XXXI International Seminar on Urban Form
ISUF2024: Future horizons for urban form
Disruption, continuity, expansion, and reverberation
16 – 20 September 2024, São Paulo, BRAZIL

# The green city morphology – Urban form, food production and nutrient circularity

**Todor Stojanovski[1], Anna Zaręba[2], Alicja Krzeminska[2], Mosen Farhangi[3] and Michael Martin[3],**

[1] KTH Royal Institute of Technology, Sweden, todor@kth.se
[2] University of Wrocław, Poland, anna.zareba@uwr.edu.pl, alicja.krzeminska@uwr.ed.pl
[3] IVL Swedish Environmental Research Institute, Sweden, mosen.farhangi@ivl.se, michael.martin@ivl.se

## ABSTRACT

The green city seeks to intertwine greenery, landscapes and agriculture into townscapes to create a sustainable urban form that will support high standard of living with nature, increased biodiversity and circular flow of resources. This paper conceptualizes and discusses visions, scales and elements of the agroecological urbanism and the green city through morphologically informed urban design. Urban designers analyse cities in three dimensions, whereas urban morphologists understand cities as a hierarchy of design elements: streets and their layout, plots and their aggregation in blocks, buildings, and land uses. The green city can be morphologically understood as a set of design elements such as windows farms, roof gardens, vertical farms, greenhouses, community allotments, backyard gardens, etc. that can be composed within the morphological hierarchy of cities. The urban agricultural systems and agritech (a shortening of agricultural technology) can utilize local wastes and employ underutilized space in urban areas for food provisioning to circulate resources. This includes e.g. vacant buildings, parking garages, basements, roofs, storage rooms, shipping containers, etc. Bringing urban morphology, landscape architecture and architecture, urban agriculture, landscape and industrial ecology together opens possibilities to better understand needs and challenges in developing productive green cities.

**Keywords:** green city, typomorphology, urban agriculture, food production, nutrient circularity

## Introduction

The future requires bold disruptive visions of future cities to achieve smart sustainability challenges. The green city prioritizes environmental design, greenery, landscapes, agriculture and townscapes that intertwine in a sustainable urban form that supports high standard of living in nature, biodiversity and circular flow of resources. The green city relates to buzzwords such as urban village, eco-village, eco-town, garden city (reviving a concept from the end of the 19th century), sustainable community, sustainable urban extension, etc. (Cowan, 2021). In parallel, smart sustainability emerges as a new transformative approach focusing on development of eco cities and sustainable neighbourhoods, digitisation of urban infrastructure, and collaborative experimentation with low-carbon and digital technologies (Evans & Karvonen, 2014; Evans et al., 2016; Cugurullo, 2021). This paper looks and discusses green architecture and eco city visions from self-sufficient hermit huts to social utopias, working cities and productive landscapes (Howard, 1898; Le Corbusier, 1987 [1925]; Wright, 1935; Viljoen et al., 2005; Gorgolewski et al., 2011; Viljoen, A. & Bohn, 2014; Davis, 2020), informal urban agriculture (Hardman & Larkham, 2014), landscape architecture and urbanism (McHarg, 1992 [1969]; Turner, 1996; 1998; Waldheim, 2016), to emerging agricultural technologies (abbreviated as agritech) inspiring high-tech smart sustainability experiments (Farhangi et al., 2020), such as urban food labs or

indoor, vertical or rooftop farms (Orsini et al., 2017; Martin & Molin, 2019; Martin et al., 2019; 2023; Martin & Orsini, 2023).

To discuss physical prerequisites and opportunities for agroecological urbanism and productive green cities, this paper converges perspectives from urban morphology, agriculture and food systems, and industrial ecology to conceptualize scales and elements for a handbook for morphologically informed urban design. Morphological analysis is defined by a hierarchy of three fundamental elements: streets and their layout, plots and their aggregation in blocks, buildings and land uses as building utilisation (Conzen, 1960; Moudon, 1997; Kropf, 2011; 2014; 2018). Urban designers focus on the experiential qualities of cities in in three dimensions (3D), liveable city and the human scale (Southworth, 2016). They combine imagery, diagrams, and maps to analyse and design cities (Talen, 2009). They develop typologies and they turn typologies into visions, design codes or Form-Based Codes (FBCs) with morphological methods (Duany & Talen, 2002; Carmona et al, 2006; Walters, 2007; Talen, 2013). Urban morphology informs urban design as hierarchy of design elements and sub-elements at various scales conventionally structured in urban design handbooks based on typologies. If urban morphology is about inference and interpretation of type, urban design is about invention of types and intervention using type in a systematic fashion (Marshall & Çalişkan, 2011). The agroecological urbanism of the green city can be morphologically understood as design elements at various scale such as rural and urban farms, community or private urban gardens, vertical farms and fields, windows farms, or roof gardens, etc. that can be integrated in the morphological hierarchy of the city. Many underutilized spaces in urban areas, particularly open spaces between buildings, that characterise the 20$^{th}$ century urbanism (Le Corbusier, 1987 [1925]) can be used for food provisioning and promotion of a circularity. This includes open green spaces, vacant buildings, parking garages, basements, storage rooms, shipping containers, and integrated in-store in commercial locations (Martin & Bustamante, 2021). This paper aims to inspire debates on implementing old and new urban agriculture technologies to produce high quality food and contribute to food security and nutrient circularity locally.

