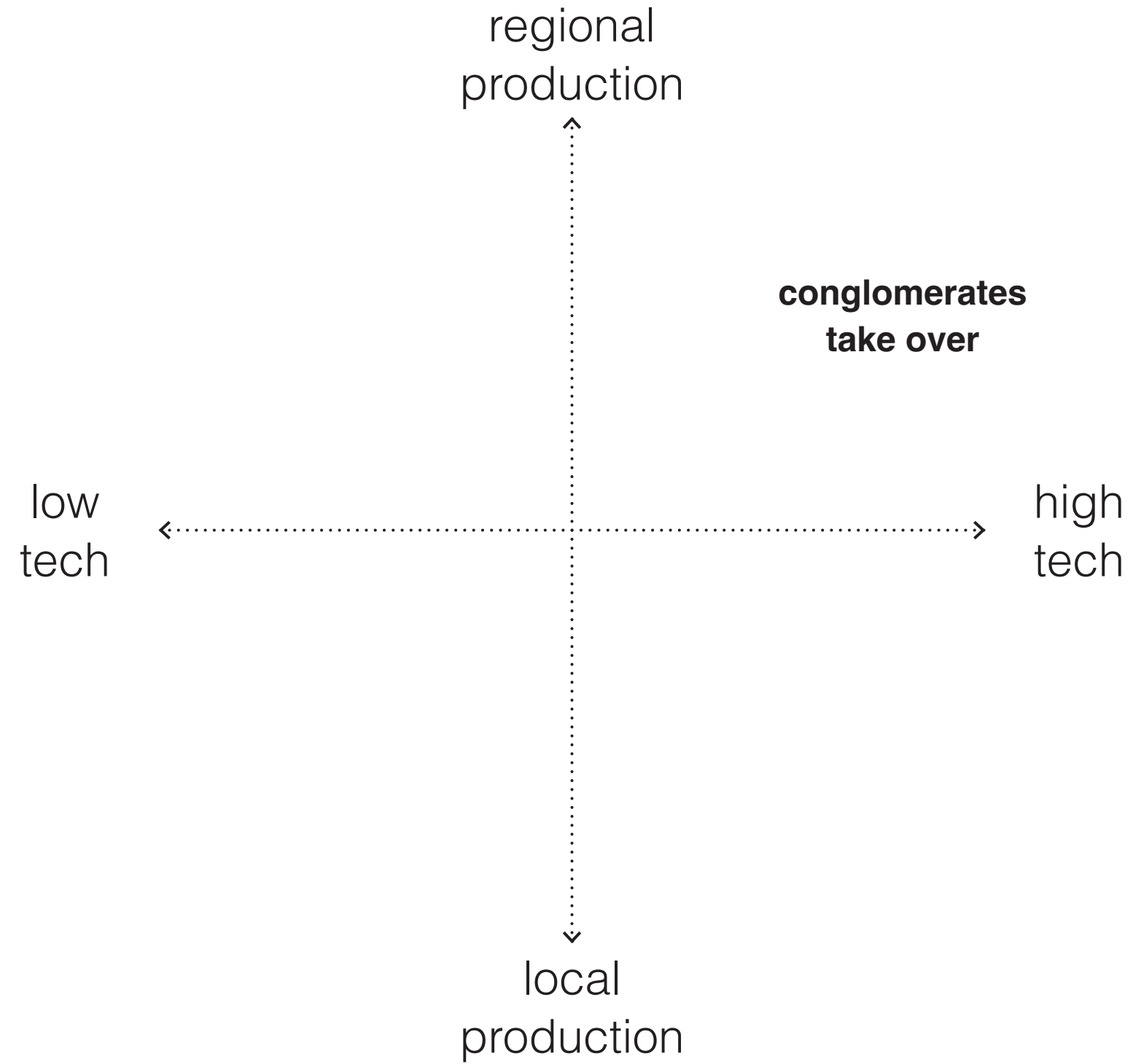
automation as commons



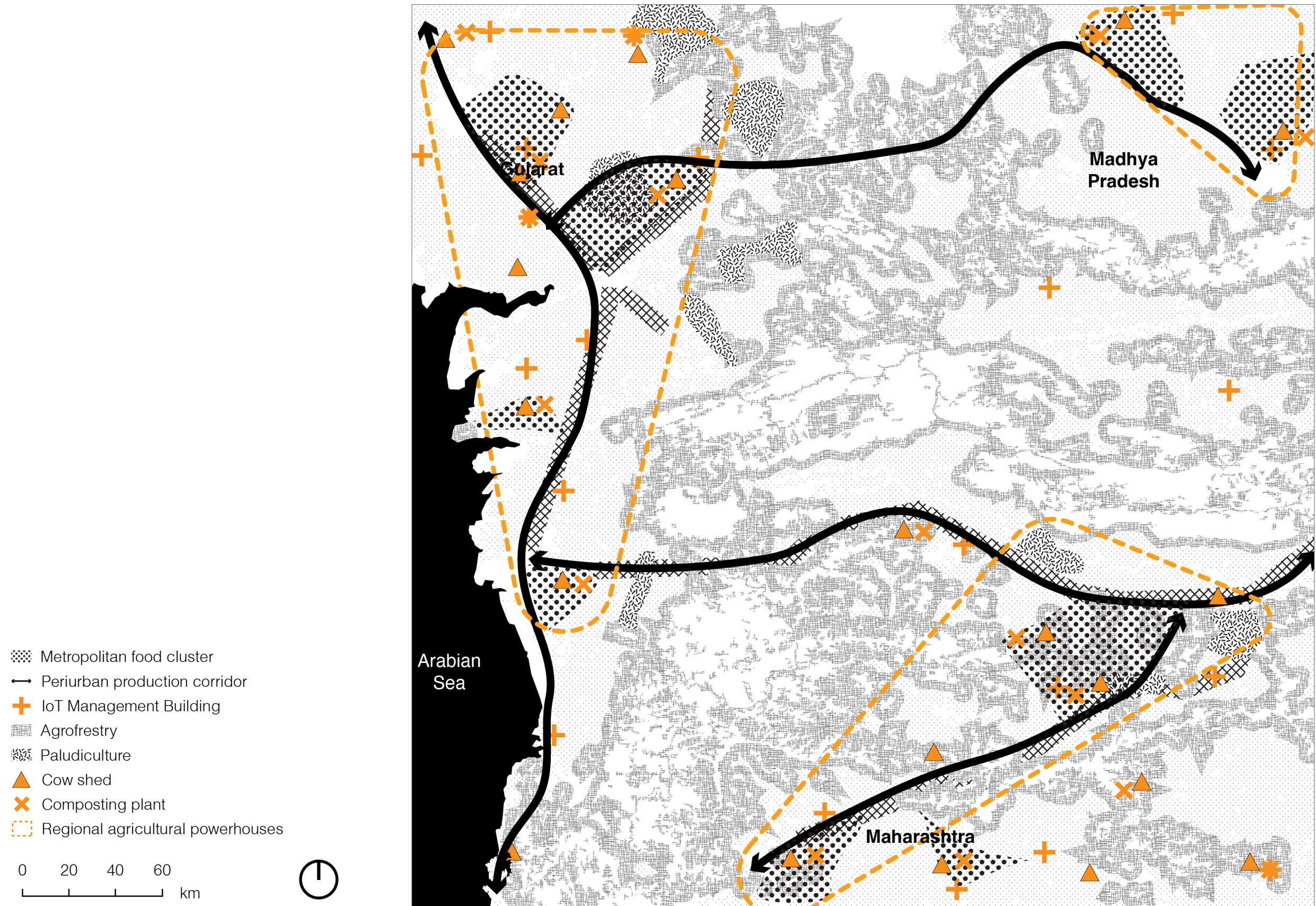
SCENARIO 3



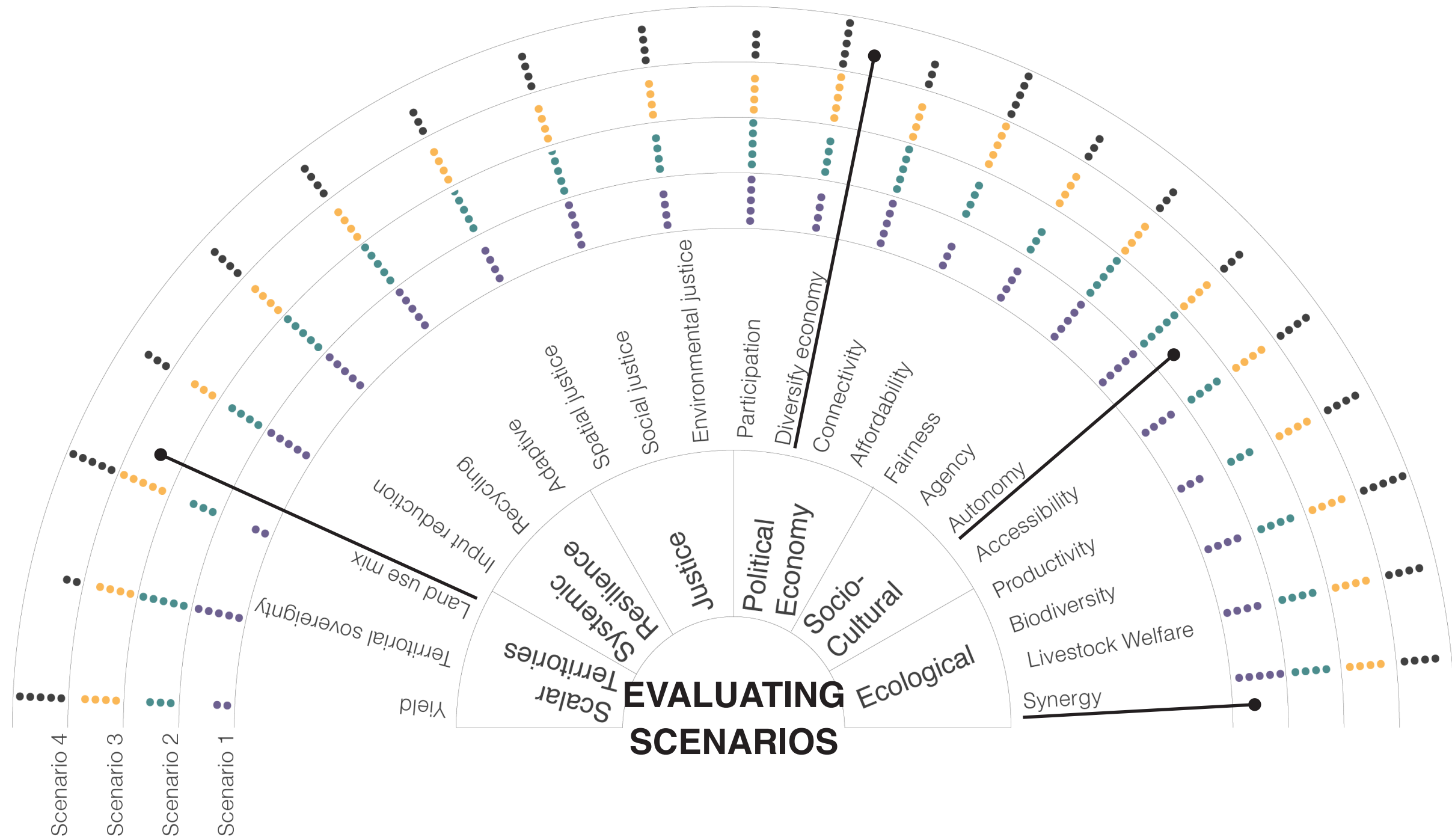
integrated farming expansion



SCENARIO 4



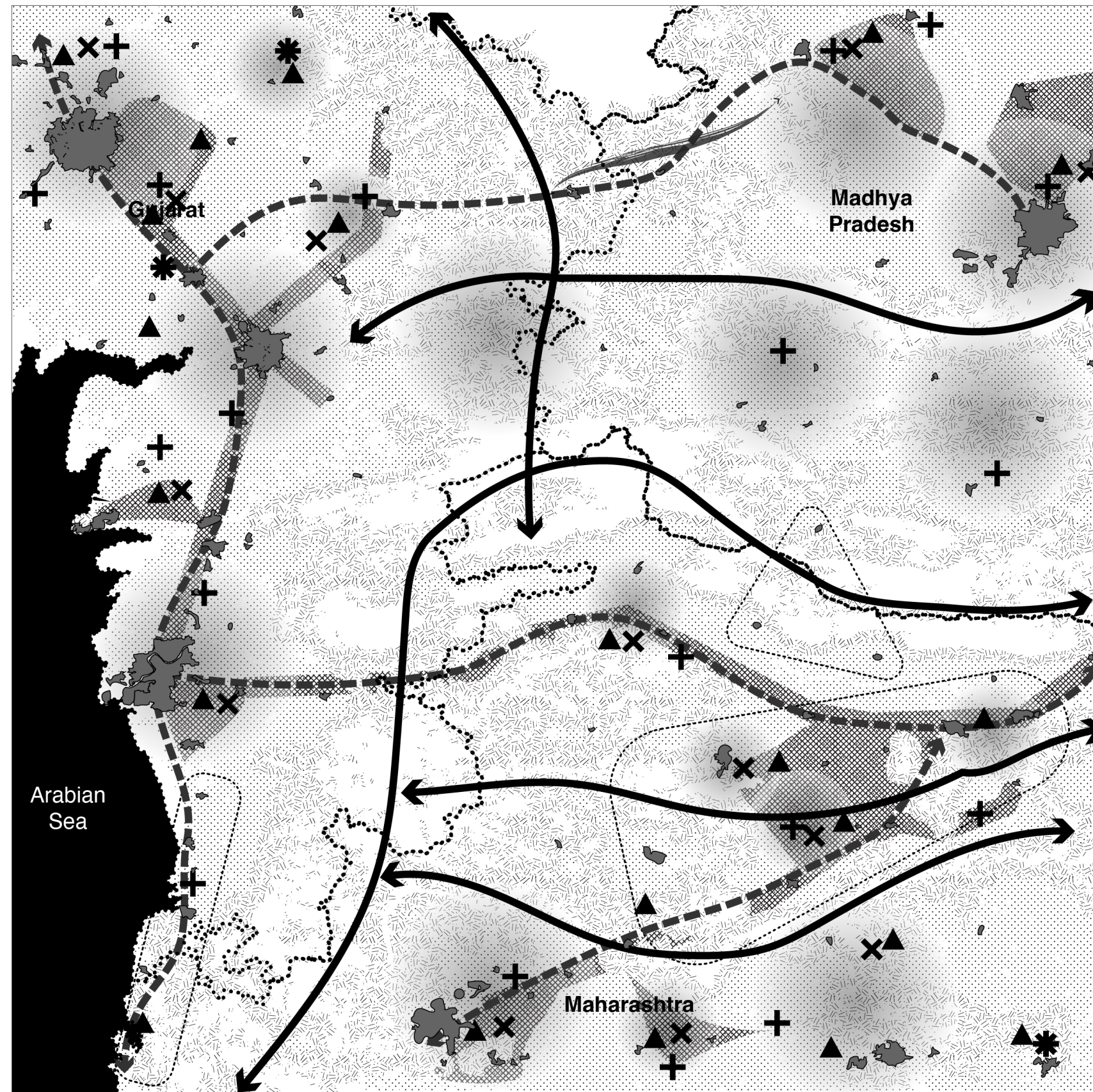
conglomerates take over



WAY FORWARD

- state boundary
- settlement area
- IoT management building
- cow shed
- composting plant
- agri-rurban areas
- agri-corridor
- ecological corridor
- agro-park
- agro-forestry
- sustainable farming with medium automation

