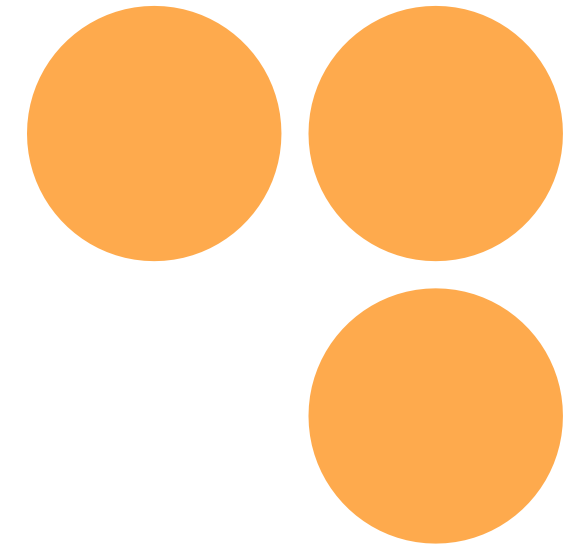


twinning towards
research excellence
in evidence-based planning
and urban design



TWIN2EXPAND

An operational and conceptual model of evidence-based design and planning



This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101078890



**UK Research
and Innovation**

This project has received funding from the UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee under grant numbers 10052856 and 10050784.

TWIN2EXPAND

TWIN2EXPAND is a project funded by Horizon Europe. It aims to enhance research capacities in evidence-based urban design and planning (EBDP) as a field of critical importance in the R&I of integrated approaches and technologies for effective spatial planning and sustainable urban governance.



Space Syntax



This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101078890

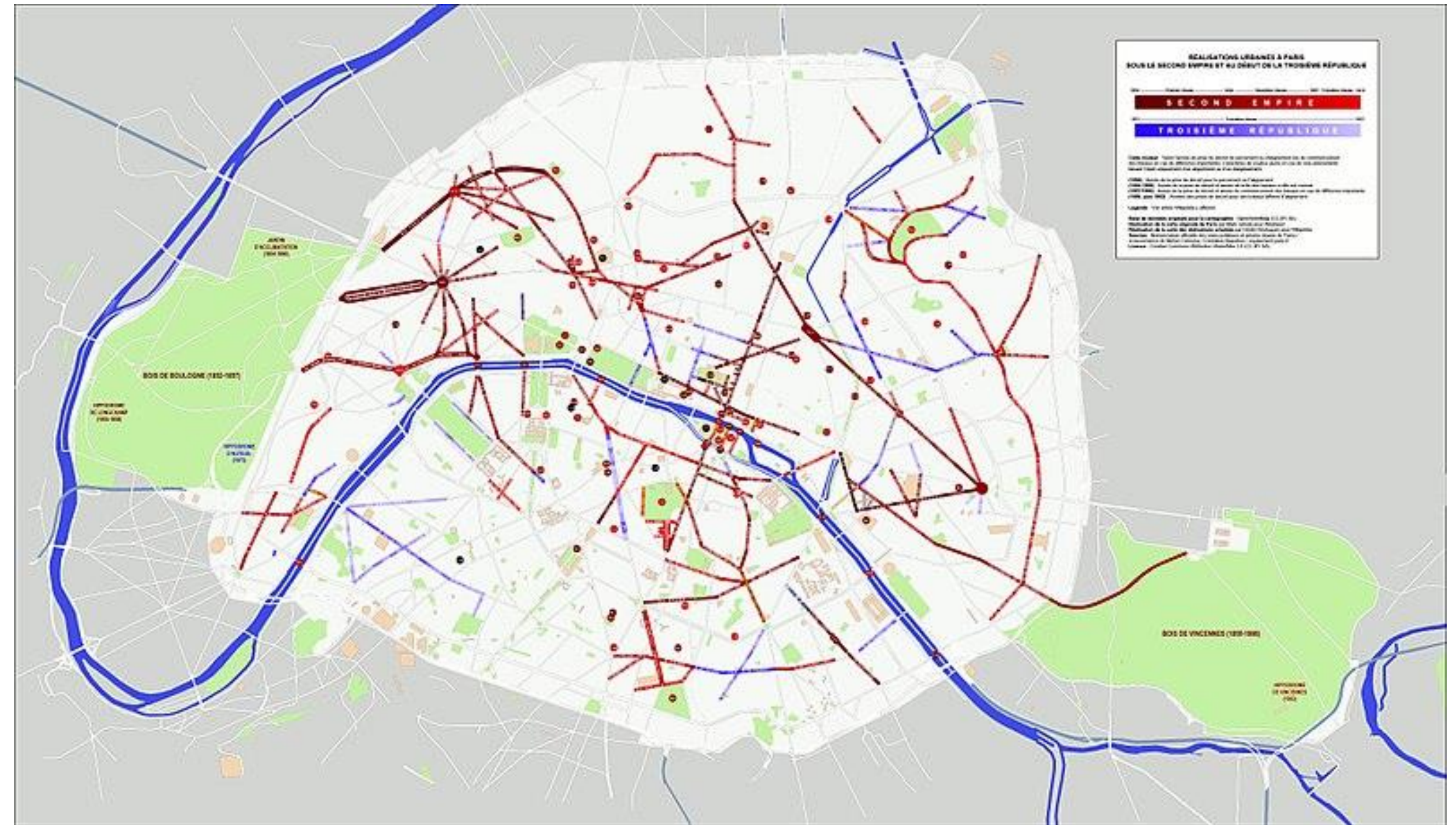


This project has received funding from the UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee under grant numbers 10052856 and 10050784.

BACKGROUND TO EBDP

-Haussmann's Paris (1800s)

Measuring and mapping of urban form and topography; population density, income levels, social conditions. Informs design strategy for Paris.



-Chicago School of urban sociology (early 1900s)

Robert Park and Ernest Burgess. Analysis of spatial distributions with mapping and statistical analysis to identify patterns and propose theories on how physical environment shapes interactions.