## The city, nature and agriculture

The green city intersects cities and nature, integrating urban environments with natural ecosystems and agriculture needed to sustain cities. Figure 1 diagrammatises the relationships between cities, agriculture and nature highlighting aspects of investigation of the relationship where agriculture is cultivated nature typically understood as countryside and the city stands as opposite. The city is within the domain of urban morphology that looks at the formation of urban elements (streets/squares, plots and buildings) and their transformation over time, nature is conceived as landscape, ecology and biology. Landscape architecture, urban design and landscape urbanism have a unique location in this relationship to integrate vegetation and water (green and blue design elements) in cities as landscape ecology (McHarg, 1992 [1969]; Turner & Gardner 2015 [2001]). Landscape architecture is the art, science and technology of composing gardens for private or public use, and green spaces and outdoor environments as public realm with good social, aesthetic and ecological, incorporating landform, vegetation and water elements with buildings, landmarks, built structures and paving (Turner, 2014). The term landscape ecology was introduced by the German biogeographer Carl Troll (1939) and combines the spatial approach of the geographer with the functional approach of the ecologist (Turner & Gardner, 2015, p.3, see McHarg, 1992 [1969]). It focuses on the spatial relationships among landscape elements, or ecosystems, the flows of energy, nutrients, plants and animals and the ecological dynamics of the landscape mosaic through time (Forman 1983).


*Figure 1: Intersection of city and nature conceptualizing relationships between disciplines focused on the green city and urban agriculture*

The food systems intersect agriculture and city starting with food production (on farms as cultivated nature or within natural ecosystems as hunting and gathering) through food distribution and trade (that includes global chains of warehouses, ports, transport and logistic infrastructure) to wholesale and retail food distribution (food markets at squares, big box supermarkets and grocers and supermarkets in buildings). Food preparation happens in kitchens and restaurants as sub-elements of buildings. The green city exist is many variations across the city, nature and agriculture fields. Some theoretical frameworks have roots in social utopianism, anarchism and even hermit communities, while others can be located in urban morphology and design, but incorporate biological and ecological narratives (from biomimicry, and biophilia, most radical assume generic engineering of proto cells to create living settlements), ecology and environmentalism (living in/living with nature), landscape architecture, etc. There is also permaculture that seeks to imitate natural ecosystem circularity for agriculture. To structure the literature of green cities and (utopian) visions that highlight agriculture, this paper starts with morphological dissection of scales and elements.

## The morphology of the green city

Urban morphology studies the physical elements and structure of cities, the physiognomy and character of their buildings, streets or neighbourhoods. One of the important aspects is the resolution of analyses or the scale (Moudon, 1997). Figure 2 shows the theoretical framework for morphological resolution based on environmental perception of urban space and the public-private spaces morphological structure of cities from a private building and plot to a public street/square (Figure 2E). The environmental perception of urban space is shaped by anthropometrics in architecture (armreach) and personal and social distances in anthropology (Hall, 1959; 1966; Gehl, 1986 [1971]) (Figure 2A). The visual world is like a sphere around a person and is clear everywhere while the visual field is the area within the field of view of both eyes (Figure 2B). The field of view is clear in the centre (foveal vision) and vague in the periphery (defined by Gibson, 1986) and the visual acuity is within a radius of 100-200 m. Visual perception is enhanced when supported by related auditory cues and vice versa. Sounds provide an important link to reality, are enriching and protective (Southworth, 1967; 2020). Sounds come from any directions. They are aural and turn the head around (Stojanovski & Axelsson, 2018; Axelsson, 2020). The operational environment defines the space where people move and work. It is a movement space and can extend up to 100 kilometres. The perceptual environment is the space where people are directly conscious and to which they give symbolic meaning (it can extend up to 1 kilometre). In the behavioural environment, people are not only aware but also

perform behavioural response (Rapoport, 1977). Figure 2C show the nested structure of operational and perceptual hierarchy of environments, whereas Figure 2D shows the amoebic shapes that are created by the urban morphology and the physical and social factors that shape the inner behavioural environment, as well as the operational environment shaped by walking.