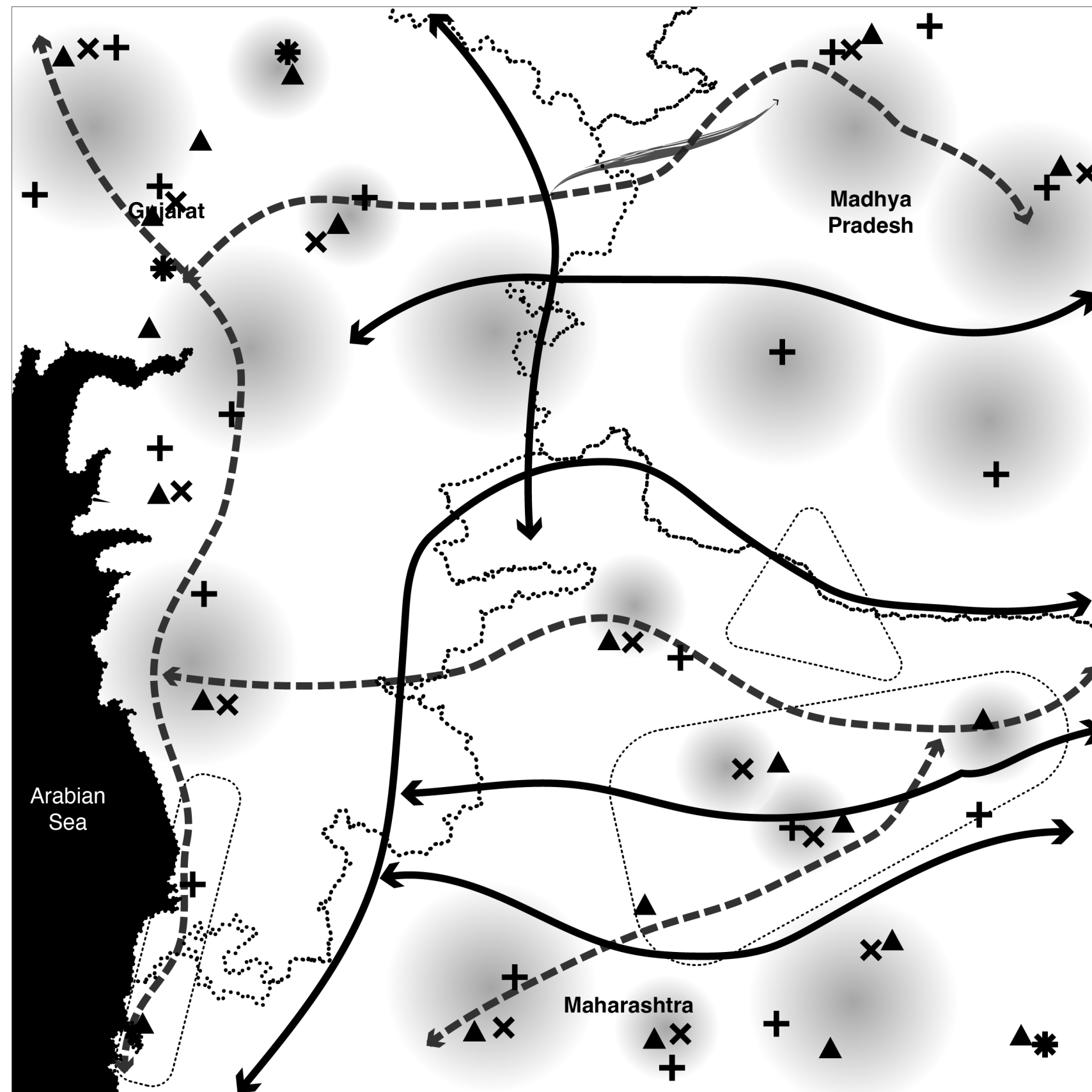
0 20 40 60 km



vision | decentralised food clusters

-  state boundary
-  settlement area
-  IoT management building
-  cow shed
-  composting plant
-  agri-rurban areas
-  agri-corridor
-  ecological corridor

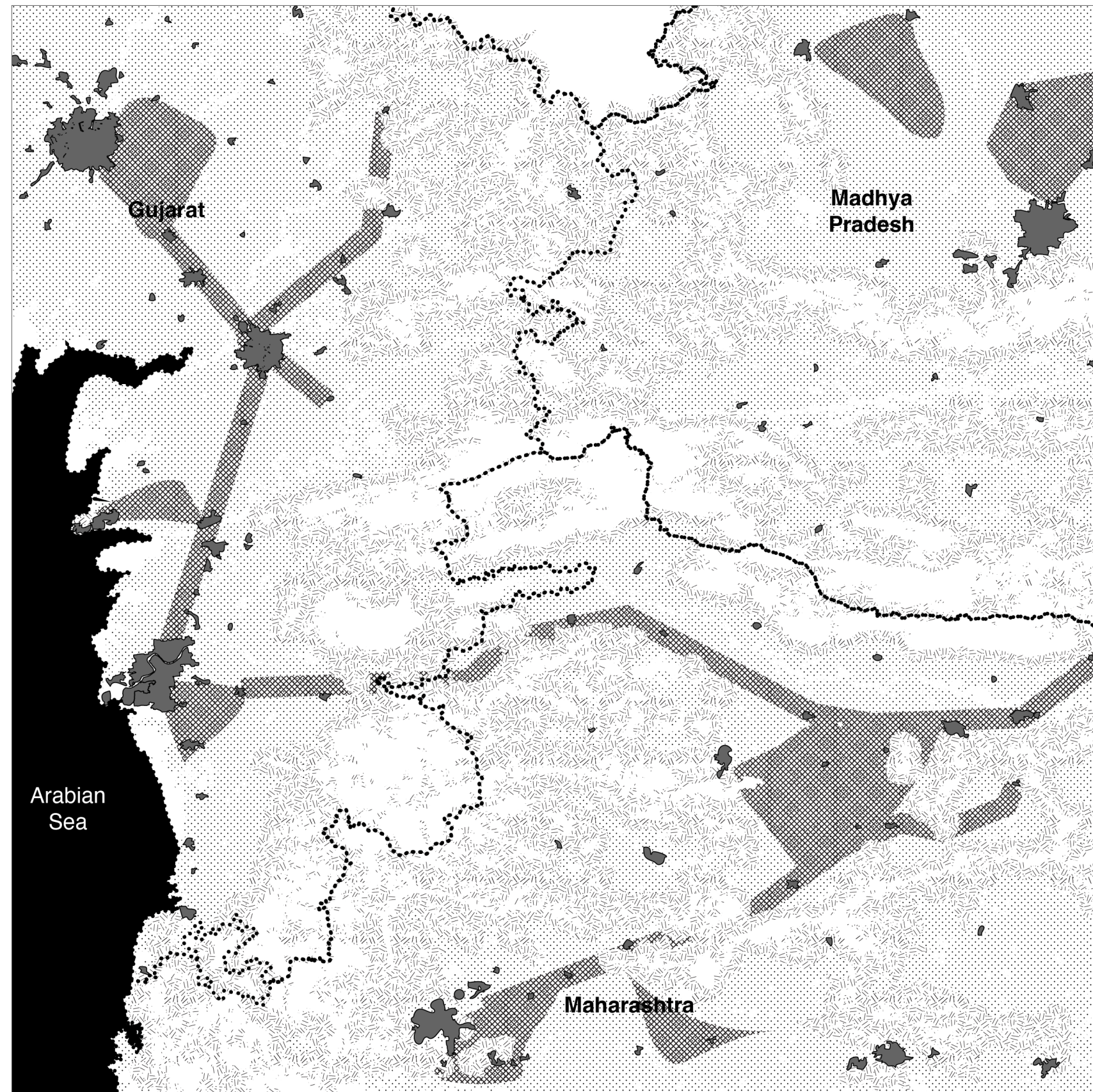
0 20 40 60
km



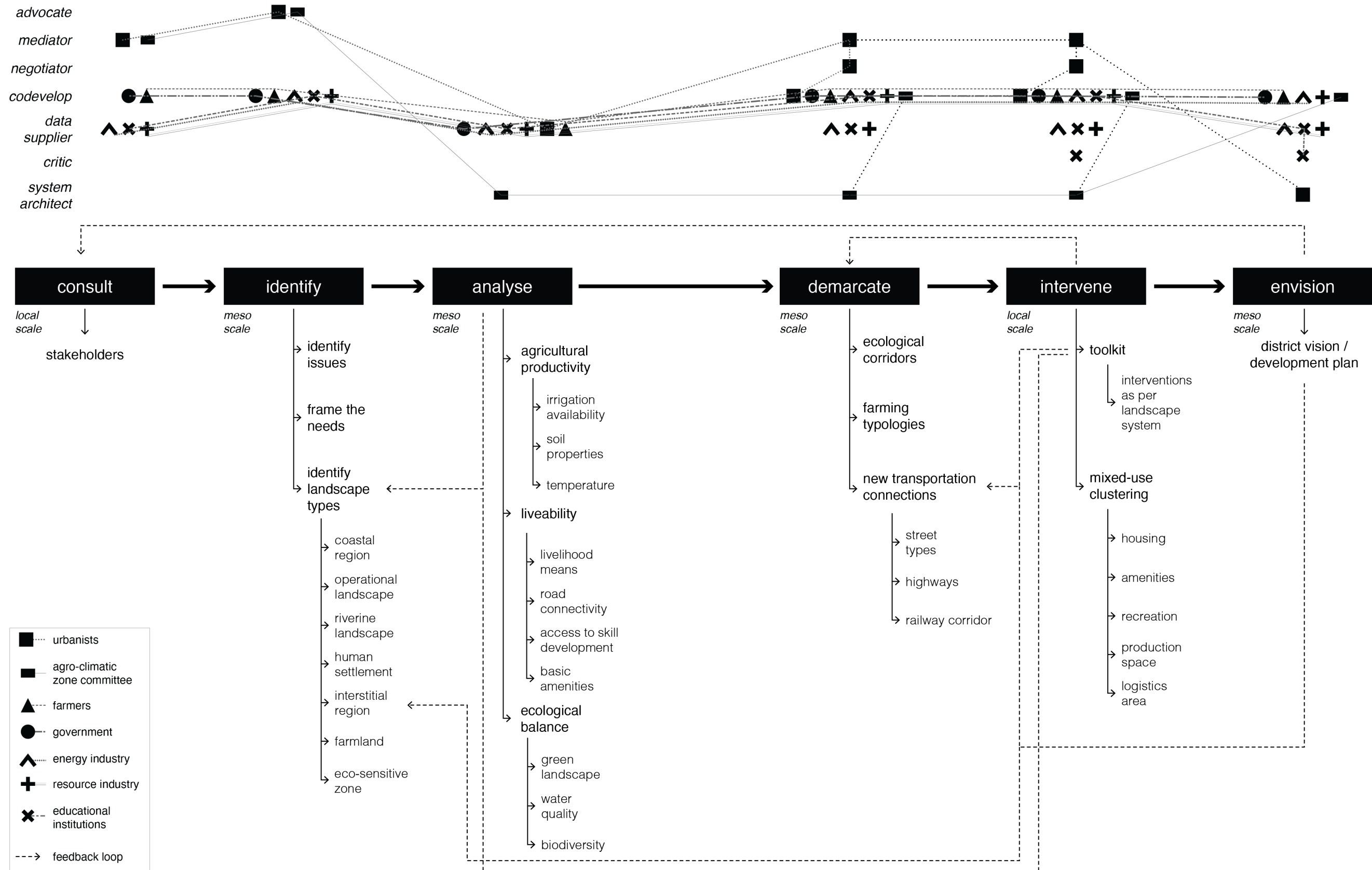
ecological corridors and production corridors

- state boundary
- settlement area
- agro-park
- agro-forestry
- sustainable farming with medium automation