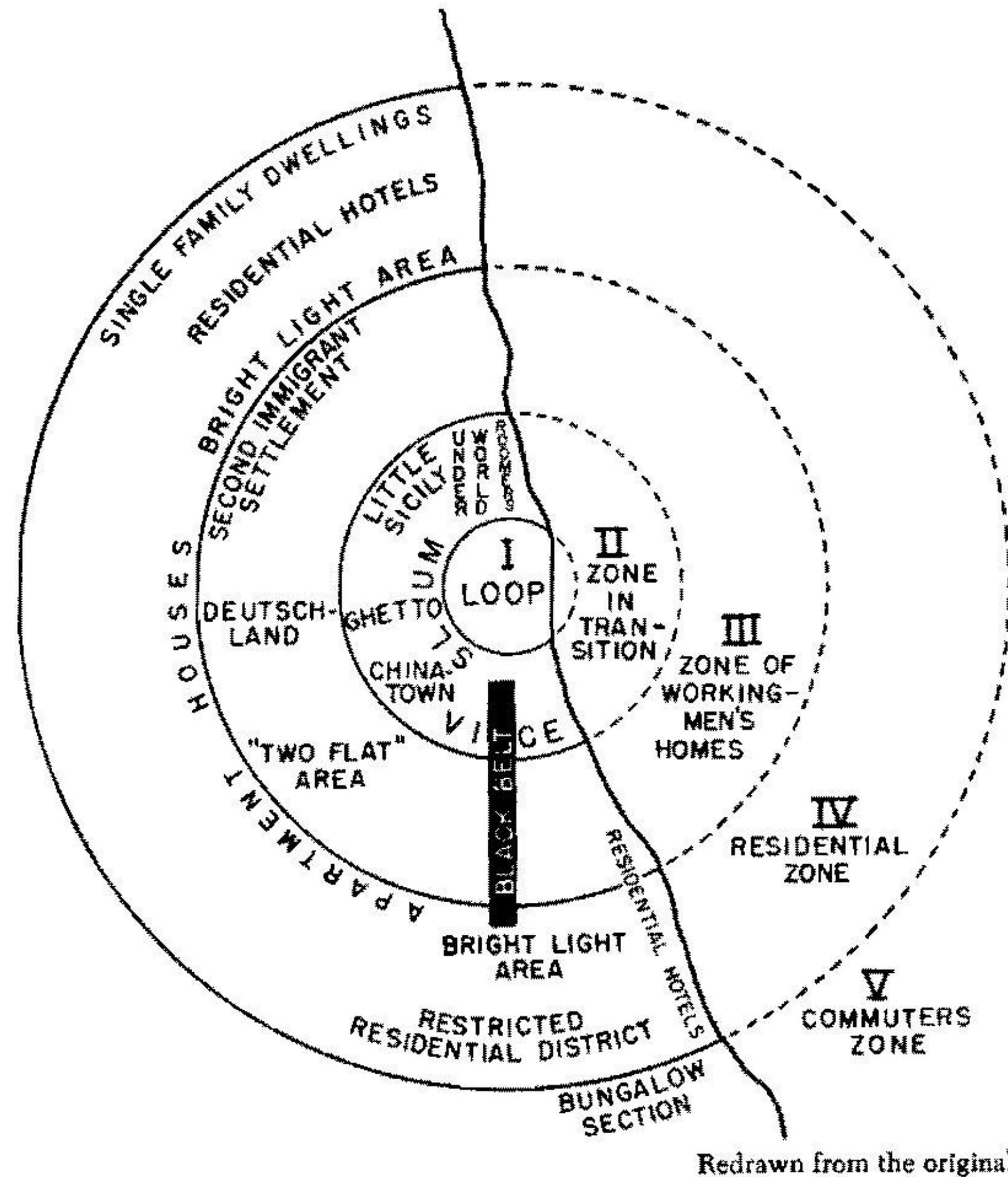
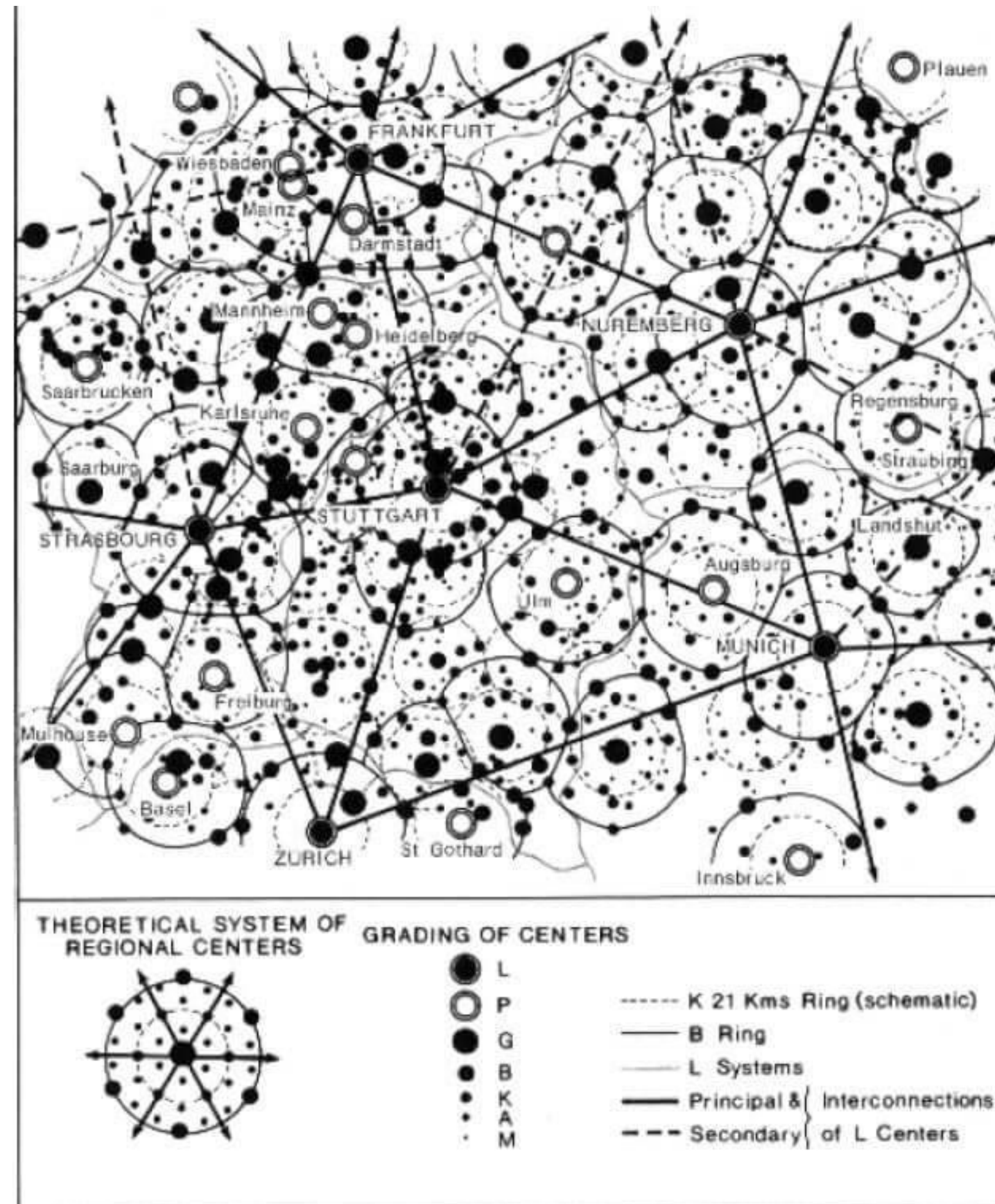


Chart 2—Urban areas.

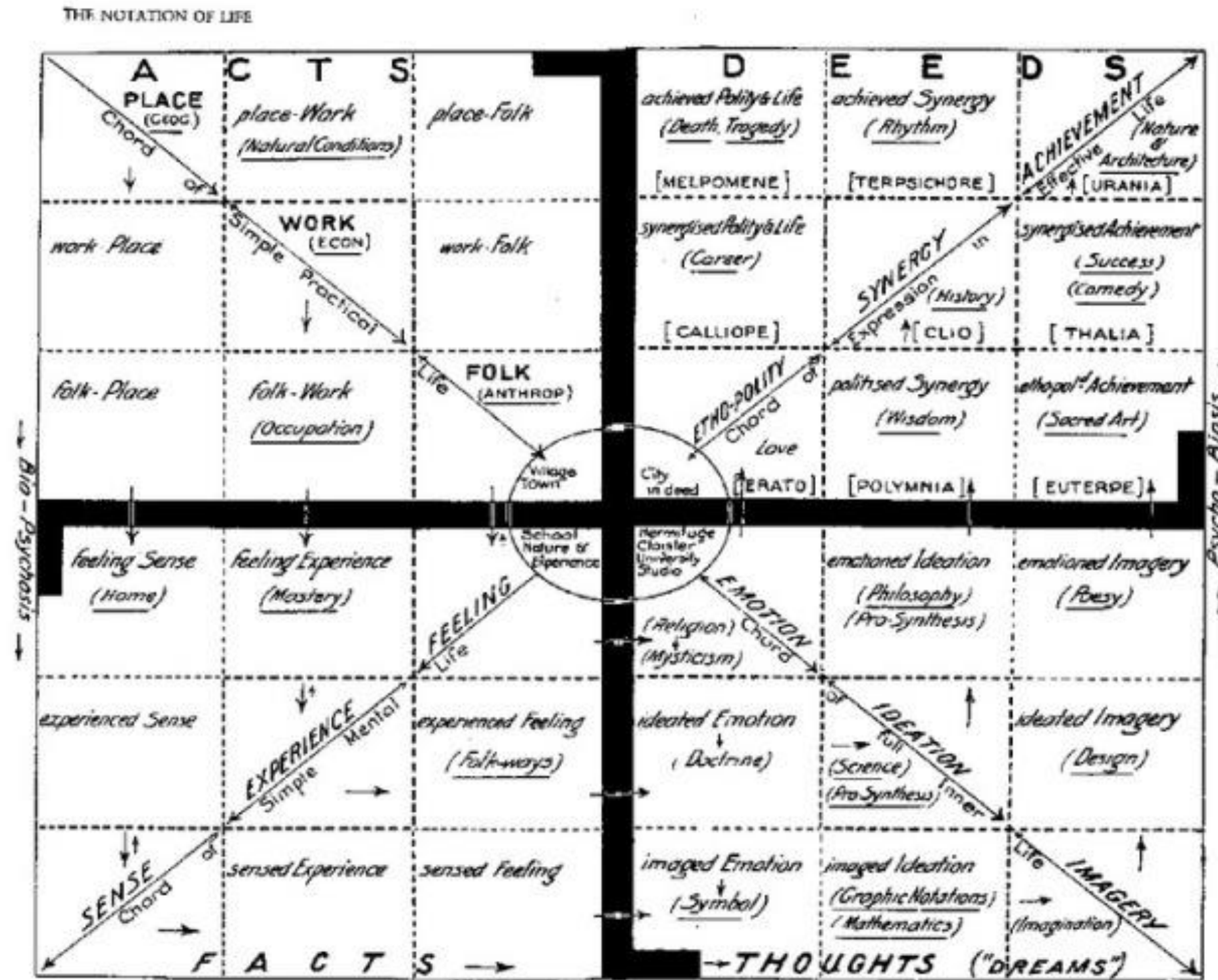
-Walter Christaller / Central Place Theory (1933):

Uses fieldwork, observations, census data, government reports to gather information on economic activity and spatial distribution of urban settlements. Leads to Central Place Theory on optimal sizes and locations for urban centres.