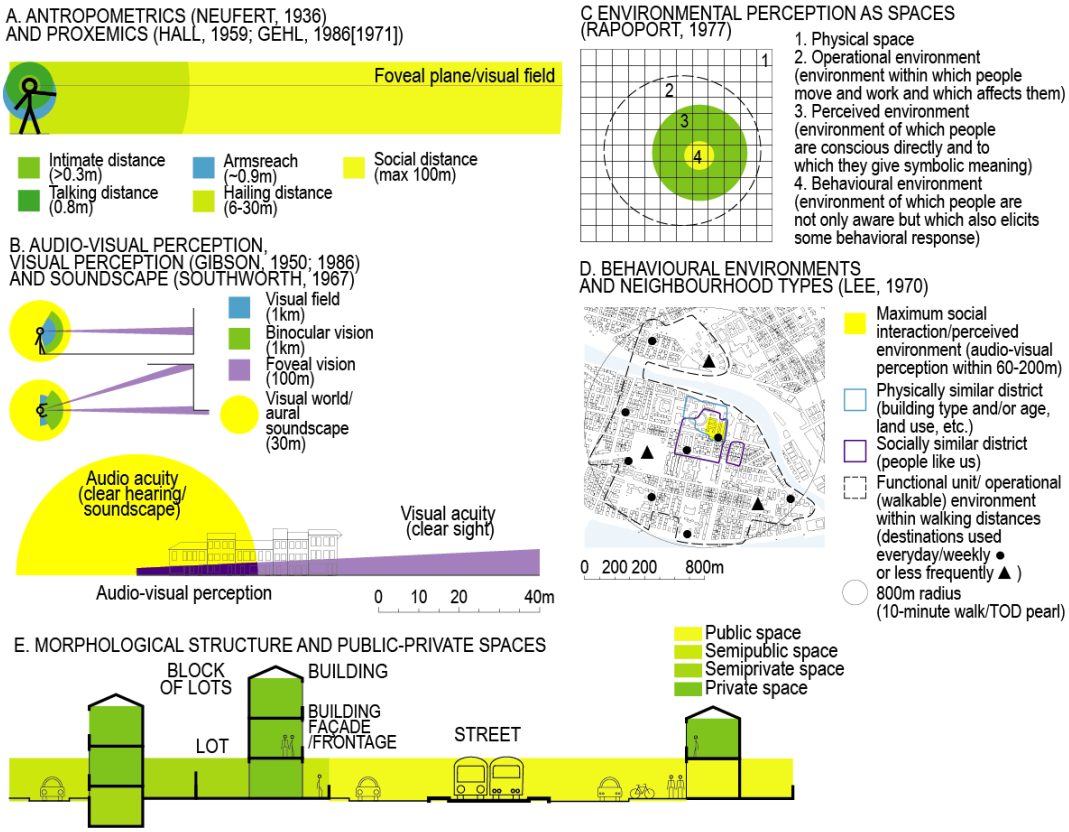


*Figure 2: Theoretical framework for morphological structure of scales based on environmental perception*

This paper furthermore explores the literature of green cities and (utopian) visions that highlight agriculture. It classifies concepts, projects, technologies, etc. by discipline, scale and agricultural technology level, by expert approaches and by regulations. To structure the literature review it uses a genealogical approach (Stojanovski & Samuels, 2023). Urban designers eclectically combine imagery, diagrams, and maps in urban design handbook urban design manuals (Bentley et al, 1985; 2024; Talen 2009) and for advocacy for design guidelines (Duany & Talen, 2002; Carmona, et al., 2006; Walters, 2007; Talen 2013) as urban design can be defined as the art of making and shaping cities by creating compositions of morphological elements in physical space (Taylor, 1999; Marshall 2016). Figure 3 shows a diagram of urban agriculture, mapping important events, models, references, actors, etc. in respect to morphological schools and approaches (see Stojanovski, 2022) highlighting disciplines such as economy/geography, architecture and landscape architecture that worked with agricultural models. There is a dominance of architects who worked with green architecture, self-sufficient communities and urban agriculture who developed visions from entire cities such as Le Corbusier and Frank Lloyd Wright, to biospheres and neighbourhoods as CPUL (Continuous Productive Urban Landscapes) to green buildings, indoor farming, guerilla gardening and foodscaping of urban spaces (Hardman & Larkham, 2014; Elmlund & Haas, 2019).

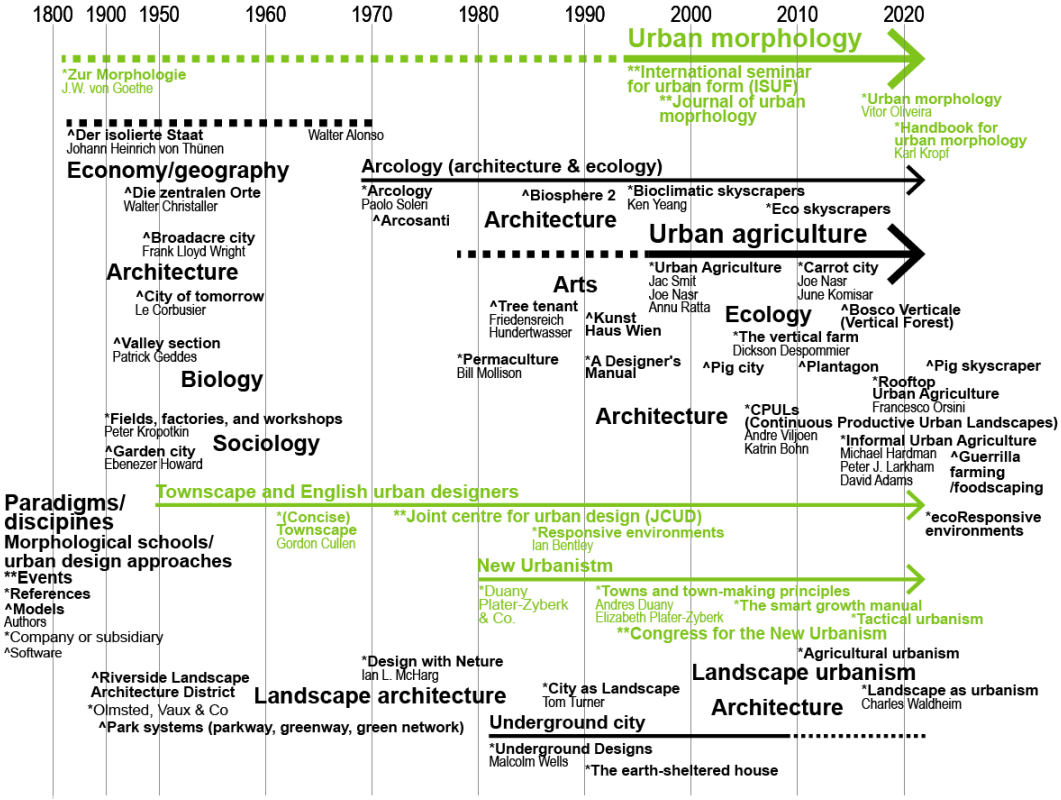


*Figure 3: A genealogical diagram of urban agriculture, mapping important events, models, references, actors, etc. in respect to morphological schools and approaches (see Stojanovski, 2022, for the entire genealogical diagram of urban morphology)*