0 20 40 60 km

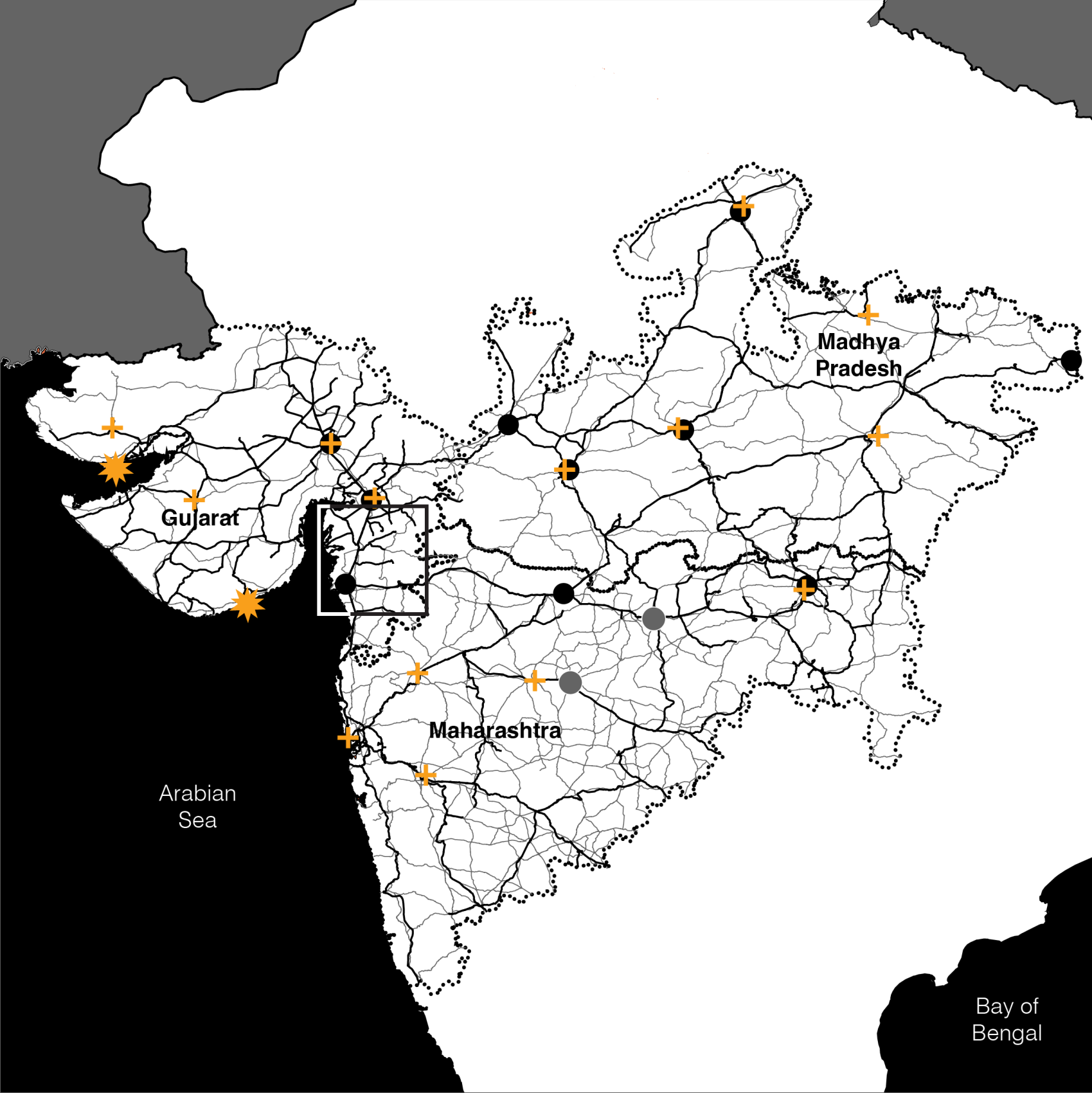


farming types



operational framework

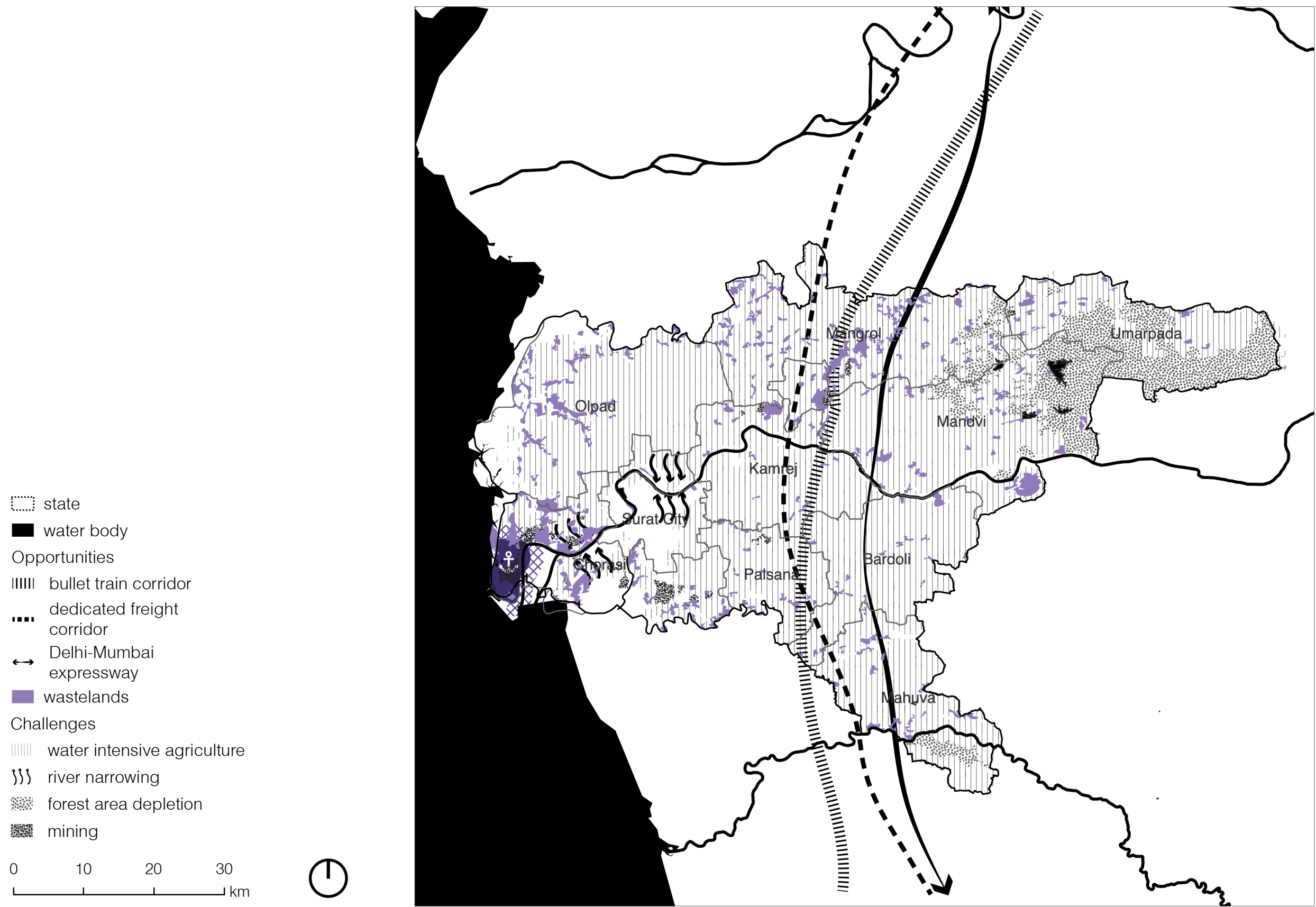
EXEMPLARY CASE: SURAT DISTRICT



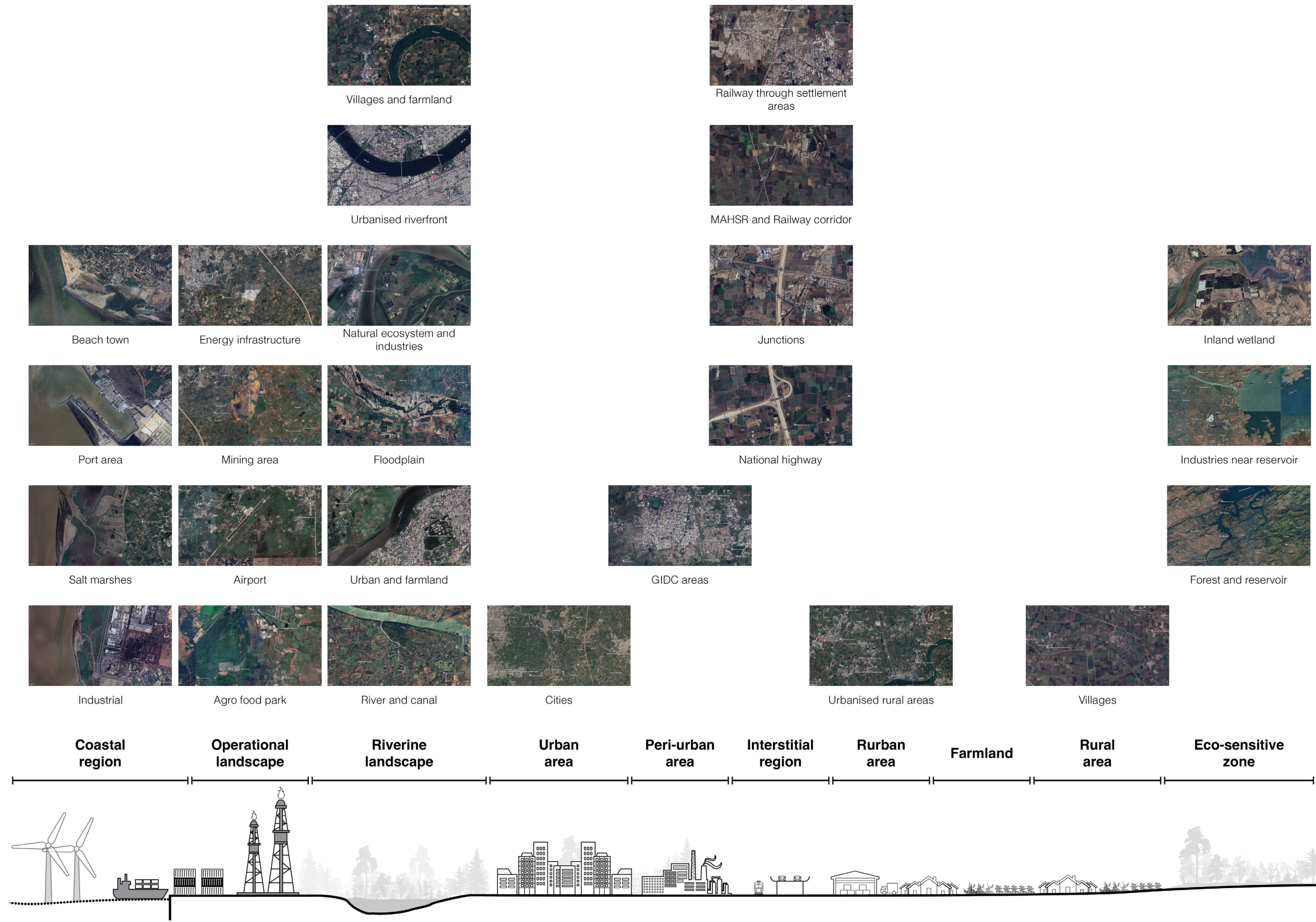
0 20 40 60 km



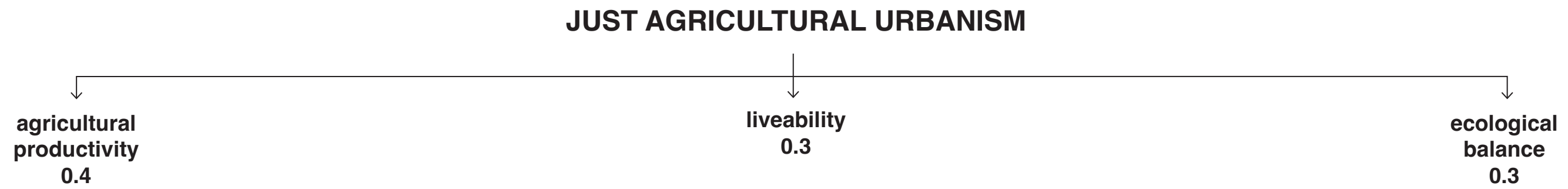
Surat district, Gujarat, India



step 1 | consult and frame the needs

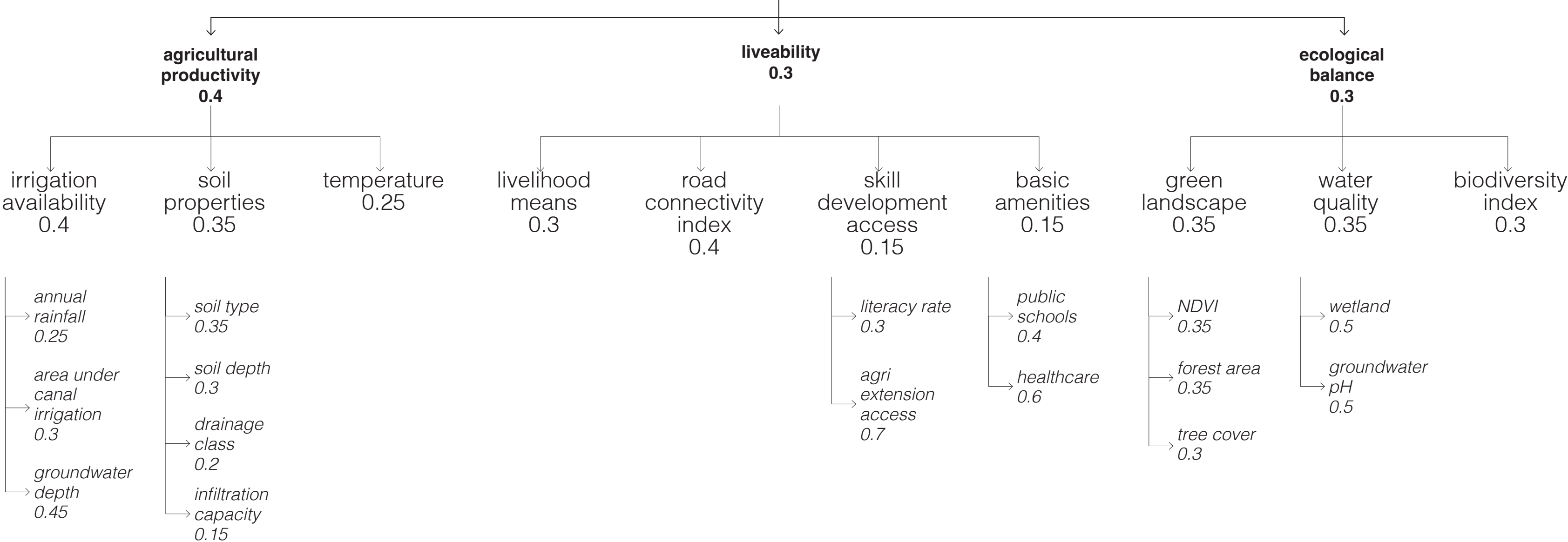


step 2 | identify landscape systems



step 3 | analyse

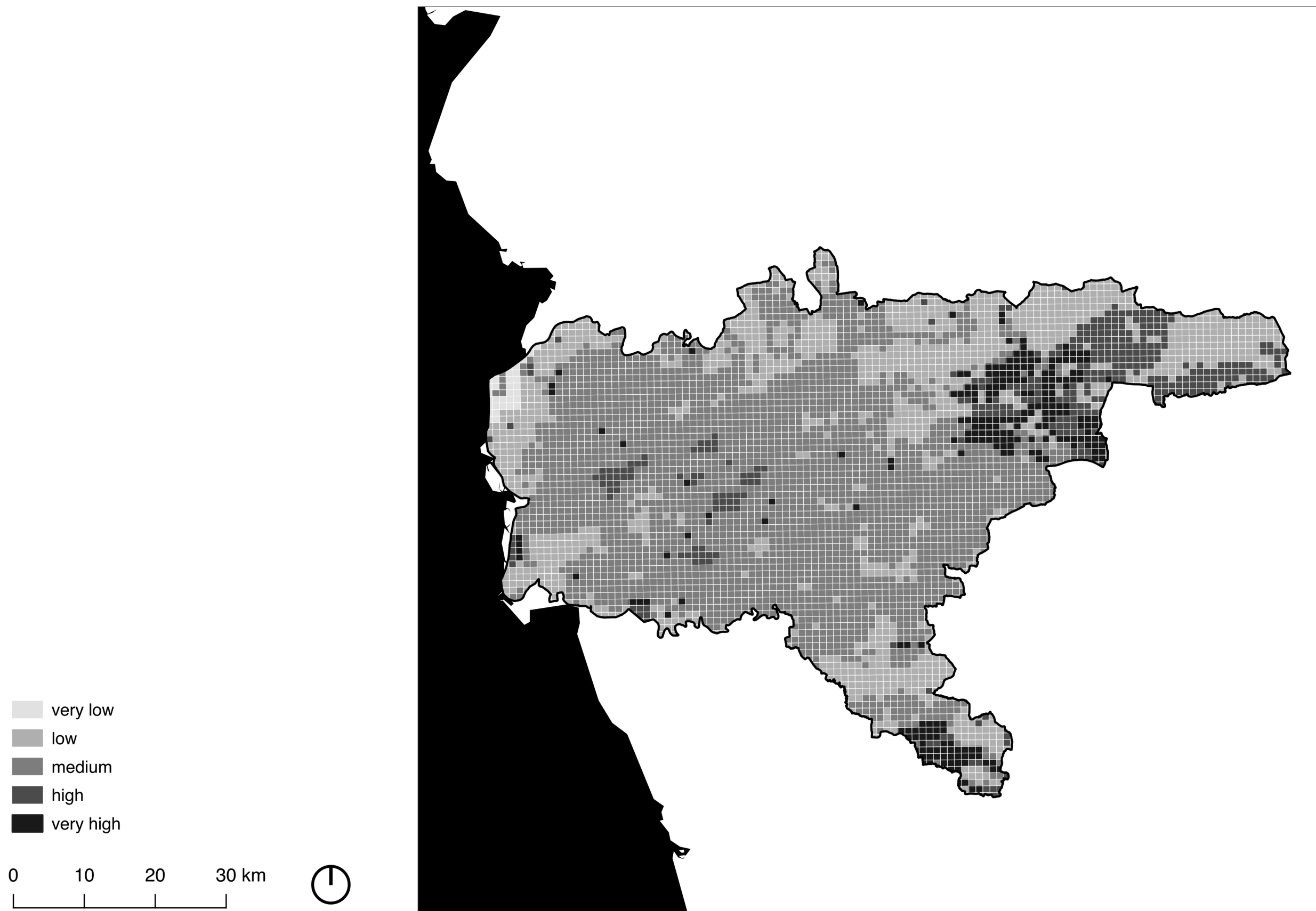
JUST AGRICULTURAL URBANISM



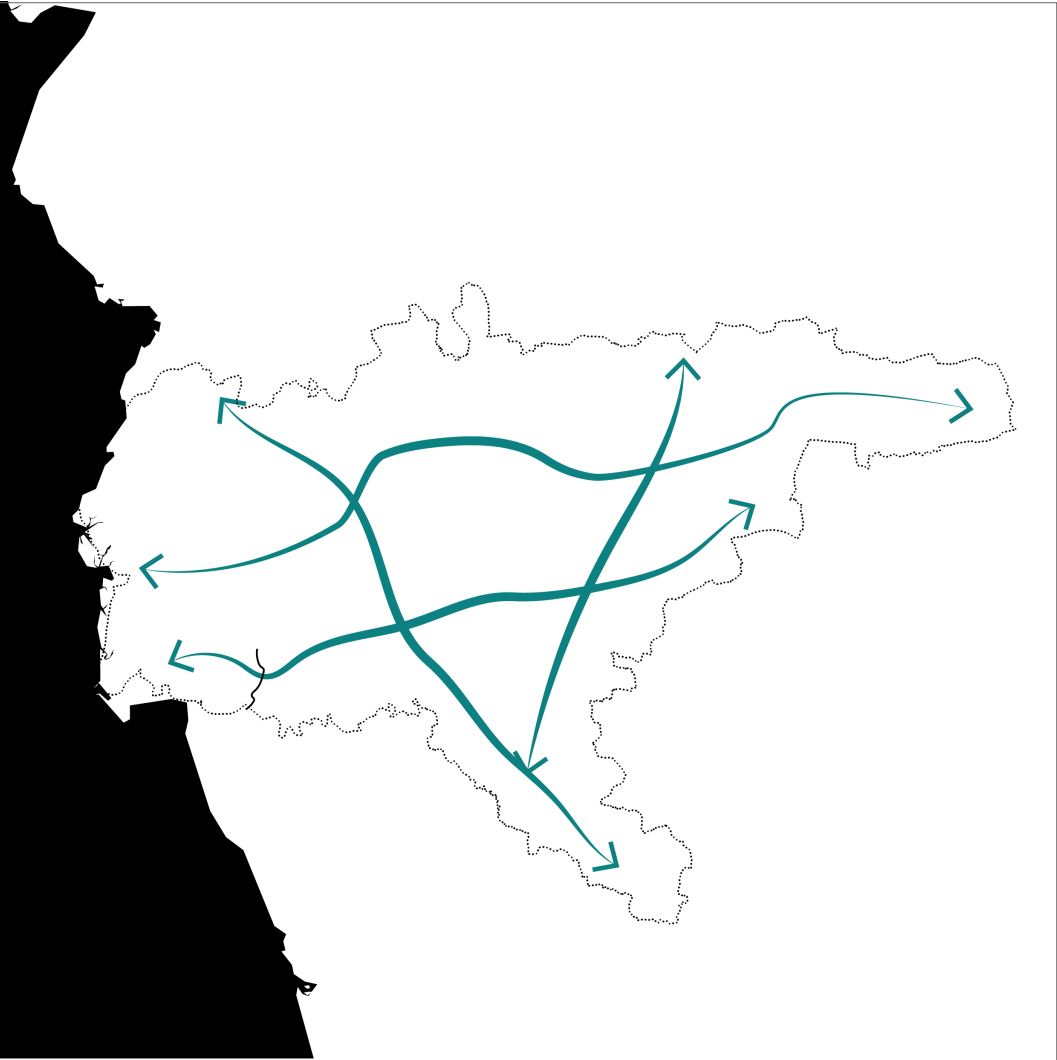
0 10 20 30 km



1 km x 1 km