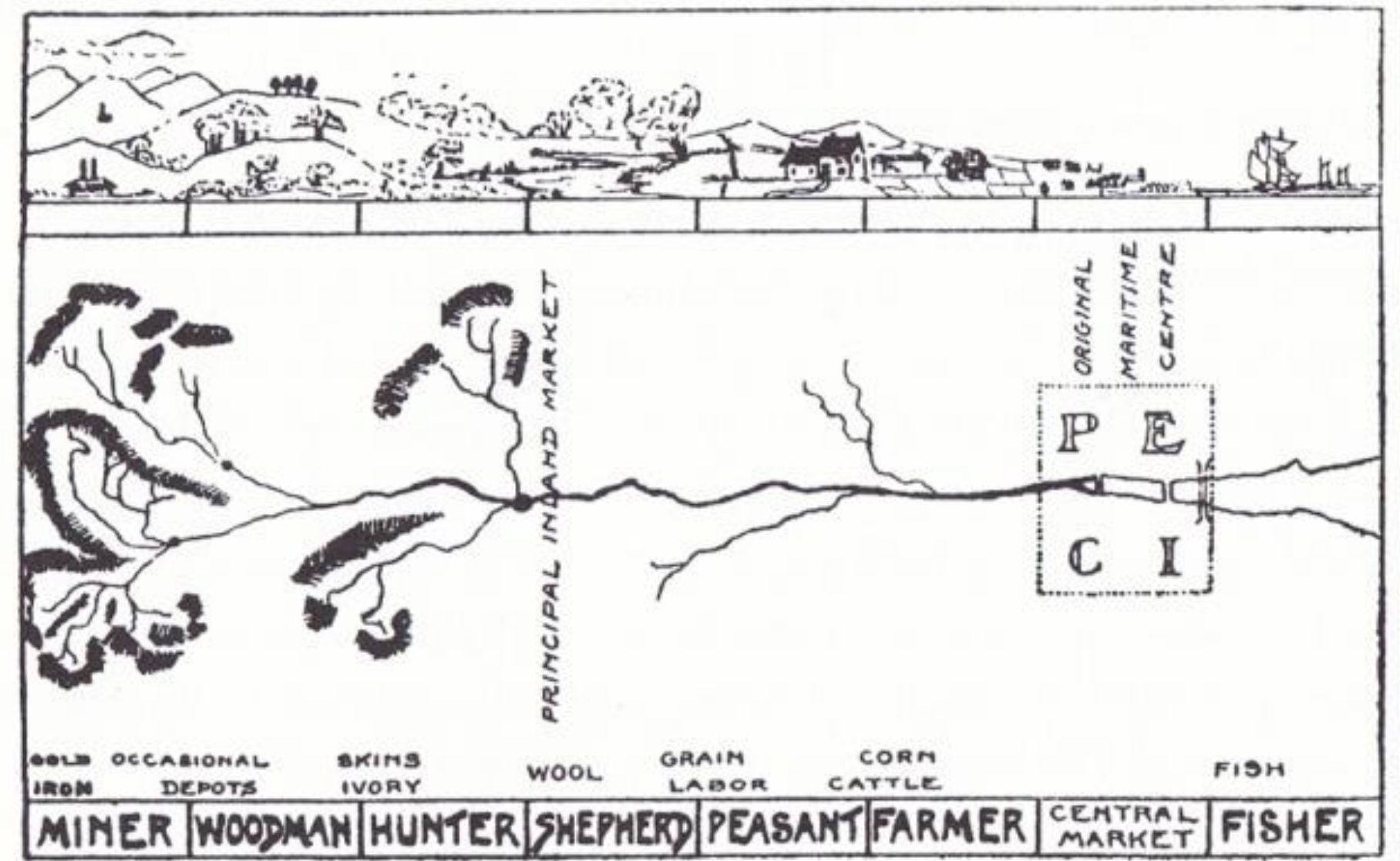


-Patrick Geddes (1800s, 1900s):

Publishes Cities in Evolution (1915). Uses surveys, mapping, observation, interviews to inform context driven approach.



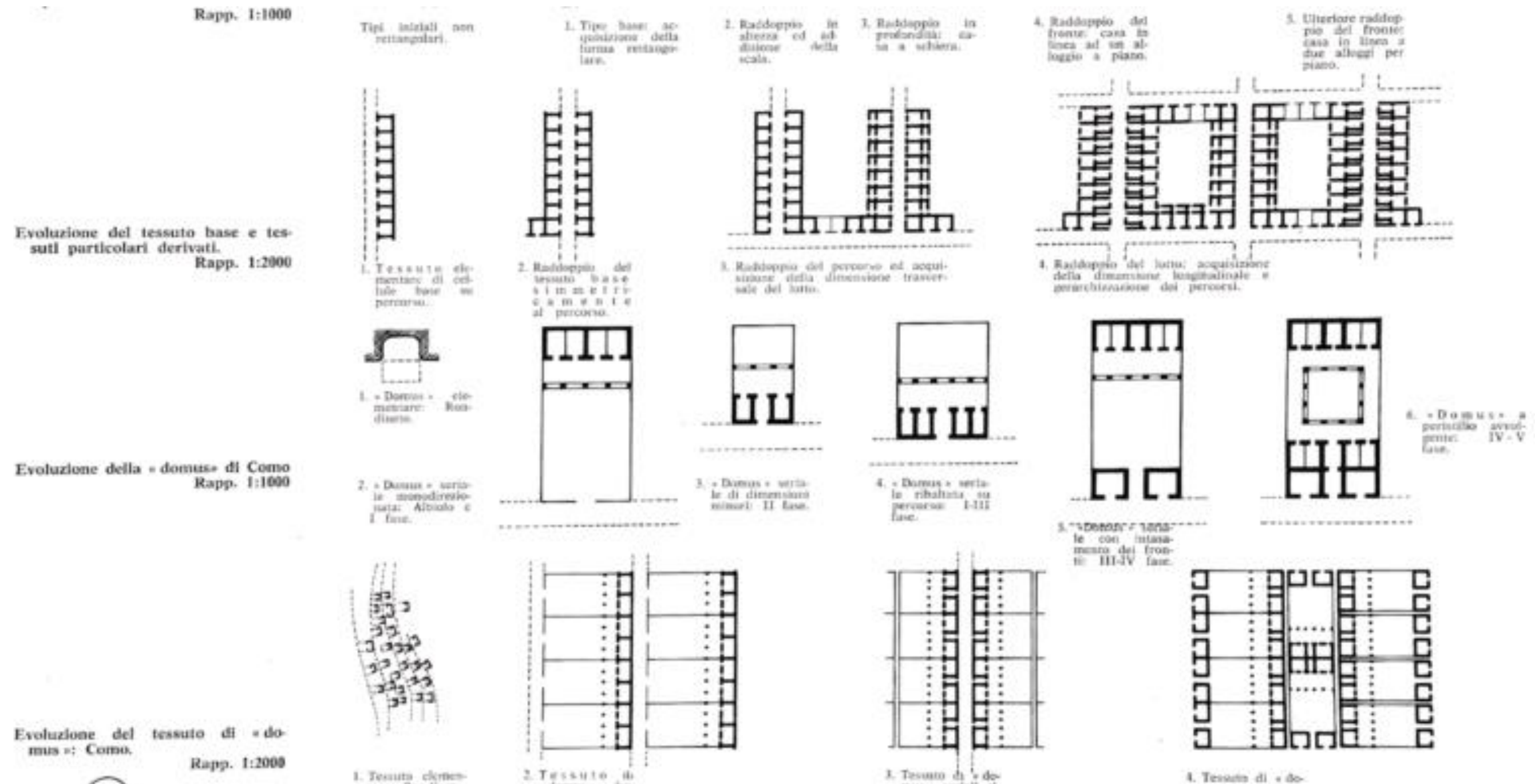
THE ASSOCIATION OF THE VALLEY PLAN WITH THE VALLEY SECTION



RURAL OCCUPATION & MARKET TOWN.