## Green city visions

There are various green city visions. Historically, the towns were a mix of city and agriculture located at transport foci surrounded by arable land and/or abundant fisheries. These historical towns/cities created a hierarchy of centres (smaller towns and villages) along transportation axes at a scale of an urban region. Johann Heinrich Von Thünen (1966 [1826]) proposed a theory of cities developing as concentric rings (Der isolirte Staat, or the Isolated City) based on transportation costs that was further developed in a theory of central places (Die zentralen Orte) by Walter Christaller's (1966, [1933]). With the industrialisation of agriculture and transport emerged models for self-sufficient communities and social utopia by thinkers as Henri de Saint-Simon, Charles Fourier and Robert Owen. A phalanstère (or phalanstery) was a type of building proposed by Charles Fourier in the early 19th century by Charles Fourier and designed for self-contained and self-sufficient community consisting of thousands people working together. Fourier combined the French word phalange (phalanx, an emblematic military unit) with the word monastère (monastery) to describe the social ethic of the utopian community. Peter Kropotkin created the most detailed model for social utopian community surveying food production in England in the 19$^{th}$ century. The community consisted of 200 families with five members, living on 1000 acres. 340 acres were to be used for growing the cereals like wheat, oats, barley, 400 acres used for all the green crops and fodder required to keep 30 or 40 cows for milk and butter and 300 heads of cattle for supply of meat. 20 acres were to be used for growing vegetables and fruits from which 2 acres under glass. Half an acre is attached to each house for hobbies and amusement, like poultry keeping, or any fancy culture, flowers, and in the end, there are remaining 140 acres for all sorts of purposes, like public gardens, squares, manufactures. Landscape architecture also emerged in the 19$^{th}$

century to address the need of green spaces in cities. Frederick Law Olmsted was pivotal in designing parks, parkways, greenways as green networks in cities that with green belts and wedges remain as a landscape planning and architecture typology for green spaces in cities (Turner, 1995; 2006). Ebenezer Howard (1898) summarised the industrialization dream of mixing city and countryside by proposing a polycentric city of tomorrow consists of railway suburbs that reside in the green tranquillity of the landscape and have a speedy connection to the diverse and exciting industrial, but polluted city. Le Corbusier's (1987 [1925]) city of tomorrow and Frank Lloyd Wright's (1935) Broadacre city created also visions of green and self-sufficient cities. Ebenezer Howard estimated roughly six times smaller agricultural area than Peter Kropotkin (6000-acre garden town assumes 5000 acres under agriculture to fulfil the needs for a city of 32000 people vs. 1000-acre community for 200 households or 1000 people), whereas Frank Lloyd Wright (1935) planned 1400 small farm units (8000 residents) on four square miles (2560 acres) in the Broadacre city. Paolo Soleri, a student of Frank Lloyd Wright planned the Arcosanti community of 5000 residents on a 4060-acre land preserve property, being one of the last agricultural utopias planned in that tradition.

A new revolution with urban agriculture, green architecture and landscape urbanism came with the environmental movement in the 1970s. Concepts such as permaculture (permanent + agriculture) by Bill Mollison, tree tenant by Friedensreich Hundertwasser, underground and earth-sheltered houses Malcolm Wells, etc. in the 1980s preceded a revolution in urban agriculture since the 1990s supported by development of new agritech (hydroponics, aeroponics, etc.). Some systems like aeroponics came out from trials to grow food on space stations in zero gravity (Stojanovski, 2023; Stojanovski & Adams, 2024). Furthermore, there is a new generation of entrepreneurs and enthusiasts as actors advocating for agroecological urbanism such as "artisan farmers", who are local businesses running farms that specialize in a specific crop (e.g. mushroom farms, salads, etc.) and supply local food with high quality and cost, typically to the local community and restaurants, "agrotechnologists" entrepreneurs developing new innovative agritech for global impact and markets, guerilla farmers or gardeners who grow food predominantly for recreation, and "agritects", typically architects who as professionals advocate for urban agriculture and green architecture, etc. This has created development of indoor and rooftop agritech, visions and experiments with vertical farming including pig skyscrapers (see Despommier, 2010; Gorgolewski et al., 2011). Food growing, farmer markets and food festivals also play important role in placemaking as guerilla gardening and city farming (Adams & Hardman, 2014; Hardman & Larkham, 2014; Hardman, et al, 2022).