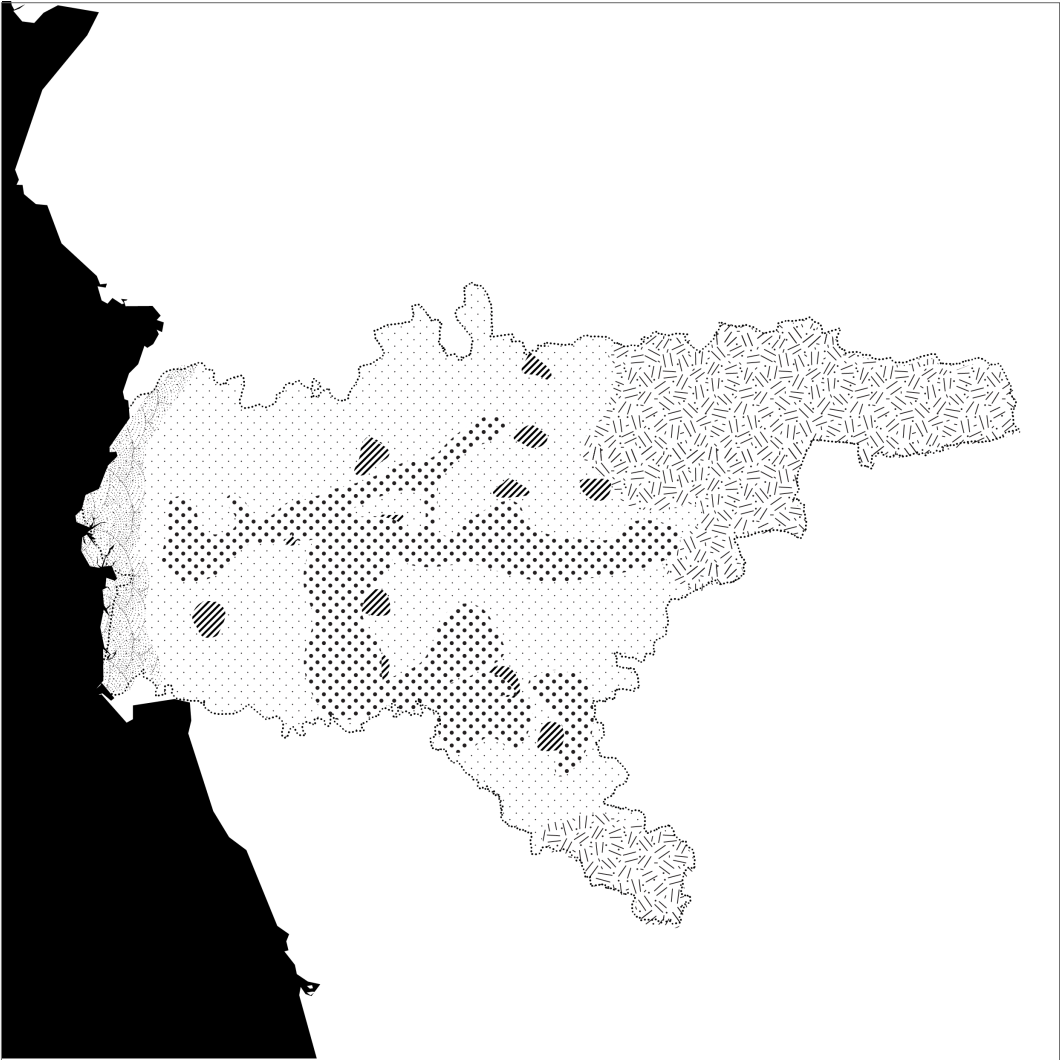


current state of agricultural urbanism



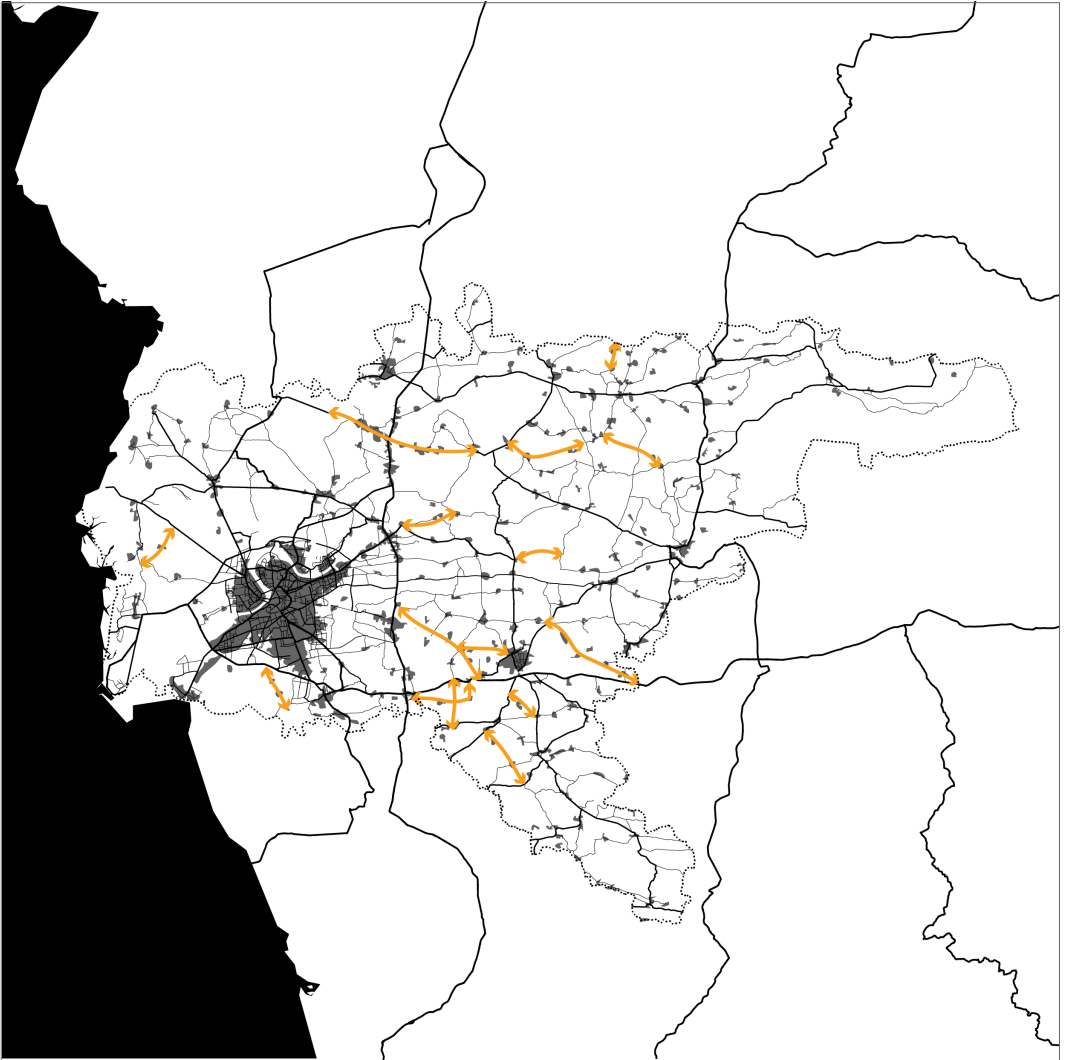
Proposed ecological corridors

- district boundary
- proposed eco-corridor



Proposed agricultural types

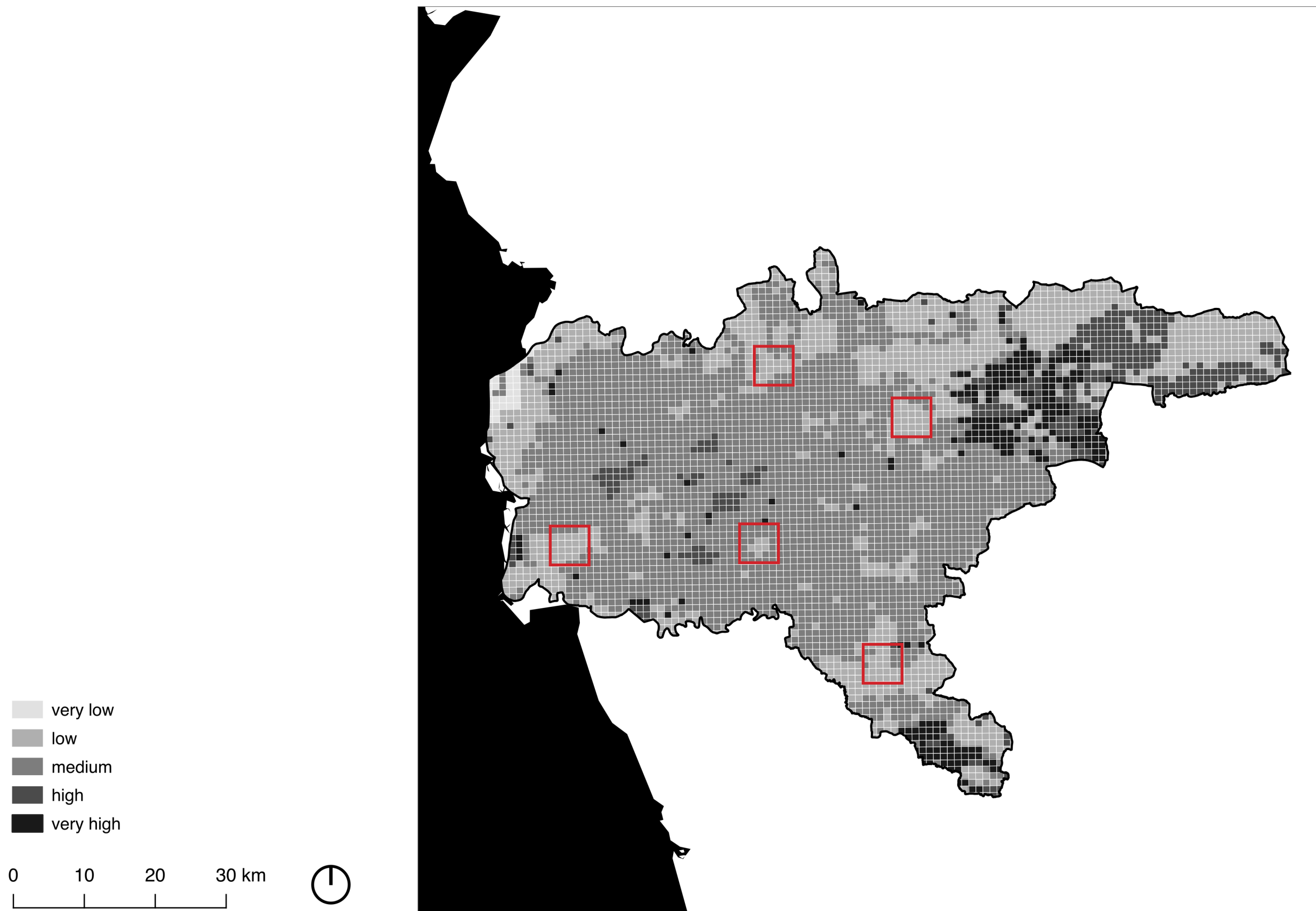
- district boundary
- halophyte farming
- Metropolitan food cluster
- Organic farming
- Medium automation
- Agroforestry



Proposed connections

- district boundary
- existing settlement
- new connection

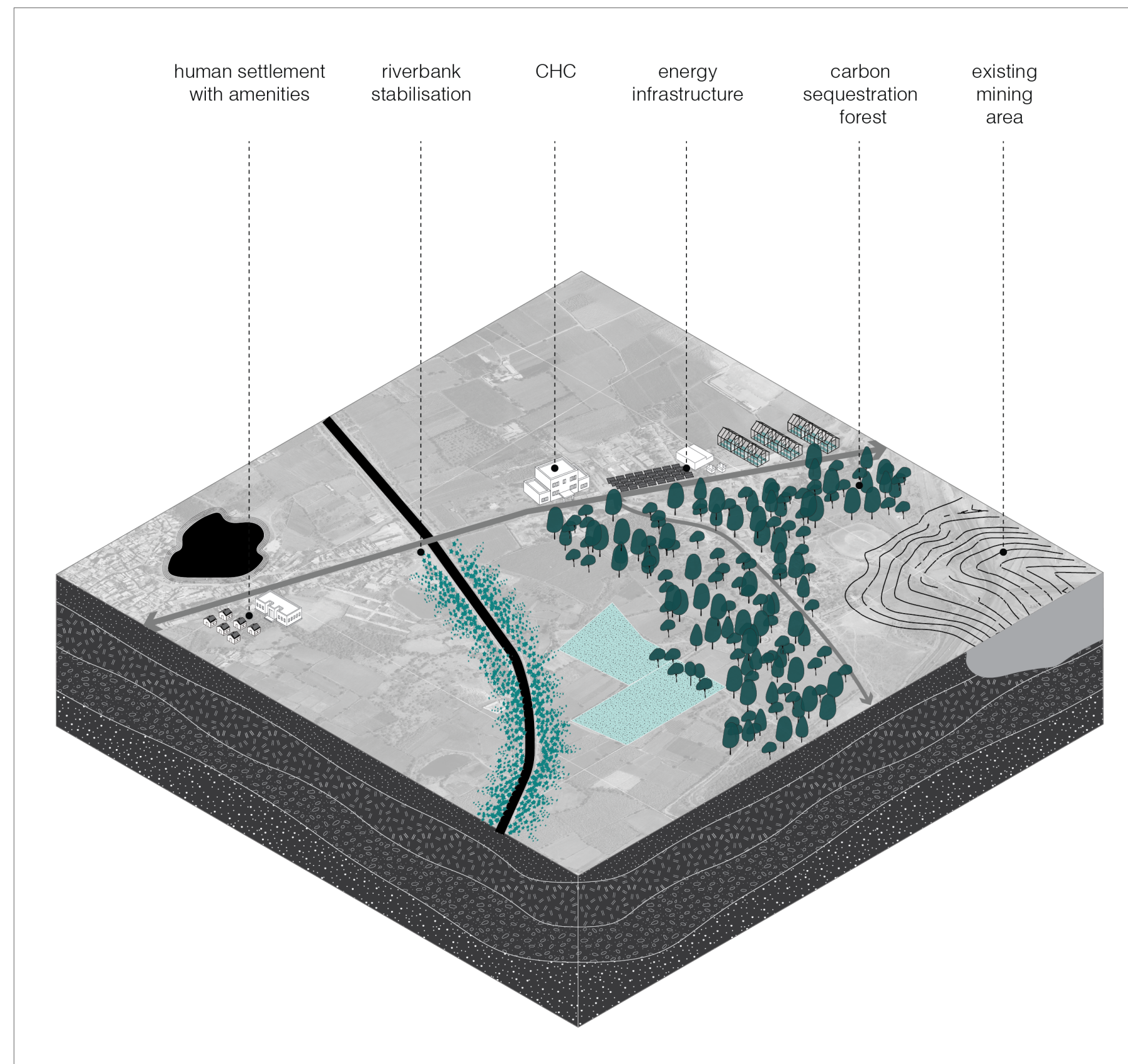
step 4 | demarcate



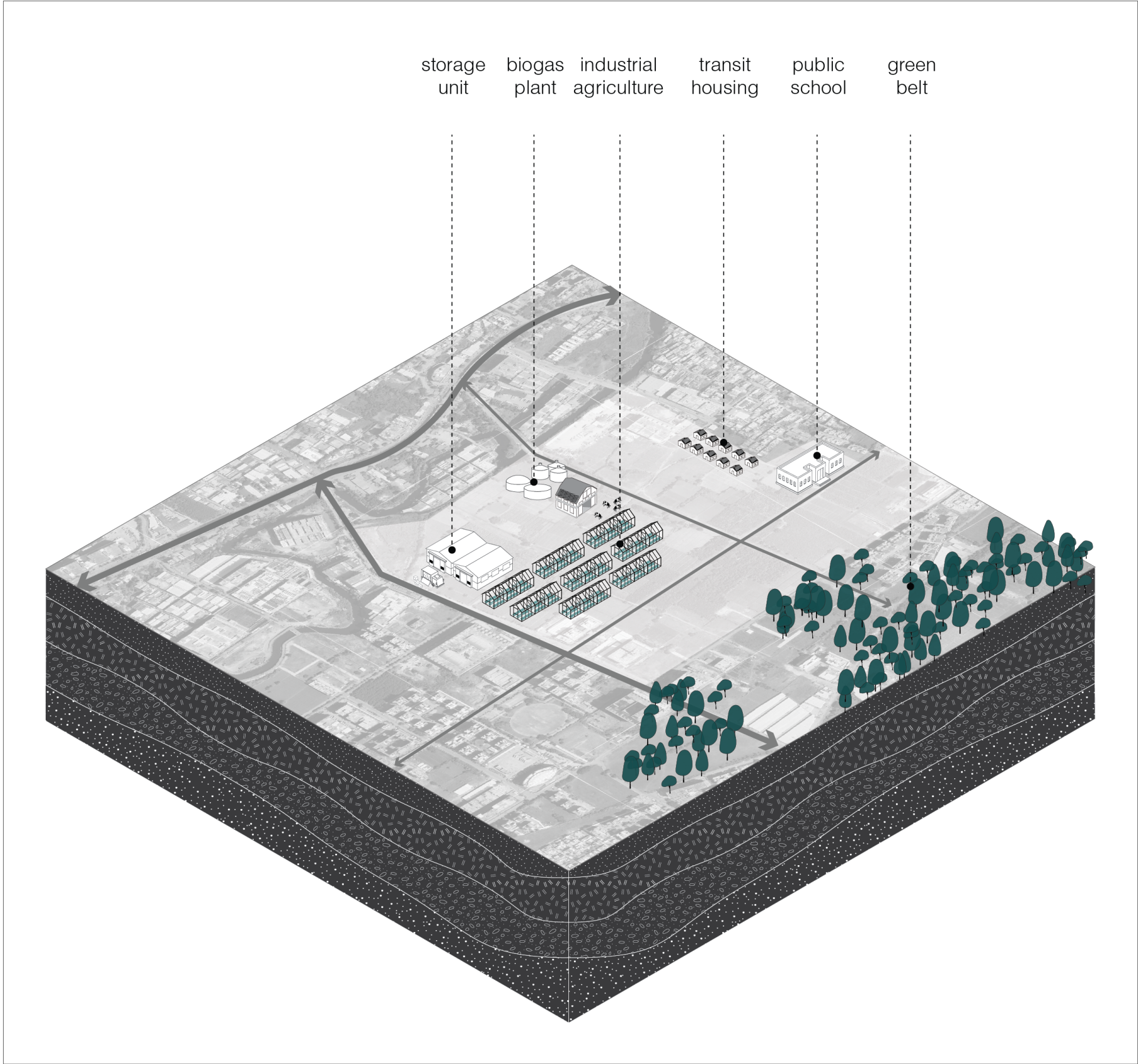
step 5 | intervene by co-creating a toolkit