-Italian School - Gianfranco Caniggia - inspired by Kevin Lynch (1960s)

Mapping of geometry of streets and arrangements of buildings. Relationships between built environment and behaviour.



-Copenhagen School - Jan Gehl - designing for pedestrians.

his 1971 publication 'life between buildings' is still considered to be an important and relevant body of text for any urban strategist today. The core foundation of his practice is to simply put the people first.



THE SURROUNDING OF THE OPERA

MAIN CONCEPT FOR BUILDING STRUCTURE



CONTINUE THE STRUCTURE OF THE NEIGHBOURHOOD



ESTABLISH AN ACTIVE FRONT WHICH FRAMES THE WATER AND THE OPERA

MAIN CONCEPT FOR PUBLIC SPACE



EVENTFUL AND APPROACHABLE HARBOURFRONT FOR ALL USERS



THE HOUSING SETTLEMENT AND THE OPEN SPACES CONNECT THE EXISTING CITY TO THE NEW WATER FRONT



THE REGULATION PLAN



VARIATION, VERTICALLY, HEIGHTS & VOLUMES



STRENGTHEN THE CONTEXT



OPTIMIZATION OF THE POSITIVE ASPECTS OF THE CLIMATE

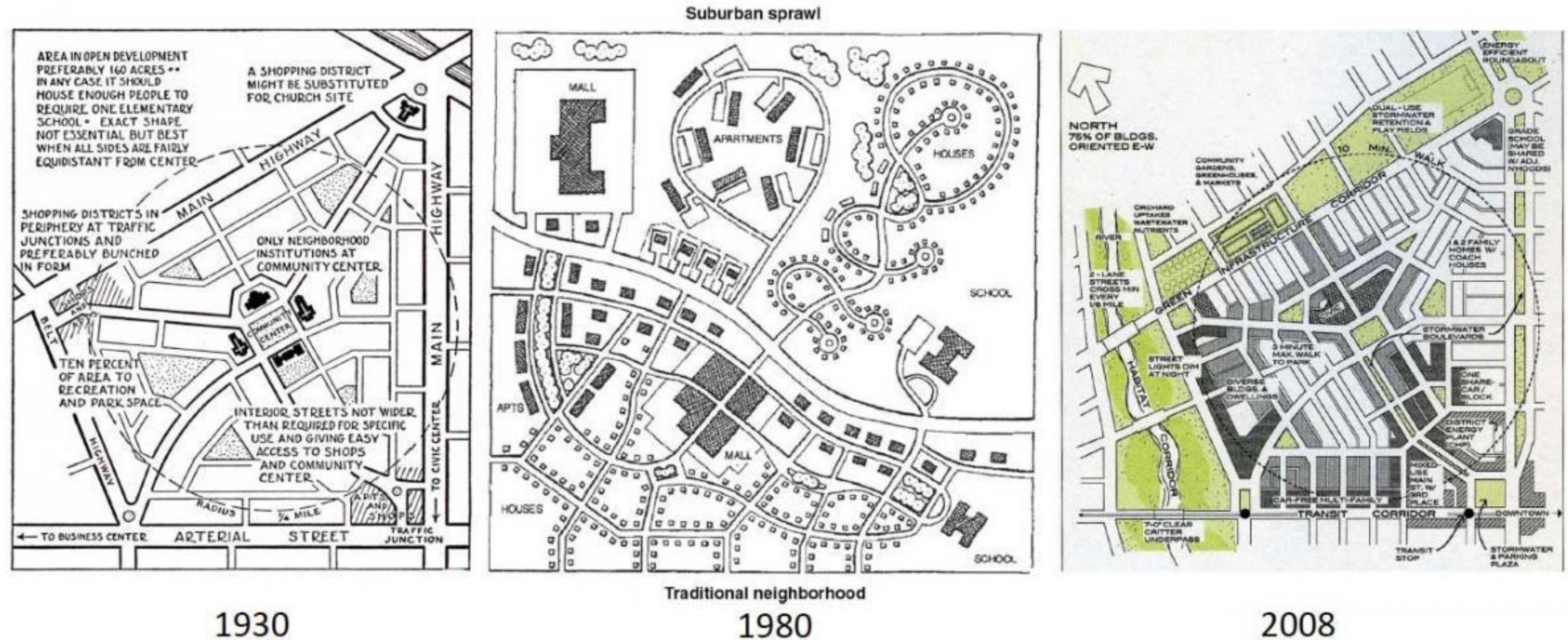




-New Urbanism (80s onwards).

Studies on walkability, transit-oriented development, mixed land uses, mixed socio-economic groups, etc. Studies raise some controversy on overstating role of urban design in shaping neighbourhoods / social cohesion of communities.

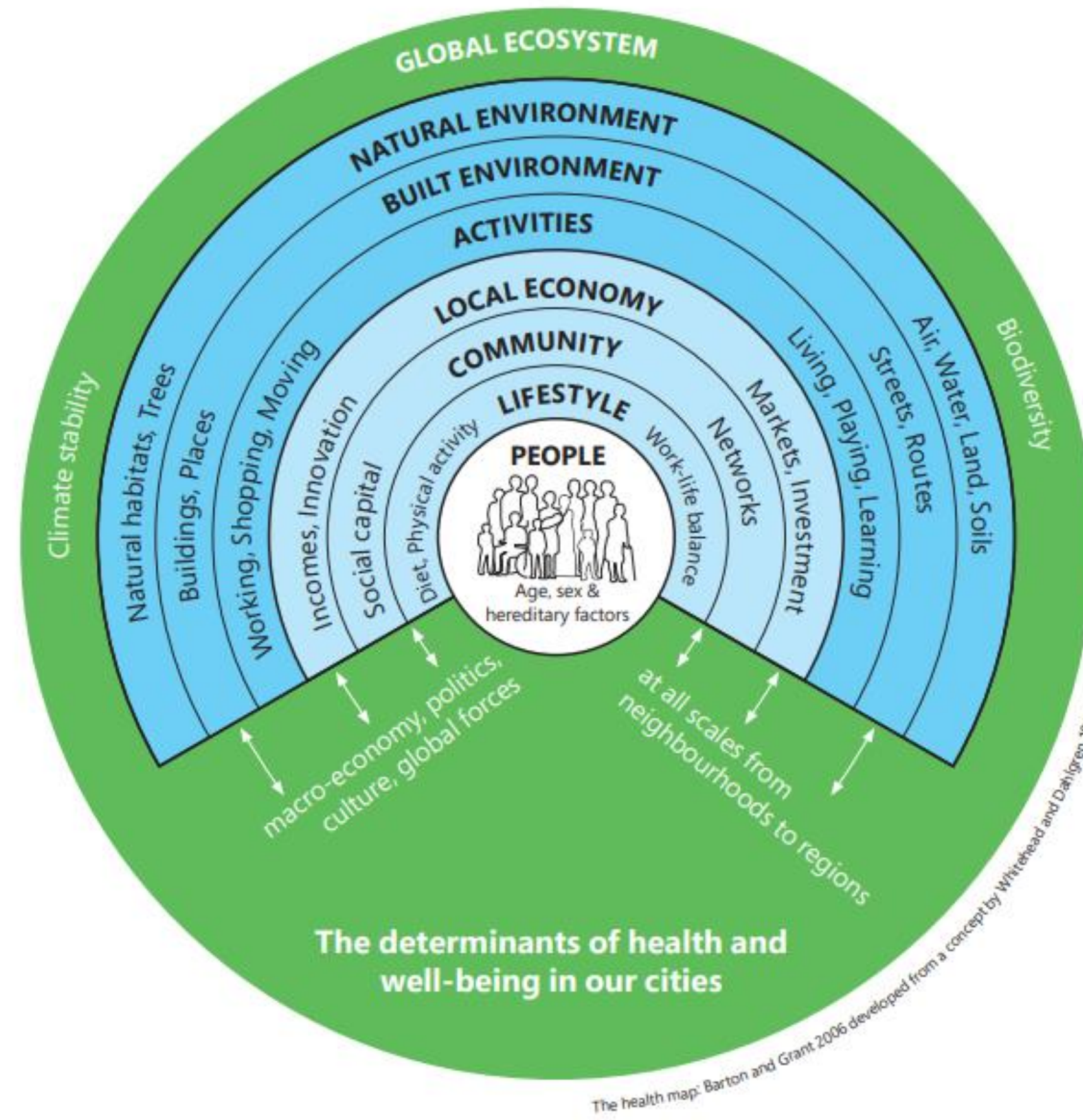
Neighborhood Organization



-Healthy Cities Movement (1984 onwards)