Figure 4 classify the visions, concepts, models, projects, technologies, etc. by scale and agricultural technology level. Figure 5 shows them by expert approaches (professional farmers and agronomists vs. recreational agriculturists) and by regulations (formal permits for agricultural land uses or farming activities vs. informal placemaking acts such as guerilla farming/gardening). Most of the models and elements from landscape agriculture are summarised by Tom Turner (1995; 1996; 1998; 2006), whereas in architecture by Joe Nasr and June Komisar (as "carrot city" advocacy, see Gorgolewski et al, 2011, Nasr & Potteiger, 2023, as depositories of urban agriculture concepts, models, projects, typologies, etc.). Additional resources are agritects such as Andre Viljoen and Katrin Bohn (2005; 2014), Janine de la Salle & Mark Holland (2010), Craig Verzone and Christina Woods (2021), and their books on productive landscapes, agricultural and food urbanism.

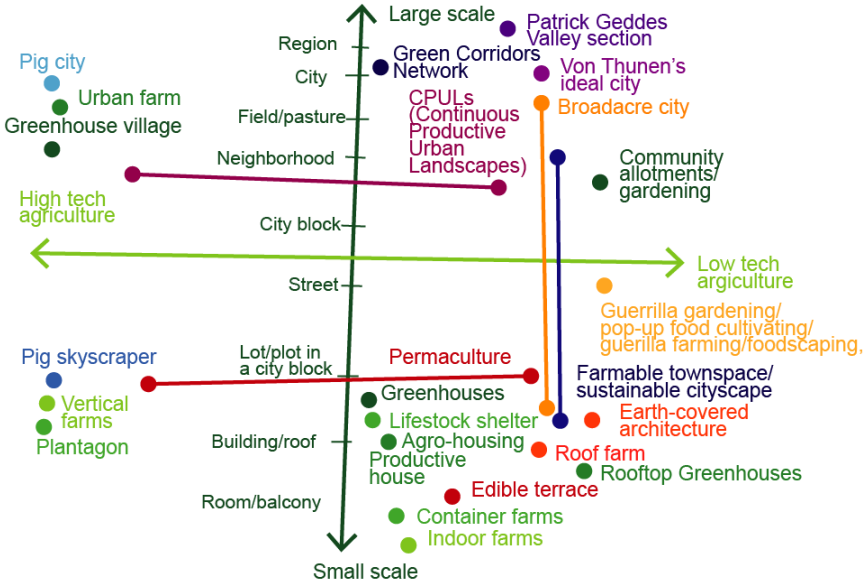


*Figure 4: Urban agriculture and agroecological urbanisms by scale and agricultural technology level*

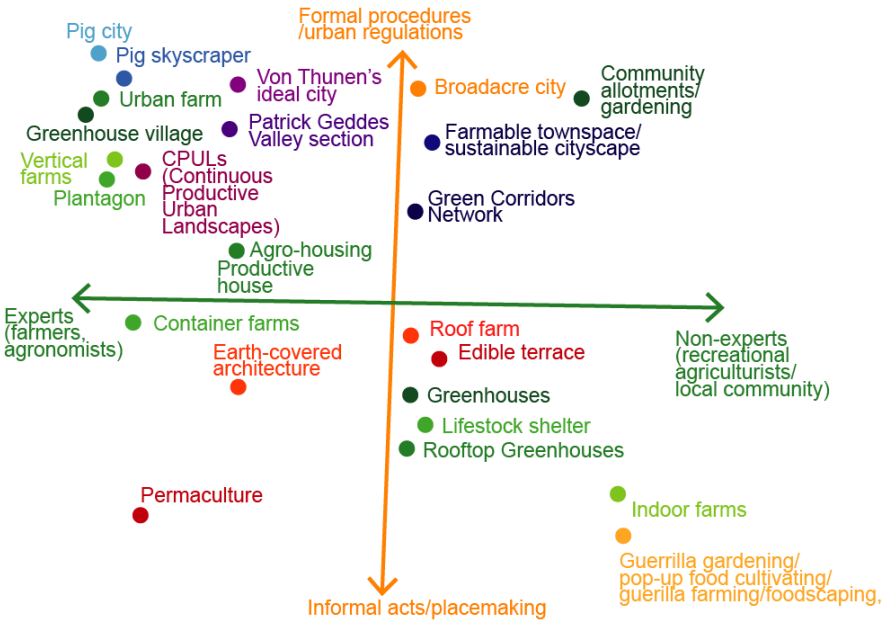


*Figure 5: Urban agriculture and agroecological urbanisms by expertise and regulations*

The figures above show visions, concepts, models, projects, technologies, etc. of urban agriculture and agroecological urbanisms at various scales with intention to map and classify morphology, scales and elements within a framework of perceptual morphology and inspire debate on integrating them in typologies of neighbourhoods, streets and buildings in various international contexts. The aim is to develop green city urban design handbooks considering local morphological context and perceptual constraints. Table 1 summarizes the visions for agroecological urbanisms, urban agriculture projects and agricultural technologies at morphological scales from a room to a city and it also juxtaposes agricultural technologies and landscape elements in a respect to direct sun or shade, public and public spaces and accessibility.