Criteria	Sub-criteria	Coastal	Eco-sensitive (Forest/Reservoir)	Mining Area	Urban	Peri-urban	Rural	Floodplain	Industrial	Infrastructure Corridor
Agricultural Productivity	Irrigation Availability	Tidal/mangrove-compatible drip irrigation Desalination-fed micro-irrigation channels	Rainwater harvesting from forest catchments Check dams along reservoir periphery	Mine-pit water harvesting Constructed wetlands to reclaim and store drainage water	Treated wastewater reuse for peri-urban farms Stormwater harvesting in urban-edge food gardens	Canal lining and drip retrofit Farm ponds and recharge wells along village commons	Check dam and nala bunding Community bore-well networks and traditional step-well revival	Seasonal flood-capture tanks Canal diversion weirs to extend irrigation into dry months	Industrial effluent recycling (post-treatment) for green buffer irrigation	Roadside swales and culvert ponds to capture runoff for adjacent farm use
	Soil Type	Salt-tolerant cover cropping Mangrove buffer planting to reduce saline intrusion into agricultural soil	Forest floor protection Restrict soil disturbance Promote leaf-litter composting	Topsoil stockpiling and restoration Biochar and compost-based reclamation Phytoremediation plots	Raised-bed urban farming with imported soil Vermiculture on organic waste	Green manuring and crop rotation Vermicompost supply chains from urban organic waste	Contour bunding and mulching Soil health card-guided amendment programs	Silt deposition management Levee design that allows controlled sediment enrichment	Mandatory green buffer with phytoremediation species (vetiver, sunflower) around industrial plots	Roadside revegetation with deep-rooted native species to arrest erosion and improve structure
	Temperature	Coastal windbreak plantations (casuarina, mangrove) to moderate thermal extremes	Forest canopy conservation as heat buffer No clearing near agricultural transition zones	Tree plantation on mine dumps Water bodies to moderate local microclimate	Cool roofs, street tree canopy, urban parks	Agroforestry corridors Shade trees along field boundaries for microclimate regulation	Farm-scale agroforestry Shade net houses for heat-sensitive crops	Riparian tree belt restoration Seasonal crop calendar adjustment	Mandatory green belt to reduce heat radiation from industrial surfaces	Avenue plantations along highway/railway corridors Reflective surface treatments
Liveability	Livelihood Means (Agricultural Income)	Integrated aquaculture-agri models Coastal fisheries cooperative support Seaweed farming	NTFP-based livelihoods (honey, bamboo) Eco-tourism linked to farming communities	Skill retraining for displaced miners Reclaimed land leased for horticulture and poultry	Roof-top/community gardens Processed food enterprise incubators for urban-edge farmers	Farmer producer organisations Contract farming linkages with urban supply chains	Diversification into horticulture, dairy, and cottage industries Crop insurance outreach	Flood-resilient crops (deepwater rice, fish culture in paddy) Post-flood income support	Industrial CSR-linked farmer markets Supply of organic produce to industrial canteens	Roadside vending zones and agri-logistics hubs along corridors
	Market Access & Infrastructure	Jetty-linked small produce markets Cold storage for fish and coastal produce	All-weather feeder roads to nearest mandi Mobile procurement vans	Repurpose haul roads for agri-logistics Establish rural mandi on reclaimed land	Urban farmer markets Direct-to-consumer digital platforms for peri-urban farmers	Warehousing and cold chain at taluka level Last-mile connectivity improvements	Village-level aggregation centres Kisan rail linkages to urban mandis	Elevated road design for year-round access Flood-resilient storage platforms	Industrial park roads dual-used for farm logistics Dedicated loading zones	Highway service nodes with agri-collection points Railway sidings for produce movement
	Educational Access & Skills	Mobile school boats or coastal reach programmes Agri-fisheries skill centres	Forest ranger-linked adult education Eco-school models in buffer villages	Mining company-funded vocational centres ITES and green trade skills for displaced workers	Urban school densification Digital literacy centres in underserved wards	Agri-extension kiosks in gram panchayat buildings KVK outreach camps	Satellite school clusters Krishi Vigyan Kendra (KVK) field schools	Elevated school buildings as flood-resilient community hubs Seasonal school calendars	Industry-linked ITI campuses On-site training for green and blue-collar trades	Transit-node education kiosks Mobile agri-extension along corridor settlements
	Access to Healthcare & Housing	Floating or elevated health posts Cyclone-resistant housing with community shelters	Forest health camps AYUSH-integrated health posts near buffer settlements	Occupational health clinics Dust-proof worker housing with green landscaping	Affordable housing densification near transit Urban health and wellness centres	Mobile health vans Site-and-services housing plots with tenure security	Sub-centre upgrades PM Awas Yojana-linked housing with kitchen gardens	Elevated plinth housing design Community health shelters on high ground	Worker housing with greenways Employer-funded health clinics	Corridor-linked dispensaries at highway nodes PMAY housing clusters near railway stations
Ecological Condition	Green Landscape (Vegetation Cover)	Mangrove restoration and coastal afforestation with native species	Assisted natural regeneration Invasive species removal Eco-restoration corridors	Post-mining revegetation with native species Native grassland restoration on overburden dumps	Urban forest patches Mandatory tree coverage ratios in development plans; green roofs	Agroforestry and farm woodlots Village commons greening	Farm boundary tree planting Wasteland afforestation under MGNREGS	Riparian buffer strips Floodplain meadow restoration	Mandatory 33% green belt Native species plantations on industrial periphery	Right-of-way greening with native avenue trees Sound-barrier green walls
	Water Body Quality	Coastal wetland buffer zones Regulation of aquaculture effluents Tidal flushing design	Riparian protection zones around reservoir Silt trap planting upstream	Acid mine drainage treatment wetlands Constructed wetland polishing cells	STP upgrades and zero liquid discharge Urban wetland restoration as tertiary treatment	Agri-runoff interception swales Phytoremediation wetlands along drainage channels	Village pond desilting and bunding Organic farming transition to reduce agro-chemical runoff	Oxbow lake and seasonal wetland restoration Floodplain buffer no-build zones	Zero liquid discharge mandates Constructed treatment wetlands as industrial estate boundaries	Highway drainage filtration strips Bridge runoff treatment before discharge to water bodies
	Biodiversity	Marine and intertidal habitat conservation Sea-turtle nesting beach protection	Wildlife corridor strengthening Eco-sensitive zone buffer compliance Camera trap monitoring	Post-mining habitat mosaic creation Reintroduction of native flora and fauna	Biodiversity parks and pollinator gardens Bird-friendly building guidelines	Hedgerow and field margin restoration Native plant nurseries in gram panchayat lands	Sacred grove protection Agro-biodiversity seed banks at village level	Floodplain grassland and seasonal wetland conservation No-till agriculture promotion	Industrial estate biodiversity plans Native-species landscaping within campuses	Wildlife crossing structures (underpasses, culverts) Corridor-side native planting

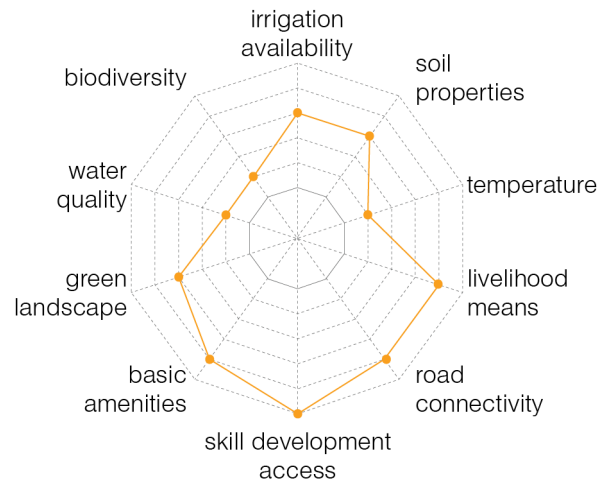
step 5 | intervene by co-creating a toolkit