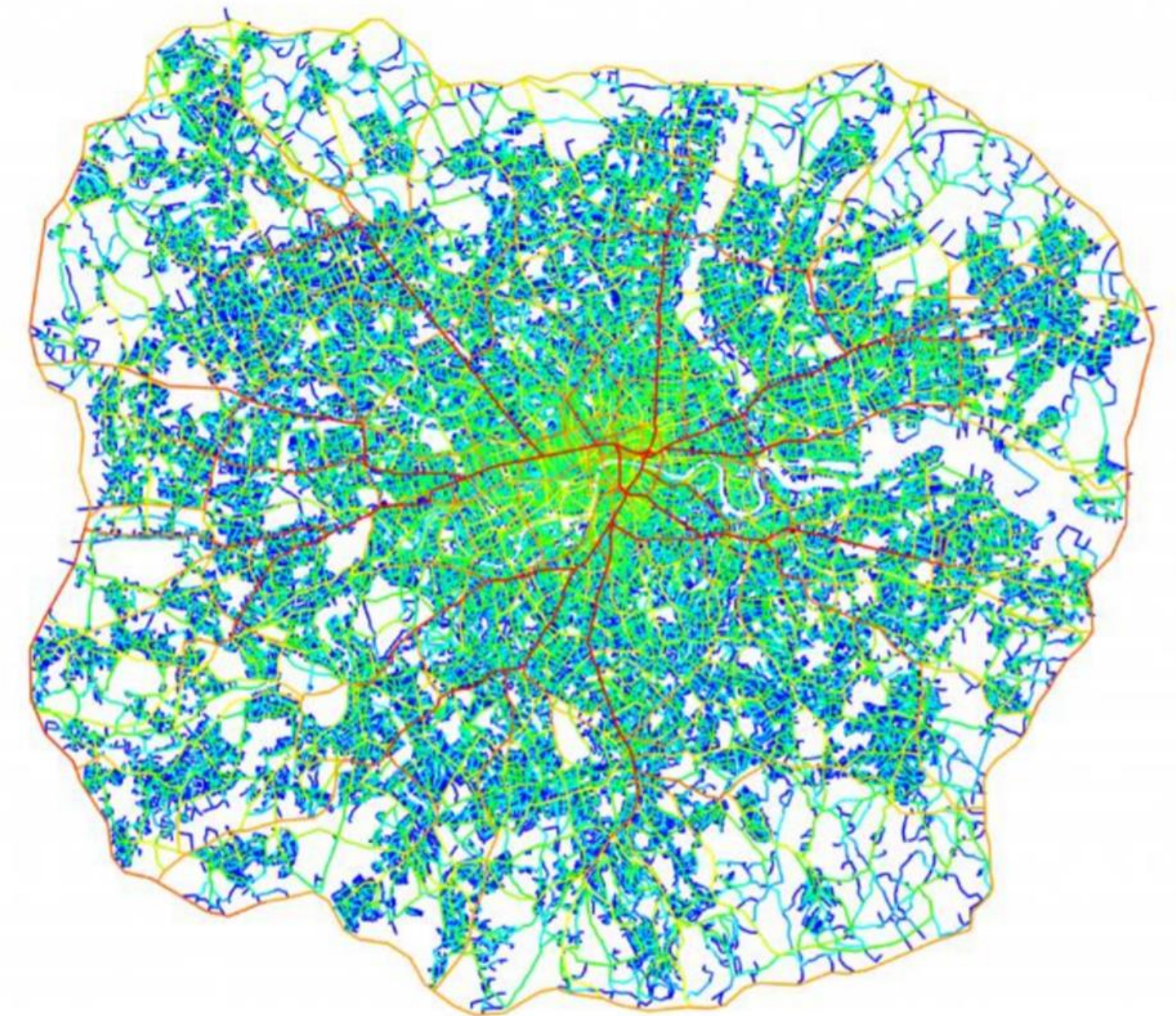
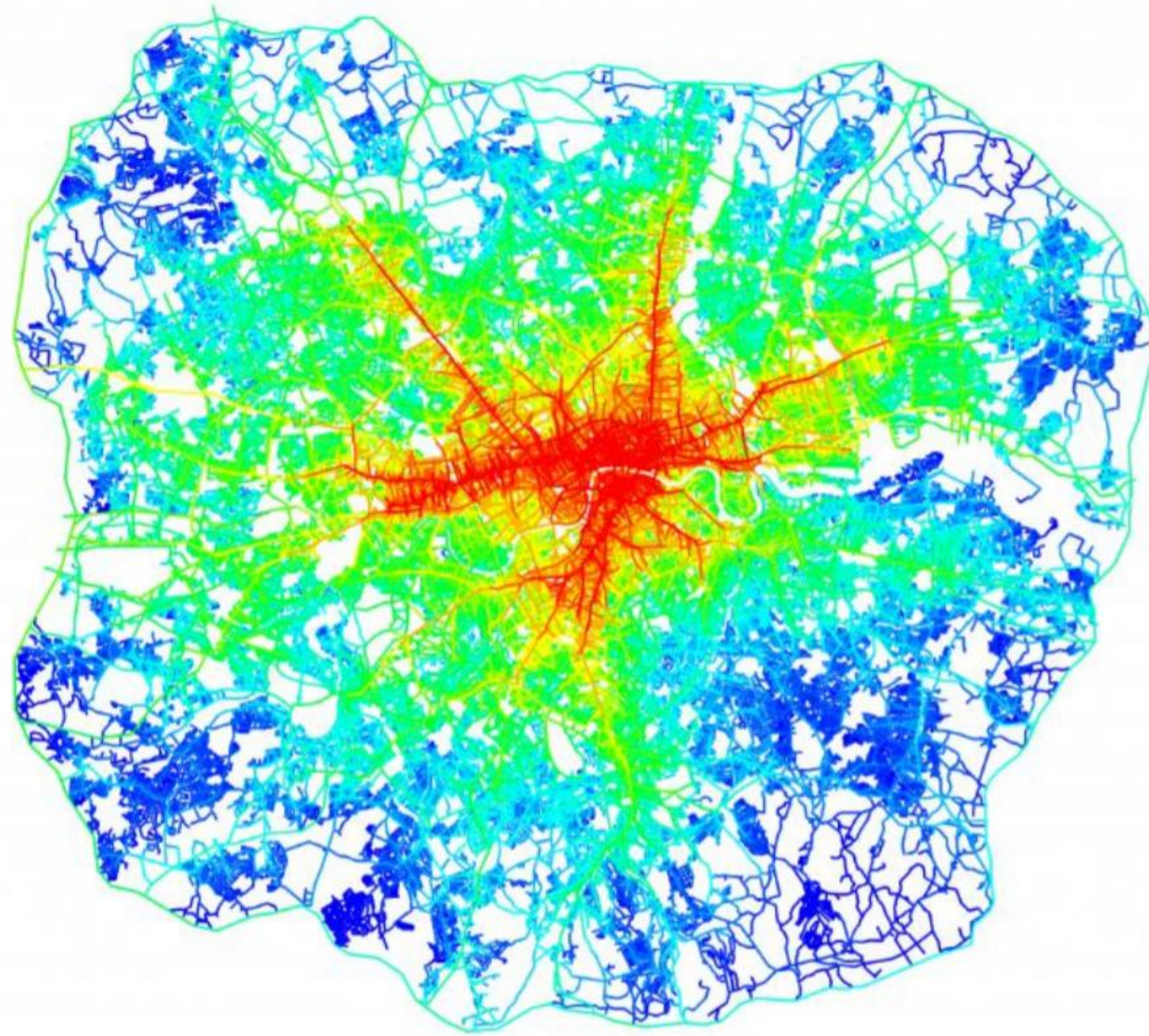
The Healthy Cities initiative was conceived with the goal of placing health high on the social and political agenda of cities by promoting health, equity and sustainable development through innovation and multisectoral change.

Figure 1. The determinants of health and well-being in the urban context (6)




-Space Syntax - Bill Hillier & colleagues

Spatial configurational understanding of cities. Use of network analysis, pedestrian counts, surveys, observational analysis.