*Table 1: Morphological scales transposed with agricultural technologies and landscape elements*

| Morphological scales | Agricultural technologies and landscape elements | Insolation | Public space and accessibility |
|---|---|---|---|
| Room (windows, doors) | Pots, indoor farming systems (plant pods, indoor gardens), window farms | Partially in sun/shade | Private space (within an arm's reach) |
| Balcony/terrace (door, windshield) | Planting walls/hanging planters | | |
| Building story | Composters | Shade | Private space (within an arm's reach) |
| Ground floor (entrances, doors) | Raised beds/containers/soft planters | | Private space or public space (within a VIEWSHED) |
| Roof | Row of plants | Direct sun/ possibly shaded from buildings | Private, semi-private or semi-public (within an arm's reach) |
| **BUILDING** | Row of trees | | |
| Building façades (windows, doors, balconies) | Arbor/pergola | | Private space or public space (within a VIEWSHED) |
| **PLOT/PARCEL** | Greenhouses | | Private or semi-public space (within an arm's reach and a VIEWSHED) |
| Backyards/open spaces | Livestock shelters/sheds | | |
| Front yards/open spaces | Hydroponic/aquaponic systems | | |
| City block front | Green façades | | Public and semi-public spaces within a VIEWSHED/aural space of audio-visual perception (30-200m) |
| **CITY BLOCKS** | Parks, pocket parks, garden lots, community gardens, allotments | Direct sun | |
| Plot division | | | |
| **STREET/STREETSCAPE** | Strips of greenery/tree alleys | | |
| Sidewalks | Street landscaping | | |
| **STREETS/ROUTES** (as a neighbourhood pattern/hierarchy) | Boulevards | | |
| | Parkways | | |
| NEIGHBORHOODS/DISTRICTS (urban tissue) | Park belts | | **Typically, public spaces in WALKABLE/ CICLYING RADIUS (15MIN CITY), 1.2km/5km** |
| | Green trails | | |
| City (urban tissue) | Park system | | |
| | Green belt | | |
| | Greenway system | | |
| Open space/agricultural land | Fields/pastures | | Private spaces within VISUAL EXTEND (1km) |
| | Woodlands/rockcrops | | |
| | Stables/stalls/corrals/pens/styes | | |
| | Silos, barns, storages | | |
| | Drainage systems and water treatment | | |
| | Waste treatment and composting landfills | | |
| | Irrigation/fertilization systems/fertigation | | |
| | Pest management | | |
| Region | Farms (urban, peri-urban and rural) | | Private spaces within MOTORIZED ACCESS |

Table 1 differentiate scales by colour. There is agritech that can be placed in a room or a balcony as sub-element of an apartment/house or building story. The roof and the open spaces on a plot (front and back yards) can use a range of technologies from pots and raised beds, greenhouses, livestock shelters/sheds, hydroponic/aquaponic/aeroponic systems as well as green walls. At a scale of city block there are parks, pocket parks, garden lots, community gardens, allotments and the street space can include also agritech besides street landscaping. At a scale of neighbourhood and city there are parkways, park belts, green trails, park systems, green belts and wedges, greenway systems, etc. There are various elements of farms on agricultural land such as fields, pastures, woodlands, rock crops,

stables, stalls, corrals, pens, styes, silos, barns, storages, drainage systems and water treatments, waste treatments and composting landfills, irrigation and fertilization systems (including fertigation tech) and pest management facilities and systems.

## Discussions and conclusion

This paper maps visions, concepts, models, projects, agricultural and urban technologies, etc. of urban agriculture and agroecological urbanisms arguing that green city can be morphologically understood as elements. This knowledge can be used to develop urban design handbooks and guidelines for green city considering local morphological context. The paper starts with a diagram of the interactions of the disciplines that tangle city, nature and agriculture and it defines scales of perceptual and cognitive morphology to analyse urban agriculture. It creates a tentative genealogy of the visions, concepts, models, projects, technologies, etc. and maps representative examples of visions, projects and elements firstly by scale and agricultural technology level, and secondly by agricultural expertise and by urban regulations. In the end, it presents a list of agricultural technologies and landscape elements in respect to the morphological elements at various scales, the need of insolation for the vegetation, considering the duality of public and private space in cities and accessibility. This paper sets a framework for writing an urban design handbook for green cities based on eclectic urban morphology.

There are various green city visions, some deriving from social utopianism, anarchism, environmental recluses and hermit communities, etc. Other come from wishes to integrate nature, living with nature, love of nature, biomimicry, and biophilia. There are many agritects' visions that seek to create green architecture and productive landscape, some can get radical forms as Malcolm Wells who promotes underground living (additional underground city scenario can be found in Stojanovski, 2007). There is another stream of green city concepts that seeks to integrate landscape in cities, starting from Frederick Law Olmsted, Le Corbusier and new proponents of landscape urbanism. Furthermore, there is a new generation of entrepreneurs and agricultural enthusiasts as such as "agrotechnologists" developing new innovative agritech, "artisan farmers" that innovate and animate local communities and business, as professionals and as recreational guerilla farmers and placemaking gardeners who plant and grow food predominantly for fun and relaxation. Food growing, farmer markets and food festivals also play important role for social cohesion and economic revival of many neighbourhoods and communities. The discussions in this paper we focus on agriculture, not as recreational activity, but as (circular) food systems that seek to eliminate wastes and produce high quality locally grown food that complements industrial production. Industrial production is crucial for grain and meats, but local production can supply high quality vegetables and fruits, as well as small scale animal husbandry. There is a great potential to integrate various agritech across the morphological elements at various scales and it needs coordination between the various disciplines. Architects and landscape architects can create visions and prototypes. Agronomists and industrial ecologists can create circular food systems. The urban agricultural systems can utilize local wastes and employ underutilized space in urban areas for food provisioning to circulate resources. This includes e.g. vacant buildings, parking garages, basements, roofs, storage rooms, shipping containers, and agritech integrated in-store in commercial locations. Bringing together urban morphology with architecture, landscape agriculture, agronomy, landscape and industrial ecology in dissecting the morphology and elements of the green city can contribute to better possibilities for developing productive green cities and reaching the goals of the smart sustainability paradigm in development of eco cities and sustainable neighbourhoods.