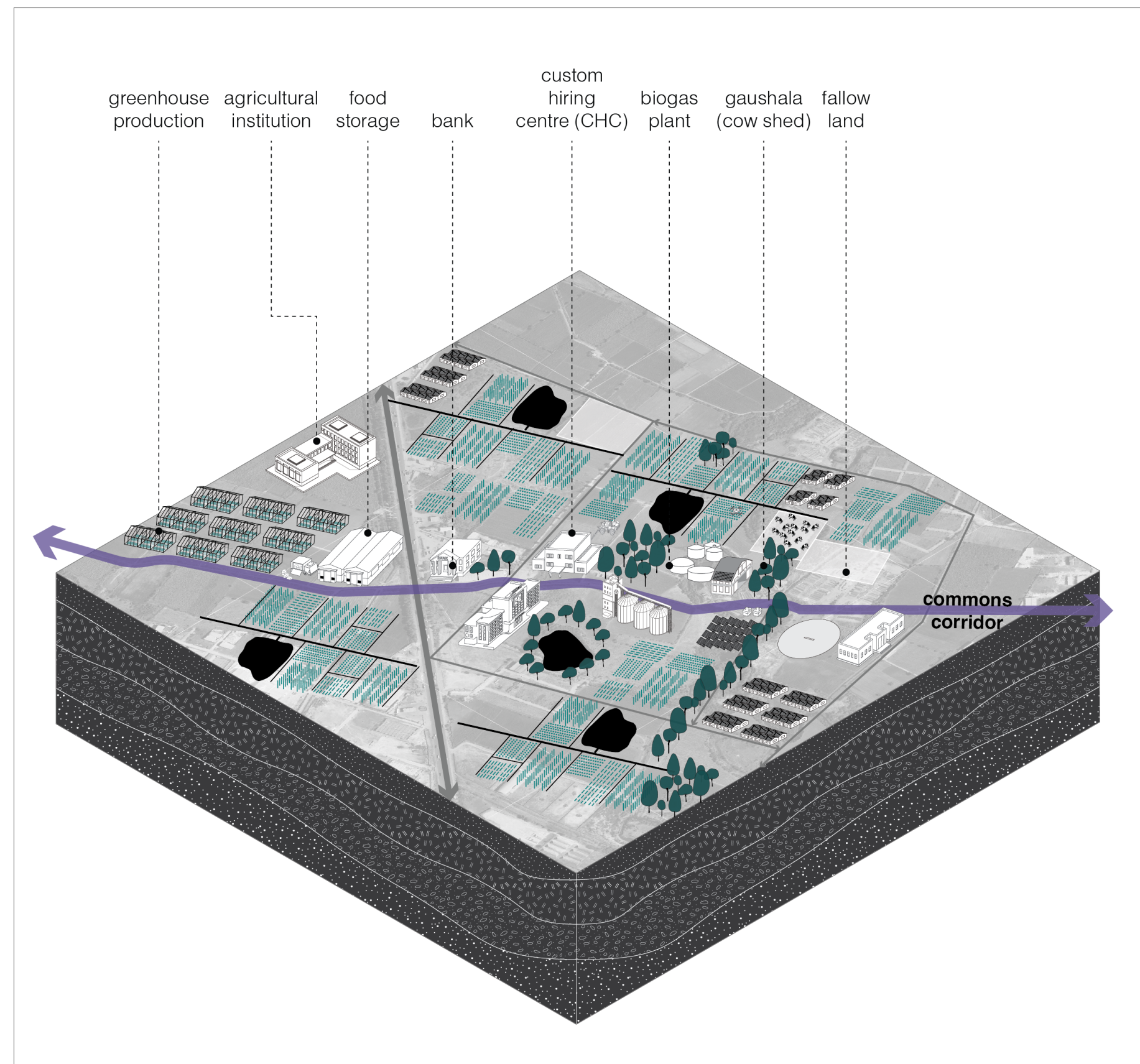


mining area

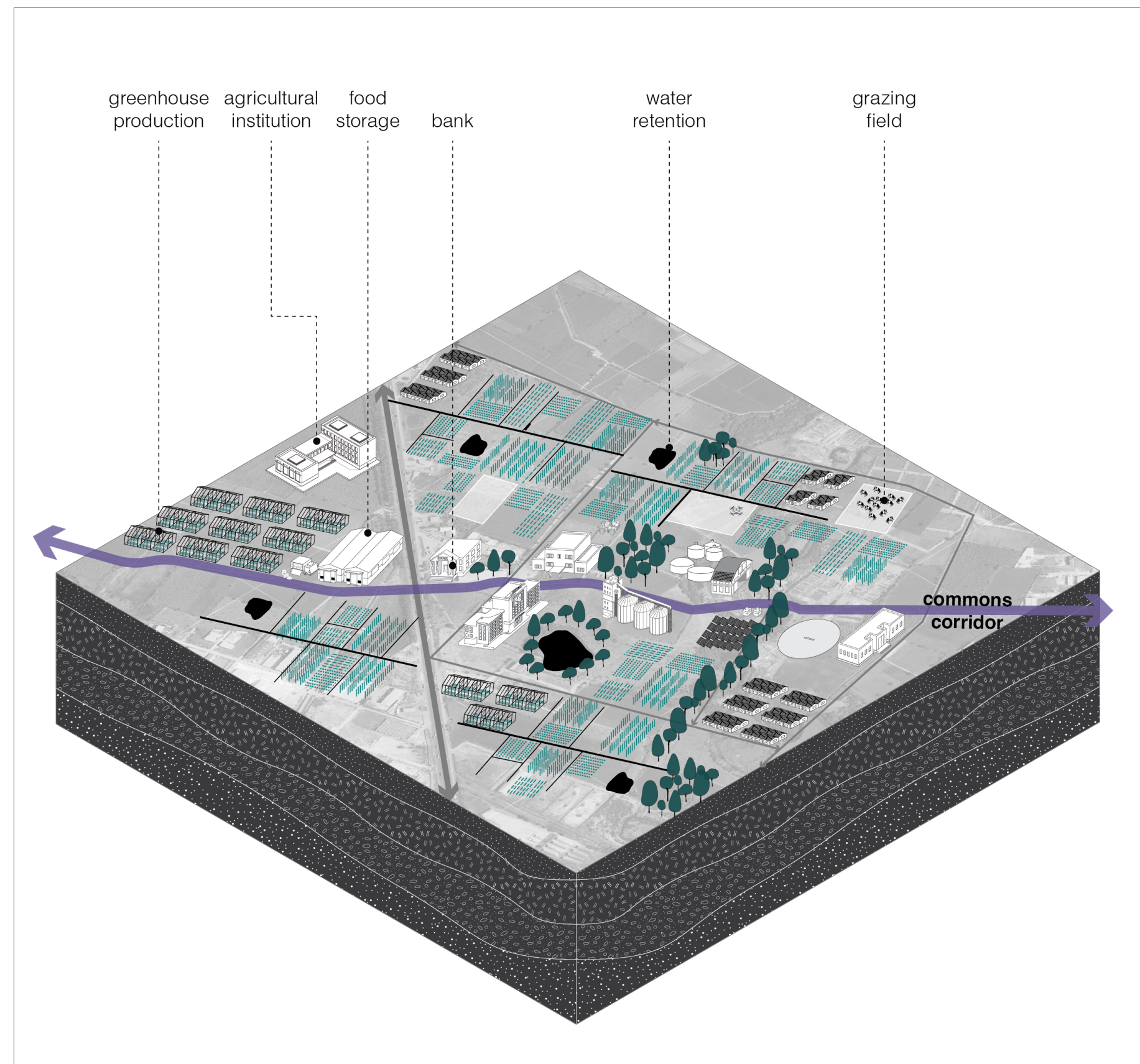


peri-urban area

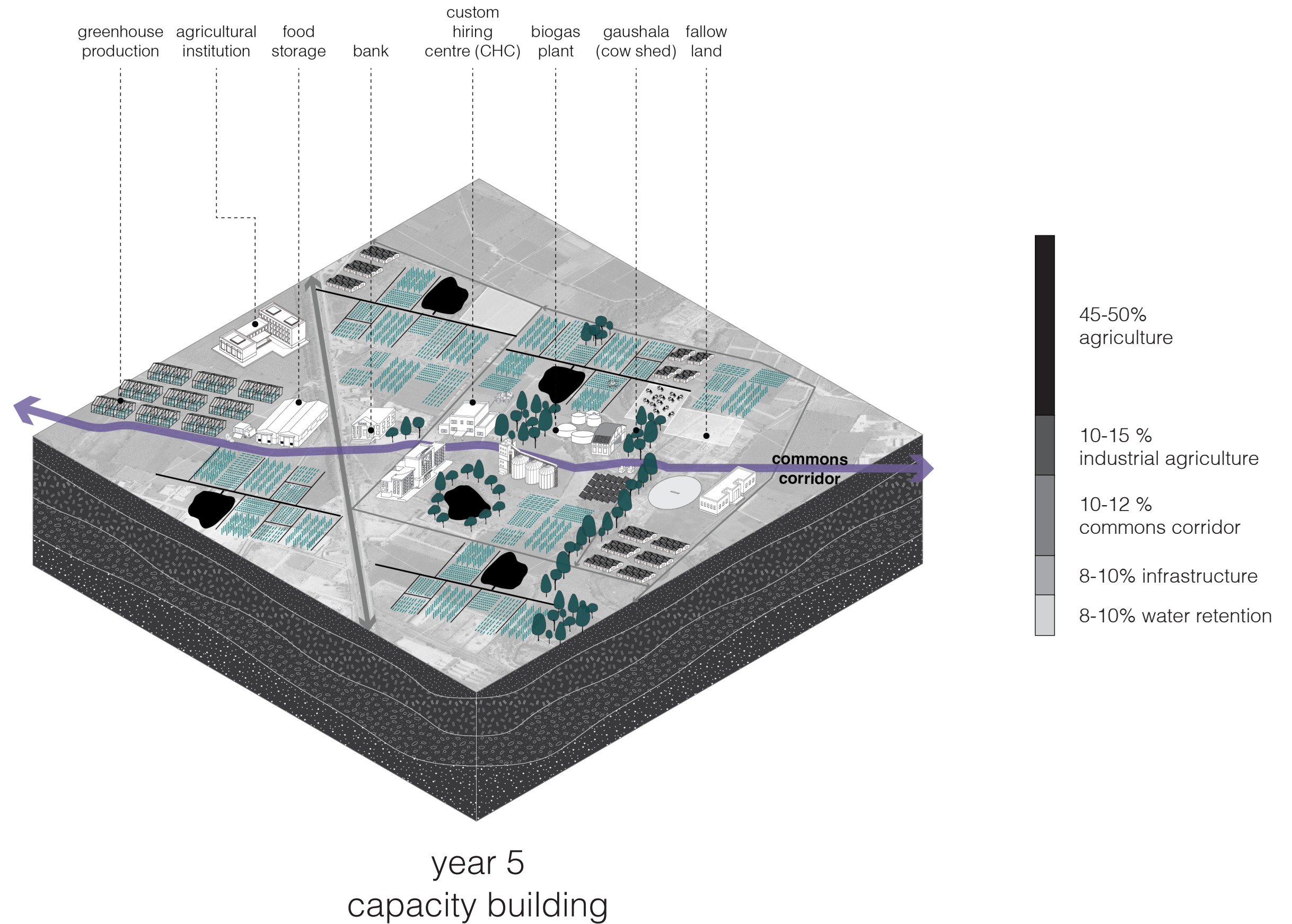


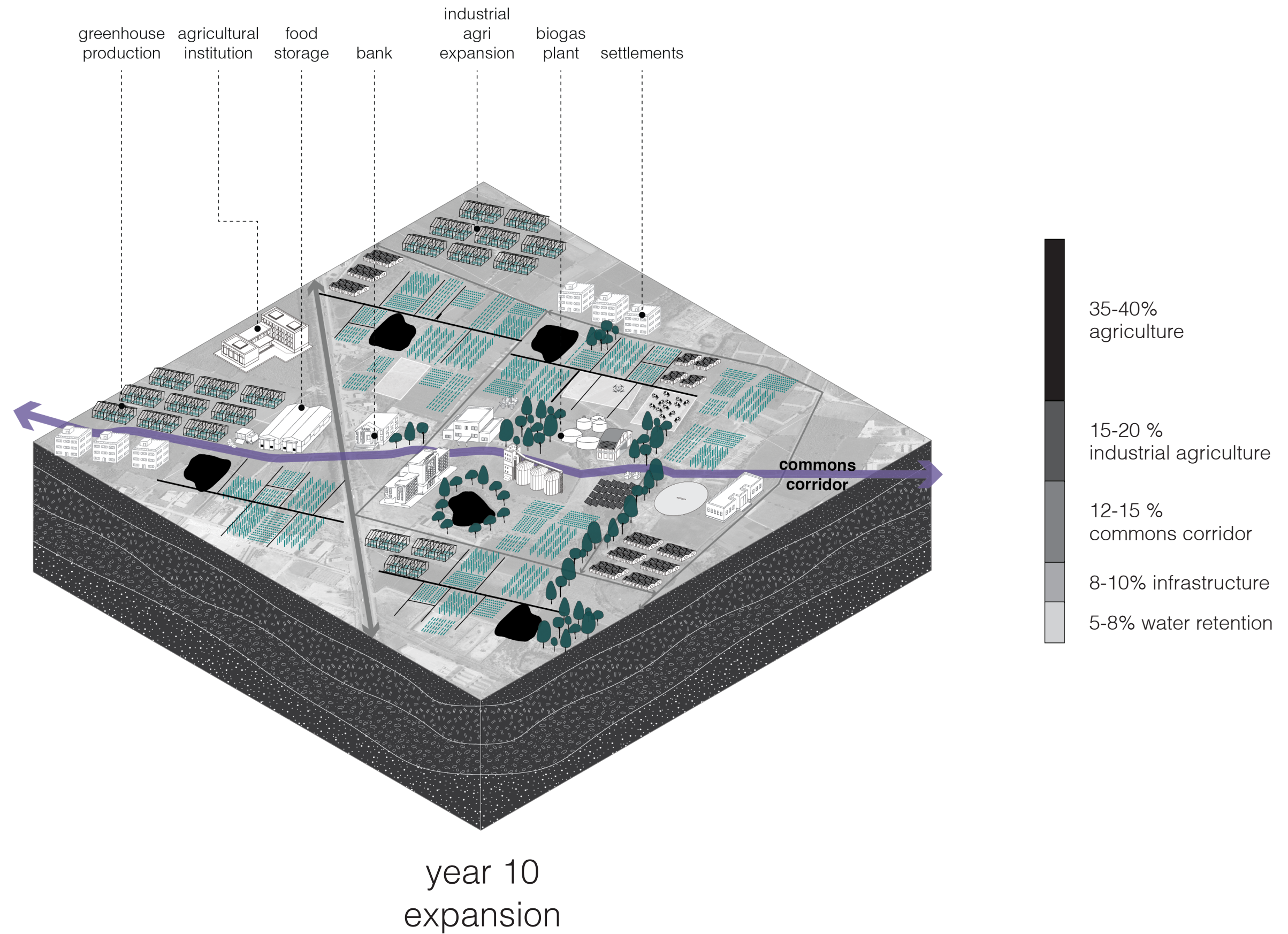


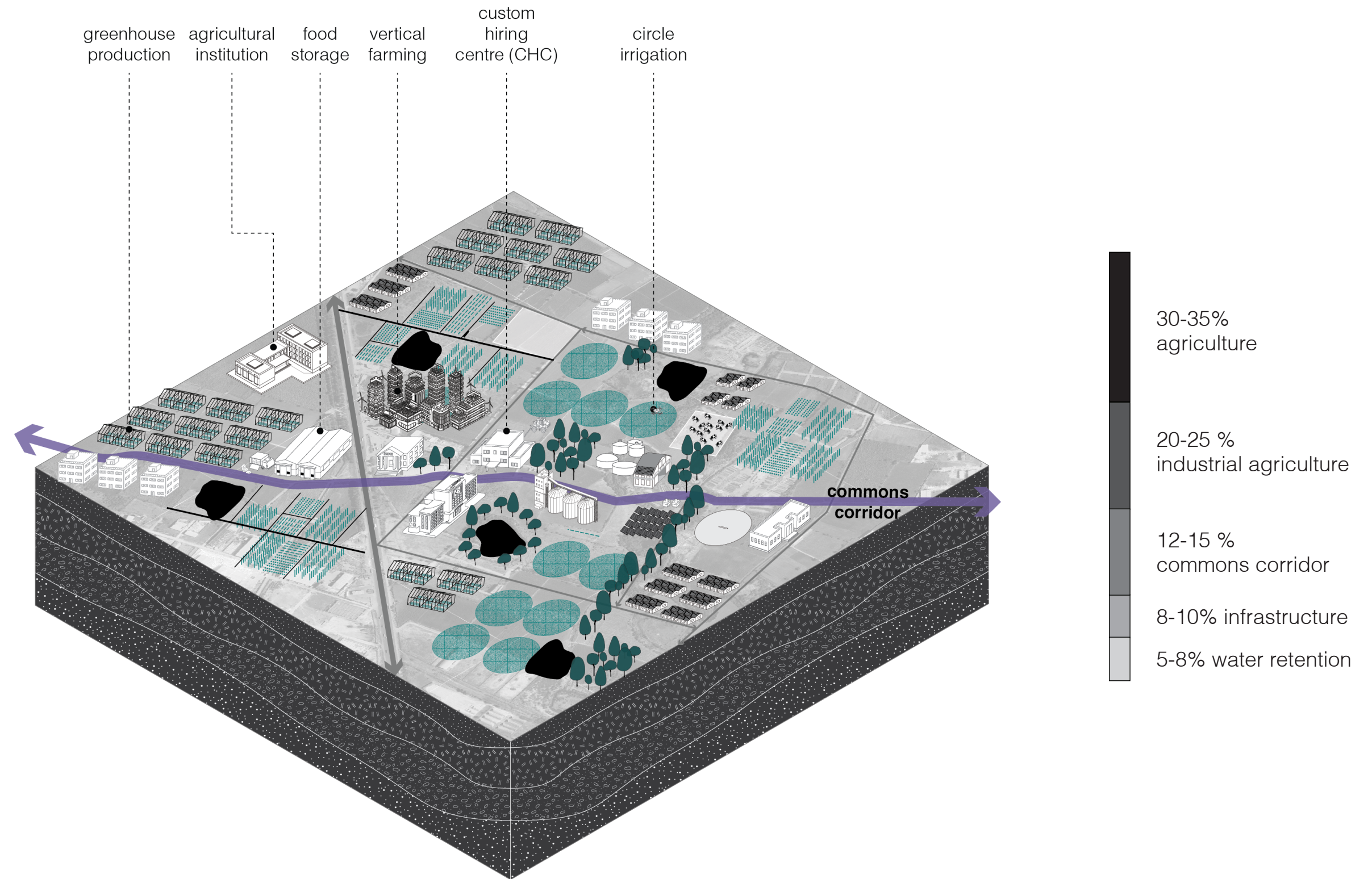
rural area | kharif season



rural area | rabi season







year 15
exploring verticality and testing grounds

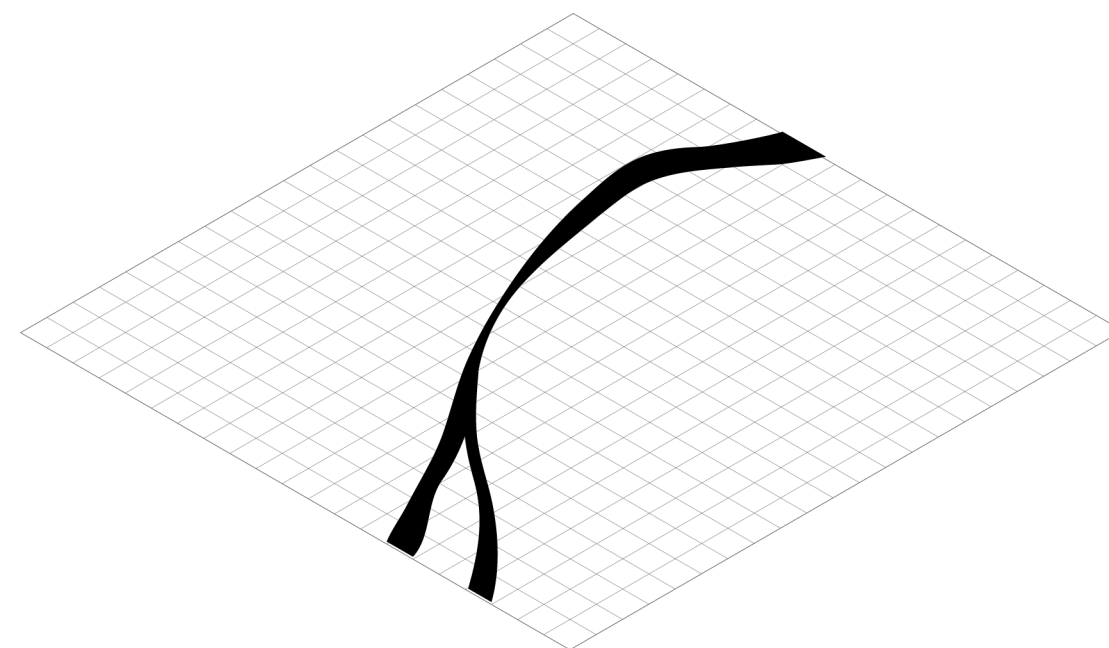
- district boundary
- existing settlement
- proposed eco-corridor
- proposed new street
- proposed development
- Metropolitan food cluster
- Organic farming
- Medium automation
- Agroforestry