-LEED Neighbourhood Design

LEED for Neighborhood Development (LEED ND) was engineered to inspire and help create better, more sustainable, well-connected neighborhoods. It looks beyond the scale of buildings to consider entire communities.



LEED® FOR NEIGHBORHOOD DEVELOPMENT


110 TOTAL POINTS POSSIBLE



SMART LOCATION & LINKAGE

27 POSSIBLE POINTS


PREREQ 1	Smart Location	REQ
PREREQ 2	Imperiled Species and Ecological Communities	REQ
PREREQ 3	Wetland and Water Body Conservation	REQ
PREREQ 4	Agricultural Land Conservation	REQ
PREREQ 5	Floodplain Avoidance	REQ
CREDIT 1	Preferred Locations	●●●●●●●●●●
CREDIT 2	Brownfield Redevelopment	●●
CREDIT 3	Locations w/ Reduced Automobile Dependence	●●●●●●●●
CREDIT 4	Bicycle Network and Storage	●
CREDIT 5	Housing and Jobs Proximity	●●●
CREDIT 6	Steep Slope Protection	●
CREDIT 7	Site Design for Habitat / Wetland & Water Body Conservation	●
CREDIT 8	Restoration of Habitat/Wetlands and Water Bodies	●
CREDIT 9	Long-Term Cnsrvtn. Mgmt. of Habitat/Wetlands & Water Bodies	●



GREEN INFRASTRUCTURE & BUILDINGS

29 POSSIBLE POINTS


PREREQ 1	Certified Green Building	REQ
PREREQ 2	Minimum Building Energy Efficiency	REQ
PREREQ 3	Minimum Building Water Efficiency	REQ
PREREQ 4	Construction Activity Pollution Prevention	REQ
CREDIT 1	Certified Green Buildings	●●●●●●
CREDIT 2	Building Energy Efficiency	●●
CREDIT 3	Building Water Efficiency	●
CREDIT 4	Water-Efficient Landscaping	●
CREDIT 5	Existing Building Use	●
CREDIT 6	Historic Resource Preservation and Adaptive Reuse	●
CREDIT 7	Minimized Site Disturbance in Design and Construction	●
CREDIT 8	Stormwater Management	●●●●
CREDIT 9	Heat Island Reduction	●
CREDIT 10	Solar Orientation	●
CREDIT 11	On-Site Renewable Energy Sources	●●●
CREDIT 12	District Heating and Cooling	●●
CREDIT 13	Infrastructure Energy Efficiency	●
CREDIT 14	Wastewater Management	●●
CREDIT 15	Recycled Content in Infrastructure	●
CREDIT 16	Solid Waste Management Infrastructure	●
CREDIT 17	Light Pollution Reduction	●



NEIGHBORHOOD PATTERN & DESIGN

44 POSSIBLE POINTS


PREREQ 1	Walkable Streets	REQ
PREREQ 2	Compact Development	REQ
PREREQ 3	Connected and Open Community	REQ
CREDIT 1	Walkable Streets	●●●●●●●●●●
CREDIT 2	Compact Development	●●●●●●●●
CREDIT 3	Mixed-Use Neighborhood Centers	●●●●
CREDIT 4	Mixed-Income Diverse Communities	●●●●●●●●
CREDIT 5	Reduced Parking Footprint	●
CREDIT 6	Street Network	●●
CREDIT 7	Transit Facilities	●
CREDIT 8	Transportation Demand Management	●●
CREDIT 9	Access to Civic and Public Spaces	●
CREDIT 10	Access to Recreation Facilities	●
CREDIT 11	Visitability and Universal Design	●
CREDIT 12	Community Outreach and Involvement	●●
CREDIT 13	Local Food Production	●
CREDIT 14	Tree-Lined and Shaded Streets	●●
CREDIT 15	Neighborhood Schools	●



INNOVATION & DESIGN PROCESS

6 POSSIBLE POINTS

CREDIT 1	Innovation and Exemplary Performance	●●●●●●
CREDIT 2	LEED Accredited Professional	●