## Acknowledgements

This paper as part of the projects FOCUSE (Food production and provisioning through Circular Urban Systems in European Cities) and HAT (Highlighting Agriculture and Transit) co-founded by the European Union (EU) by the EU partnership Driving Urban Transition (DUT), the Swedish Research Council for Sustainable Development, Formas, and the Swedish Energy Agency. Energymundigheten.

## References

Adams, D., & Hardman, M. (2014). Observing guerrillas in the wild: Reinterpreting practices of urban guerrilla gardening. Urban Studies, 51(6), 1103-1119.
Adams, D., Hardman, M., & Larkham, P. (2015). Exploring guerrilla gardening: gauging public views on the grassroots activity. Local Environment, 20(10), 1231-1246.
Axelsson, Ö. (2020). Soundscape revisited. Journal of Urban Design, 25(5), 551-555.
Bentley, I. Smith, G., Alcock, A., Murrain, P., & McGlynn, S., (1985). Responsive environments: a manual for designers. London: Routledge.
Bentley, I., De, S., McGlynn, S. & Rampuria, P. (2024). EcoResponsive Environments: A Framework for Settlement Design. Oxon: Routledge.
Carmona, M., Marshall, S., & Stevens, Q. (2006). Design codes: their use and potential. Progress in Planning, 4(65), 209-289.
Conzen, M. R. G. (1960). Alnwick, Northumberland: a study in town-plan analysis. Transactions and Papers (Institute of British Geographers), (27), iii-122.
Cowan, R. (2021). Essential Urban Design: A Handbook for Architects, Designers and Planners London. RIBA Publishing.
Christaller, W. (1966 [1933]). Central places in southern Germany. Englewood Cliffs: Prentice-Hall.
Cugurullo, F. (2021) Frankenstein urbanism: eco, smart and autonomous cities, artificial intelligence and the end of the city. Routledge, London)
Duany, A., & Talen, E. (2002). Transect planning. Journal of the American Planning Association, 68(3), 245-266.
Elmlund, P. & Haas, T. (ed.) (2019). Rural urbanism. Stockholm: Bokförlaget Stolpe
Evans, J., & Karvonen, A. (2014). Urban laboratories and the governance of low-carbon futures. International Journal of Urban and Regional Research, 38(2), 413-430.
Evans, J., Karvonen, A., & Raven, R. (eds.). (2016). The experimental city. London: Routledge.
Farhangi, M., Turvani, M. E., van Der Valk, A., & Carsjens, G. J. (2020). High-tech urban agriculture in Amsterdam: An actor network analysis. Sustainability, 12(10), 3955.Gehl, J. (1971). Livet mellem husene. København: Arkitektens forlag.
Forman, R. T. (1983). An ecology of the landscape. BioScience, 33(9), 535-535.
Gehl, J. (1987). Life between buildings: using public space. New York: Van Nostrand Reinhold.
Gibson, J.J. (1950). The perception of the visual world. Cambridge, Mass.: Riverside Press.
Gibson, J.J. (1986). The ecological approach to visual perception. Hillsdale, NJ: Lawrence Erlbaum Associates.
Gorgolewski, M., Komisar, J. & Nasr, J. (2011). Carrot City: creating places for urban agriculture. (1. ed.) New York: Monacelli Press.
Despommier, D. (2010). The vertical farm: feeding the world in the 21st century. (1. edition.) New York: Thomas Dunne.
Davis, H. (2020). Working cities: architecture, place and production. London: Rutledge
Hall, E.T. (1959). The silent language. Greenwich, Conn.: Fawcett Publications Inc.
Hall, E. T. (1966). The hidden dimension. New York: Anchor books.
Hardman, M., Clark, A., & Sherriff, G. (2022). Mainstreaming urban agriculture: opportunities and barriers to upscaling city farming. Agronomy, 12(3), 601.
Kropf, K. (2011) Morphological investigations: Cutting into the substance of urban form. Built Environment, 37(4), 393-408.
Kropf, K. (2014) Ambiguity in the definition of built form. Urban Morphology, 18(1), 41-57.
Kropf, K. (2018). Handbook of urban morphology. Chichester: John Wiley & Sons.
Le Corbusier. (1986 [1923]). Towards a new architecture. New York: Dover publications.
Le Corbusier. (1987 [1925]). The city of to-morrow and its planning. New York: Dover publications.