0 10 20 30 km

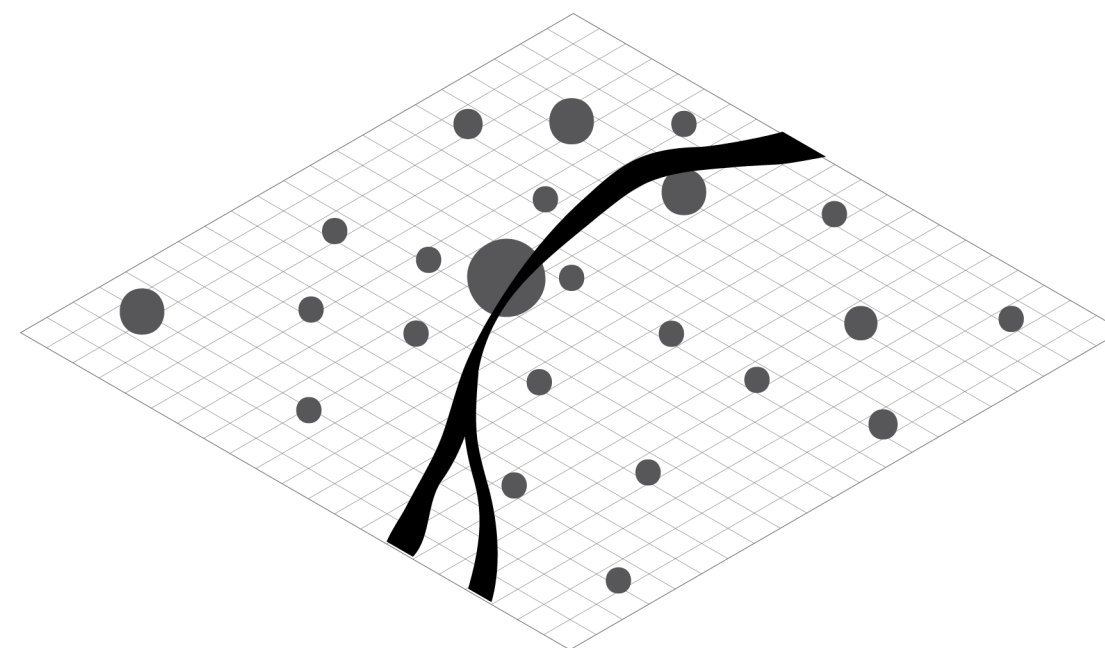


steps 6 | envision

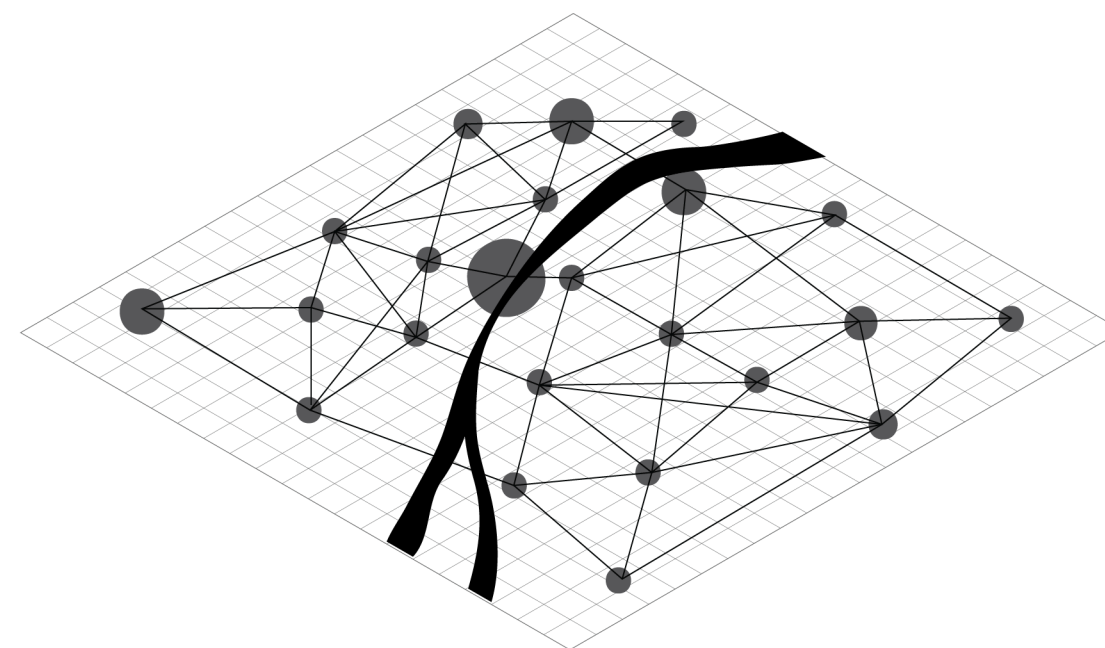
INDIAN AGRO-URBANISM MODEL



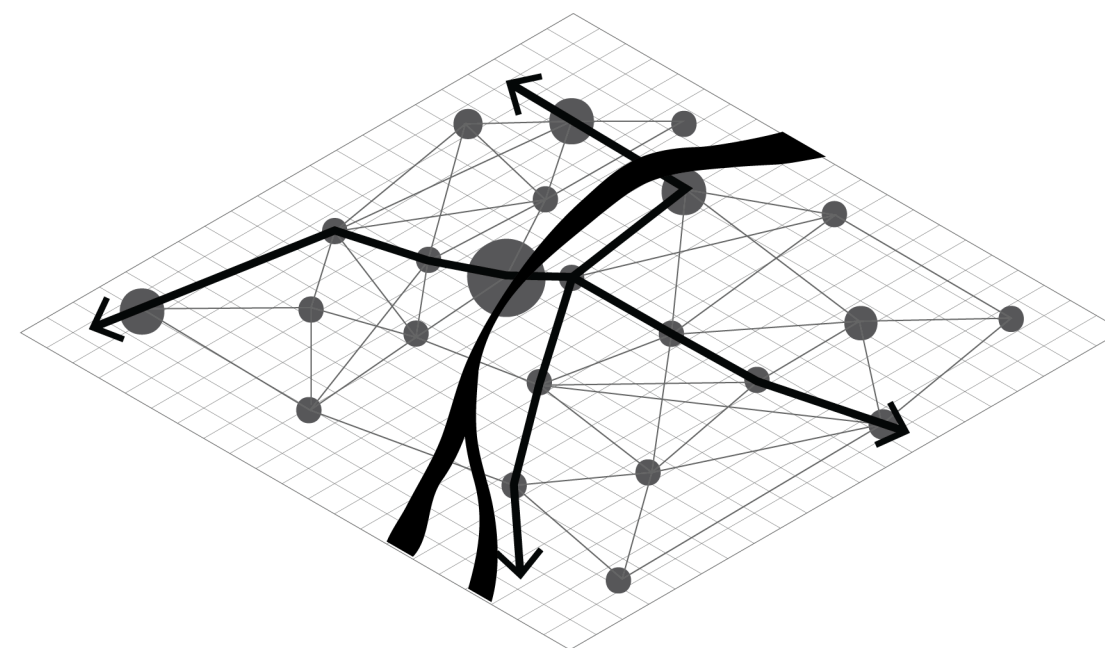
rivers and fields



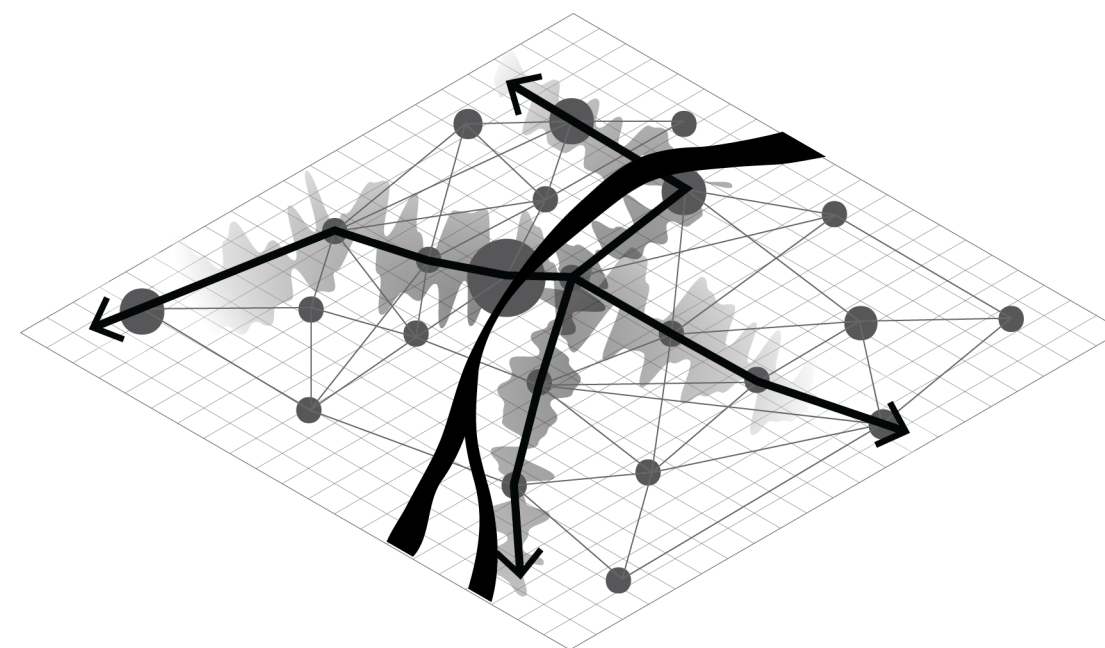
settlements around river and in valleys



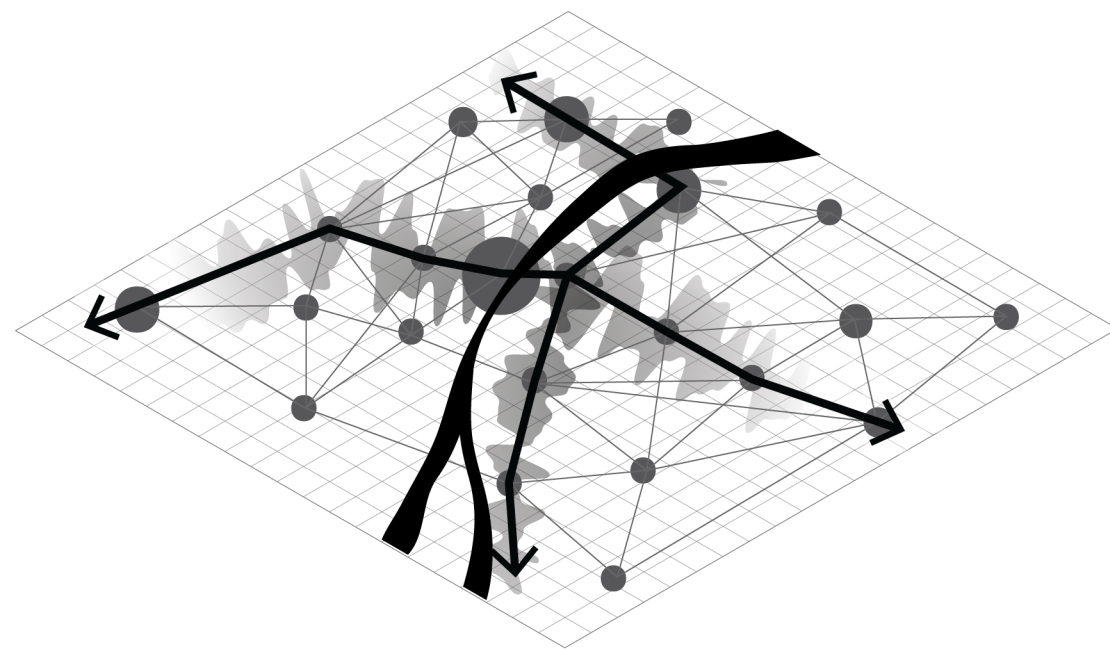
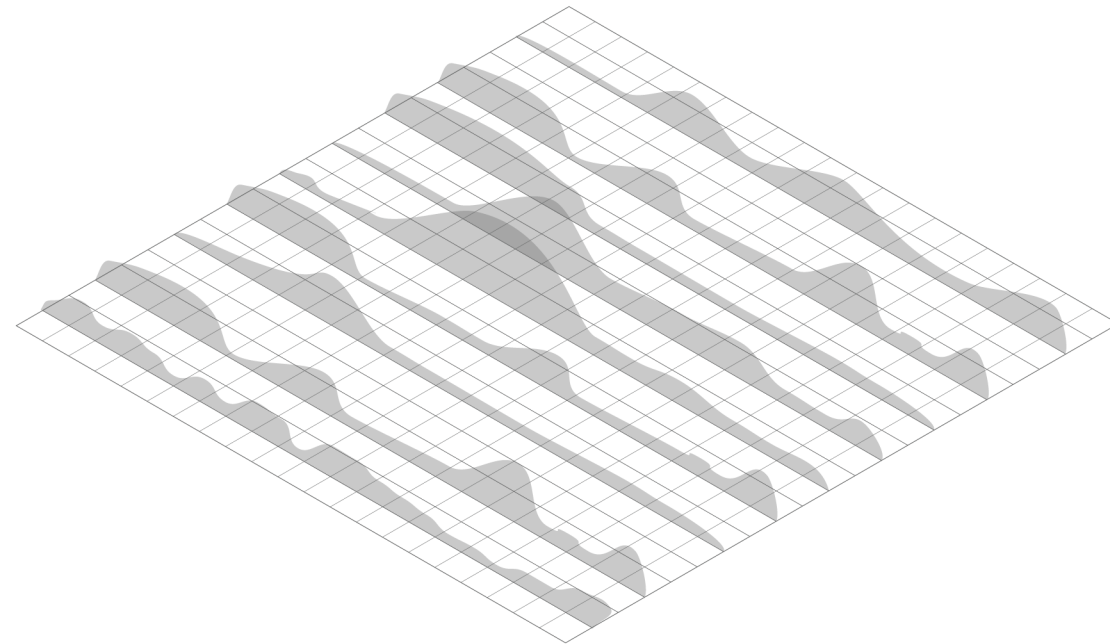
connecting settlements



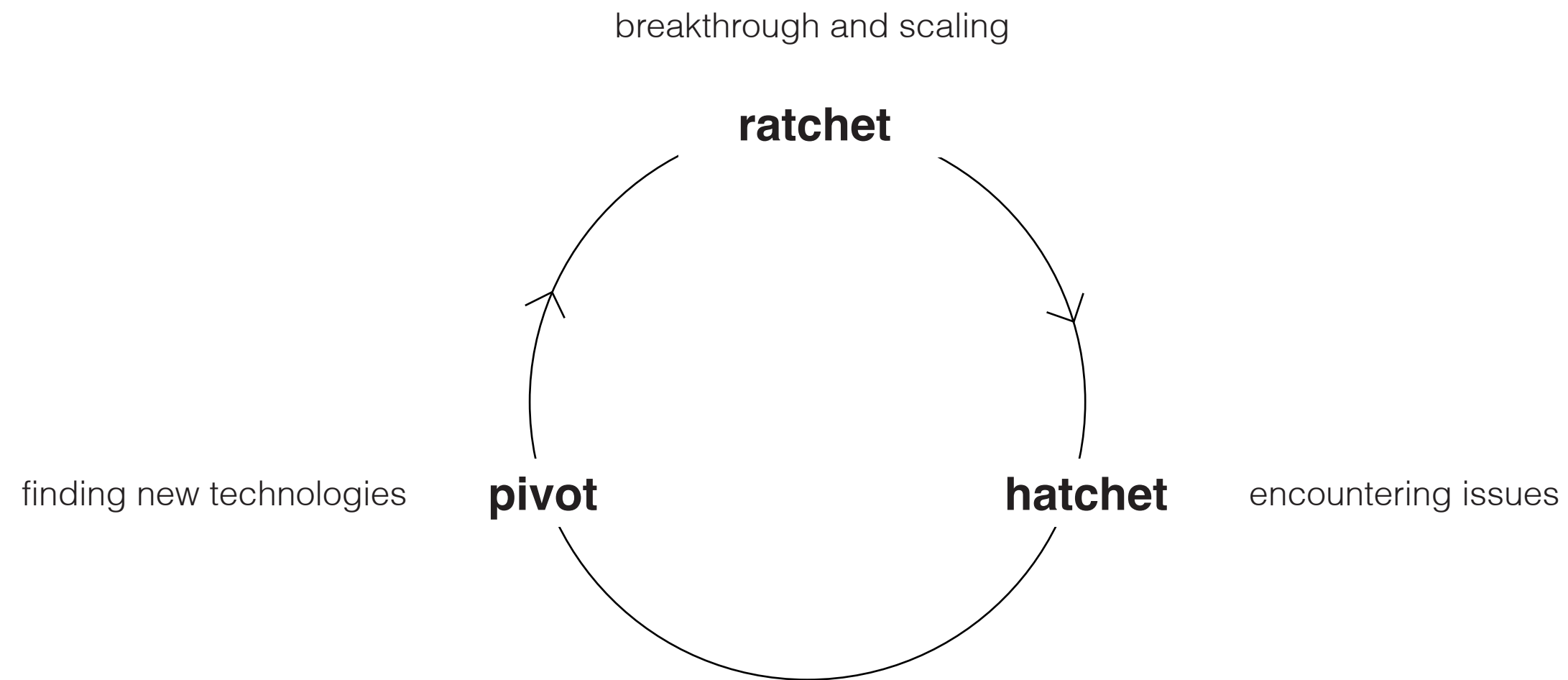
prominent connections...