REGIONAL PRIORITY CREDIT

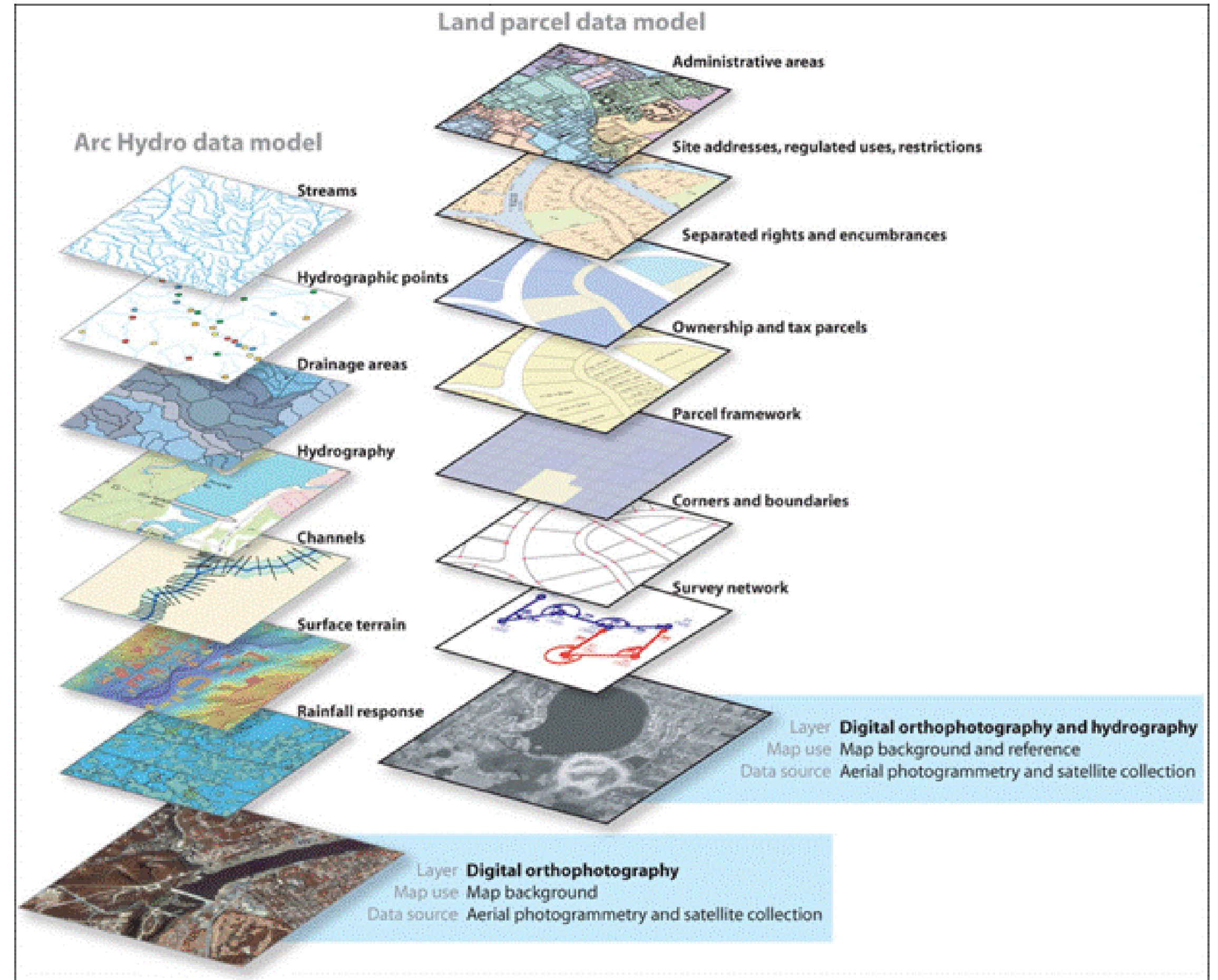
4 POSSIBLE POINTS

CREDIT 1	Regional Priority	●●●●
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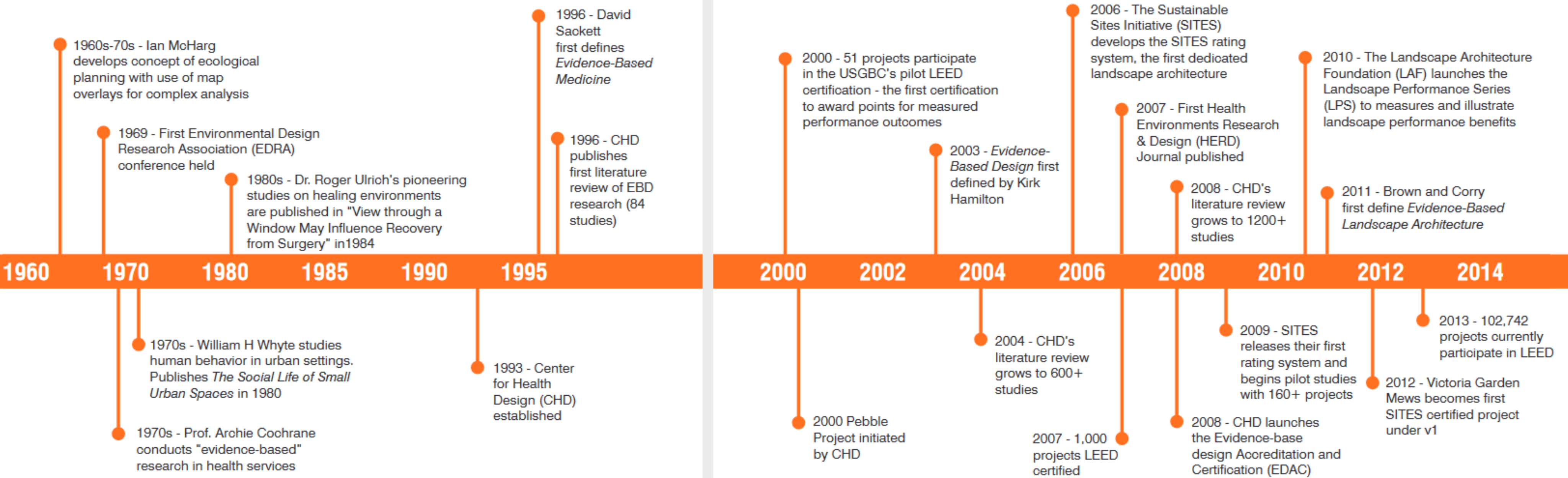
40-49 POINTS: CERTIFIED 50-59 POINTS: SILVER 60-79 POINTS: GOLD 80+ POINTS: PLATINUM

FOR MORE INFORMATION SEE THE LEED REFERENCE GUIDE FOR GREEN NEIGHBORHOOD DEVELOPMENT

-GIS enabled urban analysis



-Timeline of Evidence-Based Design



(Fagan 2017)

DEFINING EBDP

-Centre for Health Design EBD Definition

‘the process of basing decisions about the built environment on credible research to achieve the best possible outcomes’

-Expanding the definition towards Urban Design and Planning

Using empirical evidence to inform decision-making through the processes of design and planning

-The Goal of EBDP

The goal of EBDP is to achieve the best possible outcomes by incorporating credible research in the decision-making process for the built environment.

WHAT IS EVIDENCE

HISTORIC MISSTEPS

Review how the idea of ***evidence*** has changed from the modern times given the development of applied methods.

- Disregard for Context
- Separation of Functions
- Lack of Human Scale
- Disruption of Urban Fabric
- Social Exclusion
- Lack of Sustainability

Year	Research/publication	Core idea
1961	The Death and Life of Great American Cities	this influential book challenged traditional urban planning practices and advocated for a more bottom-up, community-oriented approach. Jacobs emphasized the importance of observing and understanding the dynamics of city life through empirical evidence and direct experience.
1999	Towards an Urban Renaissance	Led by Urban Task Force and Richard Rogers, this report examined the state of urban areas in the United Kingdom and proposed recommendations for sustainable urban development. It highlighted the importance of evidence-based planning, emphasizing the need for rigorous analysis, research, and data-driven decision-making in shaping urban environments.
2004	Design for Diversity: Exploring Socially Mixed Neighbourhoods	by Joseph Rowntree Foundation (2004): This research study explored the benefits and challenges of creating socially diverse neighbourhoods. It examined the impact of different design factors on social integration and cohesion, providing evidence-based insights into the design principles and strategies for promoting social diversity in urban areas.
2006	Evidence-based planning: rhetoric and reality	In this article Simin Davoudi (2006) traces the history of the use of evidence in planning and highlights the need for a more critical perspective on evidence use in policy, which recognizes the limitations and potential biases in evidence and the importance of context in shaping policy decisions.
2006	Introducing evidence-based planning	Faludi and Waterhout (2006) in this paper try to evaluate the theory and practice of evidence-based planning through case studies. Looking into various aspects such as the role of evidence in decision making, organizational form of evidence collection and interpretation etc., along with theoretical argument presented provide some insight on the trend of evidence-based planning since early 21 st century
2009	Planning Support Systems for Cities and Regions	by Stan Geertman and John Stillwell (2009): This book explored the use of planning support systems (PSS) - computer-based tools and models - for evidence-based planning. It discussed the integration of geographic information systems (GIS), spatial analysis, and decision support systems to facilitate data-driven decision-making in urban and regional planning processes.

-Hard Evidences in EBDP

theories that inform planning and design based on types of evidence that can be measured and assessed without personal judgement

- Rowe and Koetter's Collage city
- Hillier and Hanson's Space Syntax
- Alexander's A Pattern Language
- Berghauser and Haupt's Spacematrix

Towards Quantitative analytical methods

-Soft Evidences in EBDP

theories that also incorporate evidence from evaluating the urban form through observation of how people perceive space

- Jan Gehl's Life between buildings
- Whyte's Social life of small urban spaces
- Kevin Lynch's Image of the city

Incorporating Qualitative analytical methods

FRAMING EBDP

WHAT IS EVIDENCE-BASED DESIGN AND PLANNING?

Evidence-based design and planning involves using empirical evidence to inform decision-making through the processes of design and planning.

It emphasizes relying on the best available scientific evidence rather than tradition, intuition, or personal experience alone.

Evidence-based design (EBDP) follows this approach by intentionally basing design decisions on the most reliable research evidence.

EBDP involves the collaboration between an evidence-based designer and an informed client to make decisions informed by research and project evaluations.

The goal of EBDP is to achieve the best possible outcomes by incorporating credible research in the decision-making process for the built environment.

RESEARCH

≠

EBDP

≠

RID

≠

DDD

Matrix of steps for research, EBD and RID			
steps	Research	EBD	RID
	Adapted from polit and Beck (2008 and Stichler (2010b)	Adapted from the center for health design 2008	Adapted from Burghardt and hacker (2014)
1	Identify problem, research question or hypothesis	Define Evidence based goals and objectives (with client and interdisciplinary team	Clarify design problem and project-based goals and constraints
2	Perform literature review	Find sources for relevant evidence	Identify research on related problems and populations
3	Use a theoretical framework to explain the relationships among variables	Critically interpret relevant evidence, assess evidence applicability, quality, and strength	Assess Research applicability, quality, and strength. Use research to assess variables that affect performance
4	Select an appropriate research design to test the hypothesis	Create and innovate EBD concepts	Use knowledge gained from Steps 1-3 to generate design options
5	Identify measurements to quantify variables	Develop a hypothesis	Design evaluation, choose the best option using research to weigh pros/cons
6	Select the sample	Collect baseline performance measures	Develop a prototype (virtual, physical
7	Data collection and analysis	Monitor implementation of design and construction	Design testing, evaluate prototype using empirical observation or testing with target audience
8	Statistical and data analysis	Measure post- occupancy performance results	Iterative improvement, use results from testing to drive greater research inquiry, to improve, and to iterate the design process
9	Disseminate results in publications and presentations including study limitations, recommendations, and implications for practice	Disseminate post-occupancy performance results through publication and presentation	Communicate process, share process and lessons learned

-What is Evidence in EBDP?

Brandt, Chong and Martin (2010), Evidence is the “credible and defensible proof that informs design decisions”

Stichler et al, (2016) and Fagan (2017), provide some insight on the level of evidence and their strength.