La Salle, J.D. & Holland, M. (2010). Agricultural urbanism: handbook for building sustainable food & agriculture systems in 21st century cities. Winnipeg, Man.: New Society.
Marshall, S. (2016) The kind of art urban design is. Journal of Urban Design, 21(4), pp. 399-423.
Martin, M., & Bustamante, M. J. (2021). Growing-service systems: new business models for modular urban-vertical farming. Frontiers in Sustainable Food Systems, 5, 787281.
Martin, M., & Molin, E. (2019). Environmental assessment of an urban vertical hydroponic farming system in Sweden. Sustainability, 11(15), 4124.
Martin, M., Poulikidou, S., & Molin, E. (2019). Exploring the environmental performance of urban symbiosis for
Martin, M., Elnour, M., & Sinol, A. C. (2023). Environmental life cycle assessment of a large-scale commercial vertical farm. Sustainable Production and Consumption 40, 182-193.
Martin, M., & Orsini, F. (2023). Life cycle assessment of indoor vertical farms. in Kozai, T., & Hayashi, E. (Eds.). Advances in plant factories: new technologies in indoor vertical farming, London Burleigh Dodds Science Publishing. https://doi.org/10.19103/AS.2023.0126.06
vertical hydroponic farming. Sustainability, 11(23), 6724.
McGlynn, S., & Samuels, I. (2000). The funnel, the sieve and the template: towards an operational urban morphology. Urban morphology, 4(2), 79-89.
McHarg, I.L. (1992 [1969]). Design with nature. (25th anniversary edition). New York: Wiley.
Moudon, A. V. (1997) Urban morphology as an emerging interdisciplinary field. Urban morphology, 1(1), pp. 3-10.
Nasr, J., & Potteiger, M. (2023). Spaces, systems and infrastructures: From founding visions to emerging approaches for the productive urban landscape. Land, 12(2), 410.
Neufert, E. (2019 [1939]) Architects' data. (5th edition). (Chichester, Wiley-Blackwell).
Orsini, F., Dubbeling, M., de Zeeuw, H., & Gianquinto, G. (Eds.). (2017). Rooftop Urban Agriculture (1st ed. 2017.). Springer International Publishing. https://doi.org/10.1007/978-3-319-57720-3
Orsini, F., Pennisi, G., Michelon, N., Minelli, A., Bazzocchi, G., Sanyé-Mengual, E., & Gianquinto, G. (2020). Features and functions of multifunctional urban agriculture in the global north: a review. Frontiers in Sustainable Food Systems, 4, 562513.
Rapoport, A. (1977). Human aspects of urban form: towards a man-environment approach to urban form and design. Oxford: Pergamon Press.
Southworth, M. F. (1967) The sonic environment of cities (Master Thesis, Massachusetts Institute of Technology).
Southworth, M. (2016) Learning to make liveable cities. Journal of Urban Design, 21(5), 570-573.
Southworth, M. (2020) Listening to the city. Journal of Urban Design, 25(5), 556-560.
Stojanovski, T. (2007). Sustainable cityscape: future study of one neighbourhood in the city of Skopje with a story and three essays (Master thesis, KTH Royal Institute of Technology).
Stojanovski, T. (2019). Urban Form and Mobility-Analysis and Information to Catalyse Sustainable Development (Doctoral dissertation, KTH Royal Institute of Technology).
Stojanovski, T. (2022). Urban morphology and artificial intelligence. *Urban morphology*, *26*(1), 78-88.
Stojanovski, T. (2023) Urban morphology and space colonisation–Lifepods and morphological structure of off-world settlements. Presented on the 30th International Seminar on Urban Form (ISUF), Belgrade, Serbia.
Stojanovski, T., & Adams, D. (2024). Urban morphology, smart sustainability and space colonization. Urban morphology, 28(1), 84-92.
Stojanovski, T., & Axelsson Ö. (2018) Typo-morphology and environmental perception of urban space. In Proceedings for the 25rd International seminar on urban form, Krasnoyarsk, Russia.
Stojanovski T. & Samuels. I (2023). Mongrel/Džukela urbanism – Morphological schools and eclectic fusions. Presented on the 30th ISUF conference, Belgrade, Serbia
Talen, E. (2009) Urban design reclaimed: tools, techniques, and strategies for planners (American Planning Association, Planners Press, Chicago)
Talen, E. (2013). Zoning for and against sprawl: The case for form-based codes. Journal of urban design, 18(2), 175-200.
Taylor, N. (1999). The elements of townscape and the art of urban design. Journal of Urban Design, 4(2), 195-209.
Thünen, J.H.V. (1966 [1826]). Von Thünen's isolated state: An English edition of Der Isolierte Staat. Oxford: Pergamon.
Turner, T. (1996). City as landscape: a post-postmodern view of design and planning. (1.ed.) London: Spon.

Turner, T. (1995). Greenways, blueways, skyways and other ways to a better London. Landscape and Urban Planning, 33(1-3), 269-282.
Turner, T. (1998). Landscape planning and environmental impact design. (2. ed.) London: UCL Press.
Turner, T. (2006). Greenway planning in Britain: recent work and future plans. Landscape and urban planning, 76(1-4), 240-251.
Turner, T. (2014). Landscape architecture design: theory and methods. (Amazon.com Kindle Editions).
Turner, M.G. & Gardner, R.H. (2015). Landscape Ecology in Theory and Practice Pattern and Process. (2nd ed.) New York: Springer.
Verzone C. & Woods, C. (2021). Food Urbanism Basel. Birkhäuser.
Viljoen, A., Bohn, K. & Howe, J. (2005). Continuous Productive Urban Landscapes : Designing Urban Agriculture for Sustainable Cities. Burlington: Elsevier.
Viljoen, A. & Bohn, K. (red.) (2014). Second nature urban agriculture: designing productive cities. Abingdon, Oxon: Routledge.
Waldheim, C. (2016). Landscape as urbanism: a general theory. Princeton, New Jersey: Princeton University Press.
Walters, D.R. (2007). Designing Community: charrettes, master plans and form-based codes. London: Routledge.
Wright F.L. (1935). Broadacre City: A New Community Plan. Architectural Record 77, 243-254