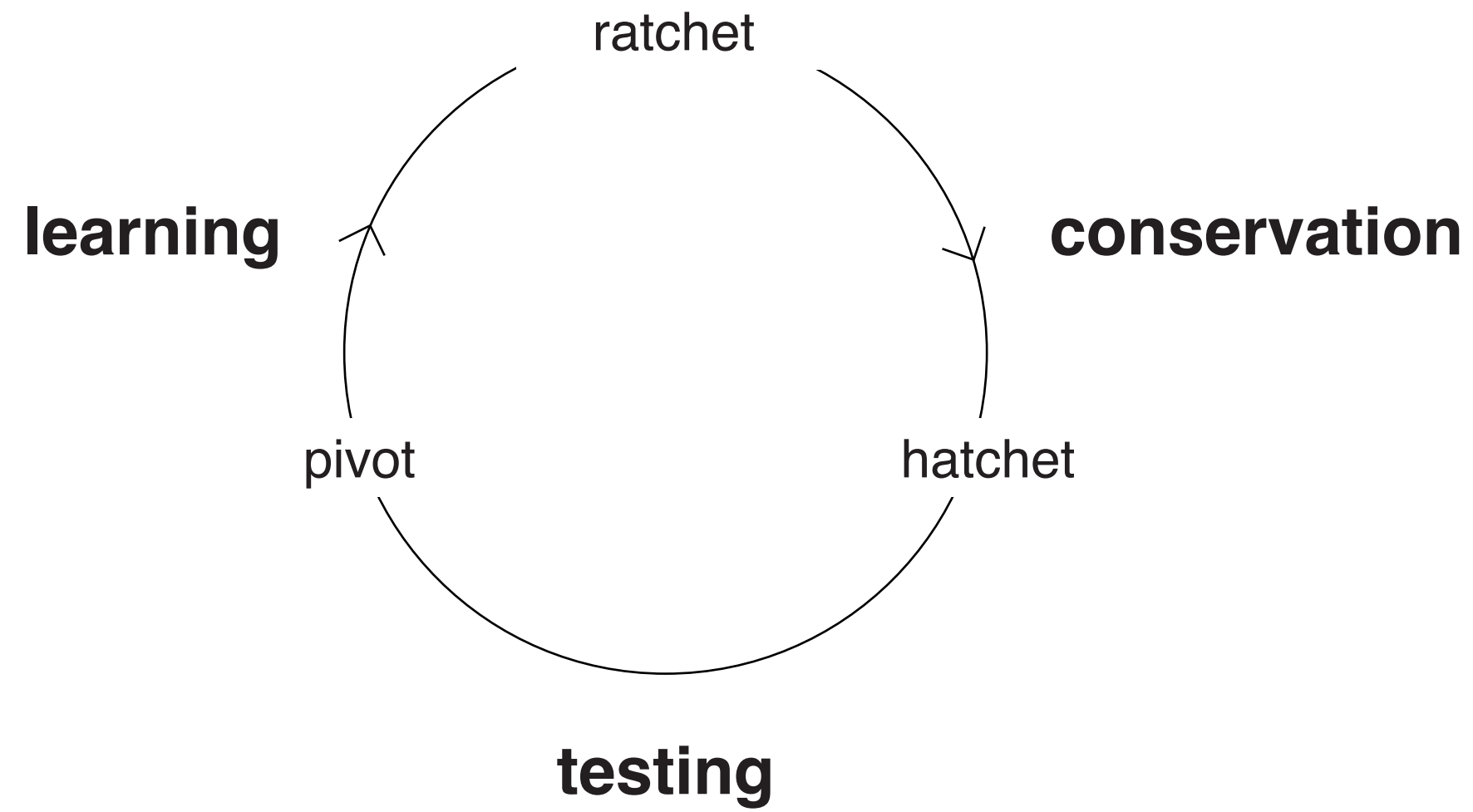
...as development anchors

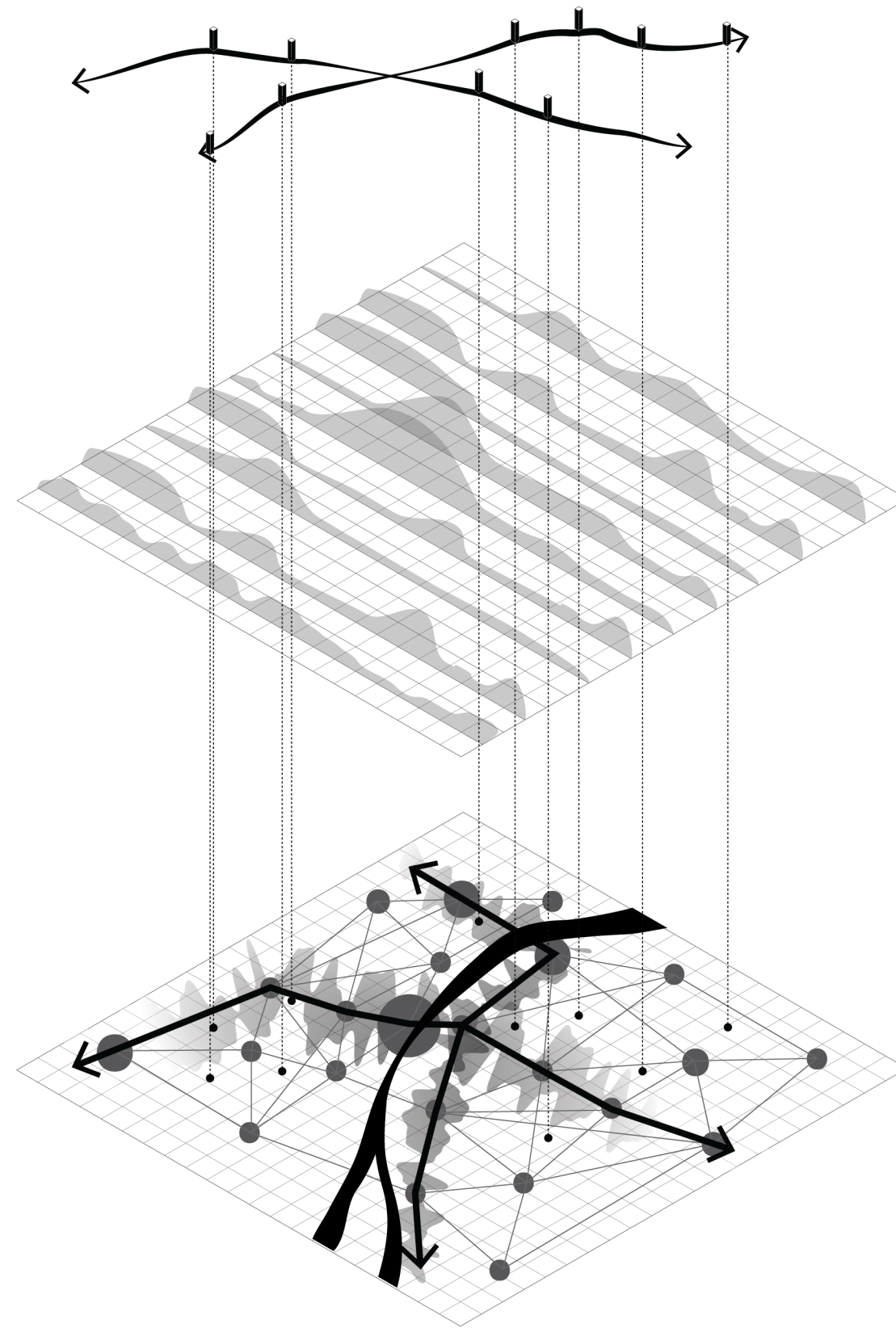


importance of field

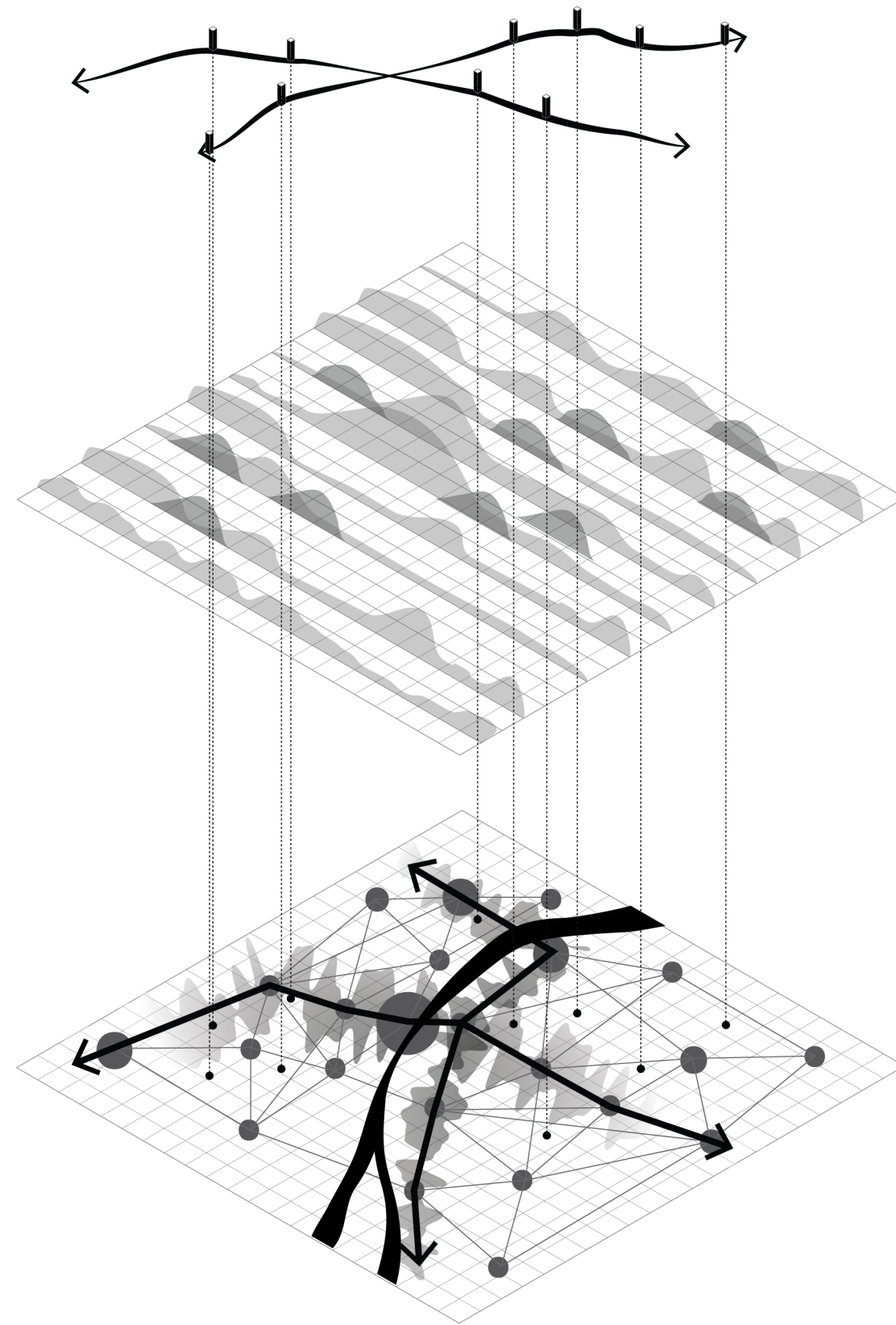


food systems must be designed to adapt at every stage of this cycle





public infrastructure as commons



proposed Indian agro-urbanism model

CONCLUSIONS

FOOD PRODUCTION MUST BE ADDRESSED SPATIALLY.

Reinstating agro-climatic zone-based planning, updating it periodically, would restore ecological differentiation to territorial governance.

THE OPERATIONAL FRAMEWORK IS TRANSFERABLE.

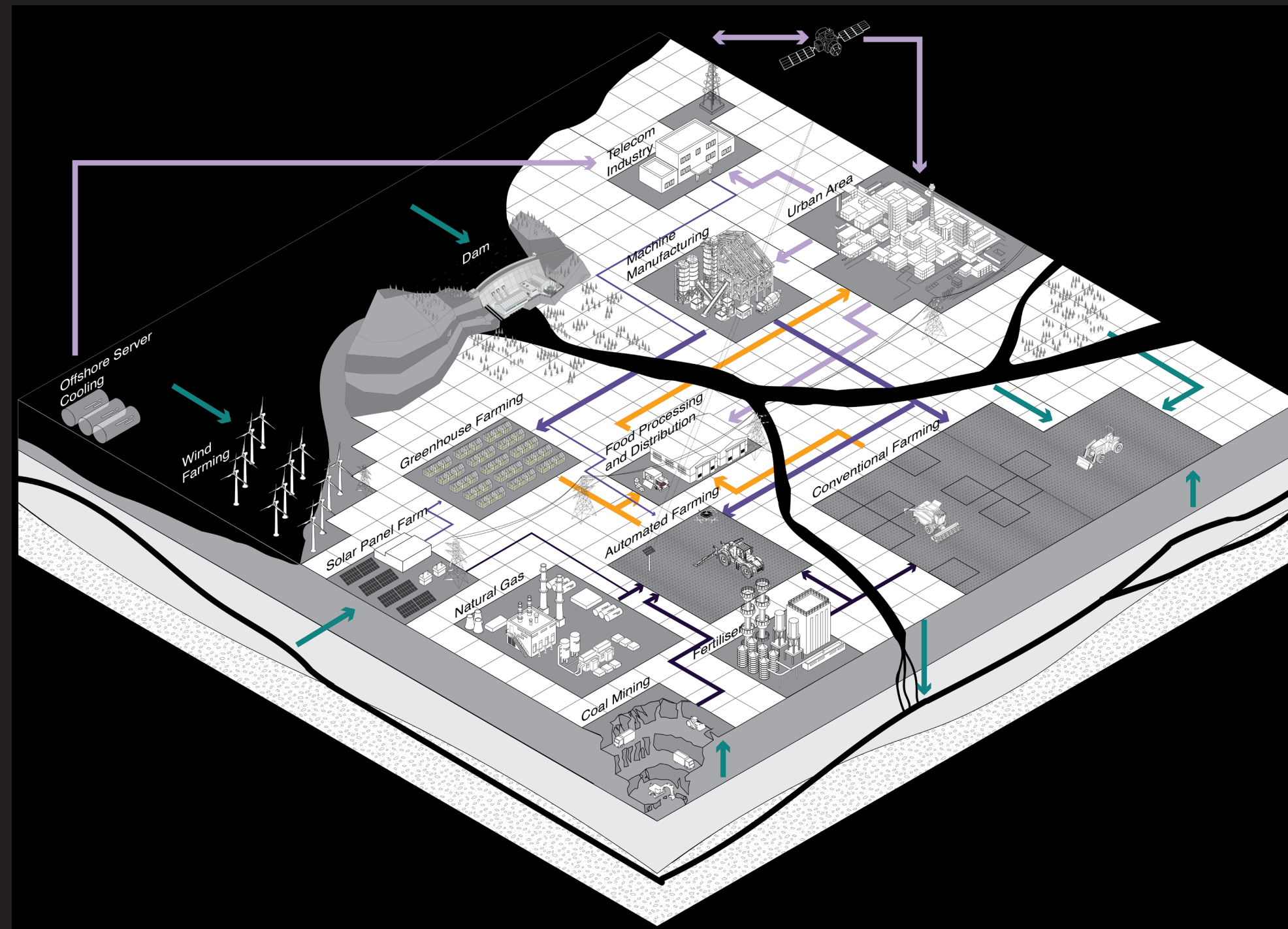
The six-phase process offers planners a structured yet flexible instrument adaptable across India's diverse agro-climatic contexts, one that embeds participatory design within every stage.

THE WAY FORWARD...

This project has addressed the first stage in the food system: production. Further stages and systems looking at equitable distribution, circular waste systems, and sustainable energy transitions are integral and demand further inquiry.

The contextualised Indian agro-urbanism model proposed here is an invitation: to planners, policymakers, farmers, and communities, to co-produce the spatial imaginaries that India's agricultural crisis urgently demands.

THANK YOU!



Aparnaa Chandrasekaran envisions

INDIAN AGRO-URBANISM MODELS

Mentors: Víctor Muñoz Sanz and Daniele Cannatella

- Bolhuis, M. A., Rachapalli, S. R., & Restuccia, D. (2026). India's Agricultural Productivity Trap Lies in Land Immobility. The Policy Edge. <https://www.policyedge.in/p/indias-agricultural-productivity-trap-lies-in-land-immobility>
- DTE Staff. (2021). Privacy Concerns, No Consultation: Farmer and Digital Rights Groups Write to Centre on AgriStack. Down To Earth. <https://www.downtoearth.org.in/agriculture/privacy-concerns-no-consultation-farmer-and-digital-rights-groups-write-to-centre-on-agristack-77711>
- Kodali, S. (2024). India's Farmers Are Wary of AgriStack. They Have Good Reasons to Be. The Wire. <https://thewire.in/agriculture/india-farmers-agristack-concerns-technology-agriculture>
- Moules, J. (2025). Indian Farmers Struggle as Climate Change Warps Landscape. Foreign Policy. <https://foreignpolicy.com/2025/10/24/india-farmers-crops-climate-change/>
- PM Modi and Netherlands' PM Discuss Strengthening Ties in Water, Agriculture & Health. (2024, December 18). <https://newsonair.gov.in/pm-modi-with-his-netherlands-counterpart-discusses-ways-to-further-deepen-existing-cooperation-in-sectors-of-water-agriculture-health/>
- Policy Circle Bureau. (2026, May 20). Farmer suicides: Small farms at the heart of distress. <https://www.policycircle.org/society/farmer-suicides-small-farms/>
- Press Trust of India. (2021, November 7). Over 33 lakh children in India malnourished, 17.7 lakh of them severely malnourished: Govt data. The Indian Express. <https://indianexpress.com/article/india/33-lakh-children-india-malnourished-17-lakh-severely-malnourished-govt-data-7611676/>
- Sebastian, M. (2022, July 28). How India's Opposition United to Challenge Modi. BBC News. <https://www.bbc.com/news/world-asia-india-62307784>
- UNICEF India. (2016). Household Food and Nutrition Insecurity in Four Drought-Hit Indian States: A Study in Bihar. UNICEF India. <https://knowledge.unicef.org/resource/household-food-and-nutrition-insecurity-four-drought-hit-indian-states-study-bihar>

references