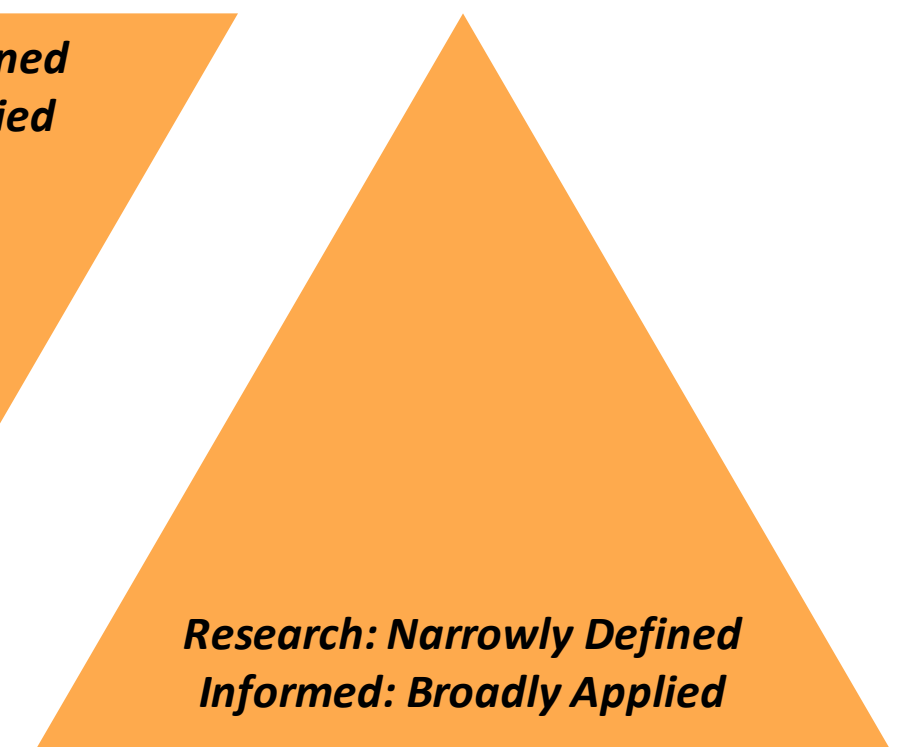
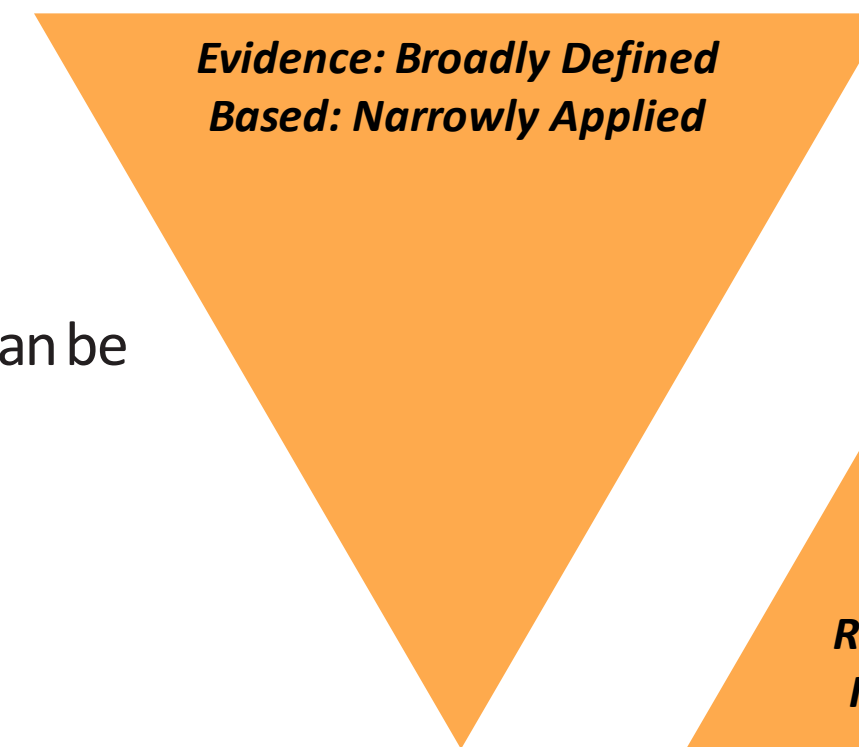
**EVIDENCE
BASED
RESEARCH**



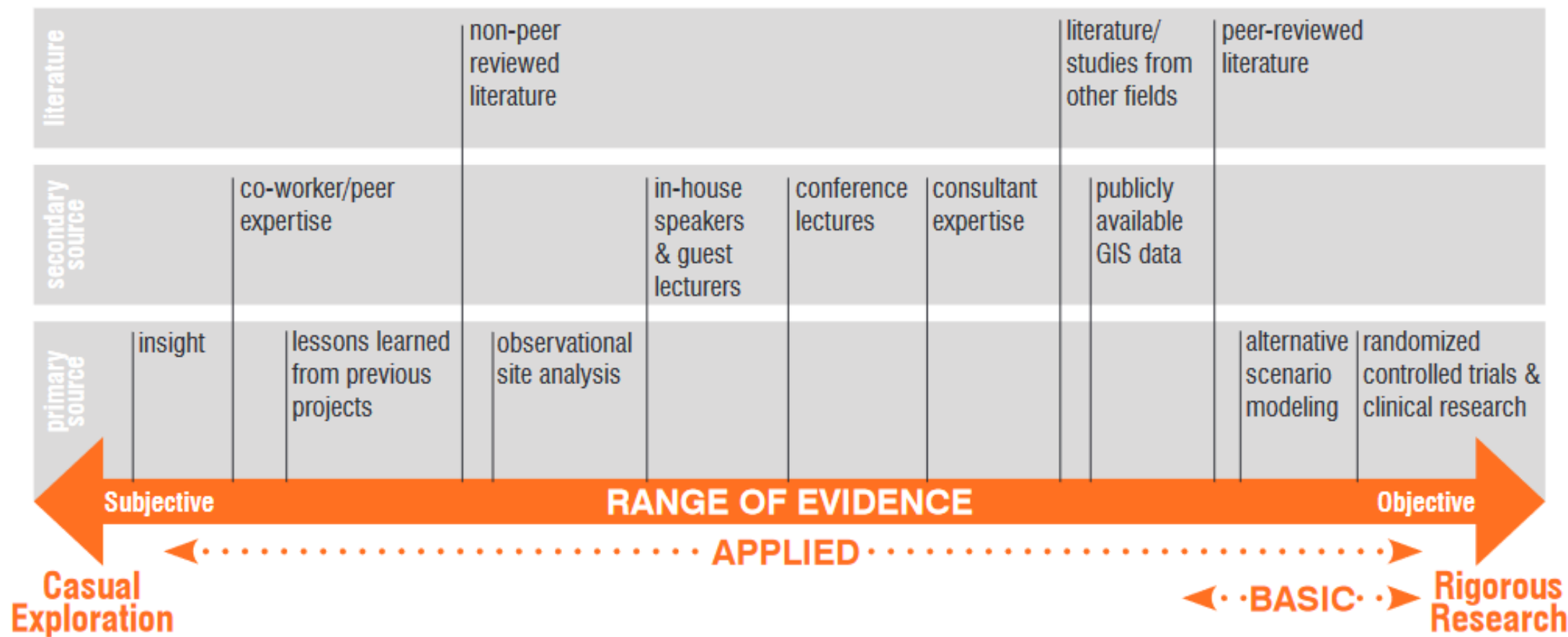
Evidences can be broadly defined



Based is narrowly applied requiring that decisions can be founded on a base of existing knowledge



-Range of Evidence and Quality of Evidence



Range of evidence Fagan (2017)

Level 1 (strongest)	1 Meta- analysis and systematic reviews of randomized controlled trials or experimental studies
Level 2	Single experimental study (randomized, controlled)
Level 3	Single quasi-experimental study (e.g., nonrandomized, concurrent, or historical controls)
Level 4	Systematic, interpretive, or integrative review of multiple studies of observational or qualitative research
Level 5	Single nonexperimental study, correlational, descriptive, mixed methods and qualitative research
Level 6	Published evaluation data (facility evaluations, mock-ups) that were systematically collected and were verifiable
Level 7	Consensus opinion of authorities (a nationally known guideline group with strong peer review)
Level 8 (wickest)	Opinions of recognized experts, case studies

Quality of Evidence Stichler et al, (2016)

HOW IT IS APPLIED IN PRACTICE

-The evidence- Based Design Process

Problem definition/ brief consultation and post occupancy evaluation are crucial steps where citizens and local stakeholders can be engaged, in order to affirm the EBDP process



Figure 2.3 The Evidence-Based Design Process (Adapted from The Center for Health Design 2009)

Fagan, E. (2017). Evidence-based design: structured approaches in leading landscape architecture practice. Kansas State University.

Figure 2.4
 Typical Linear Design Process EDiagram
 for Landscape Architects.
 (Adapted from Lynch and Haack 1984, 11)

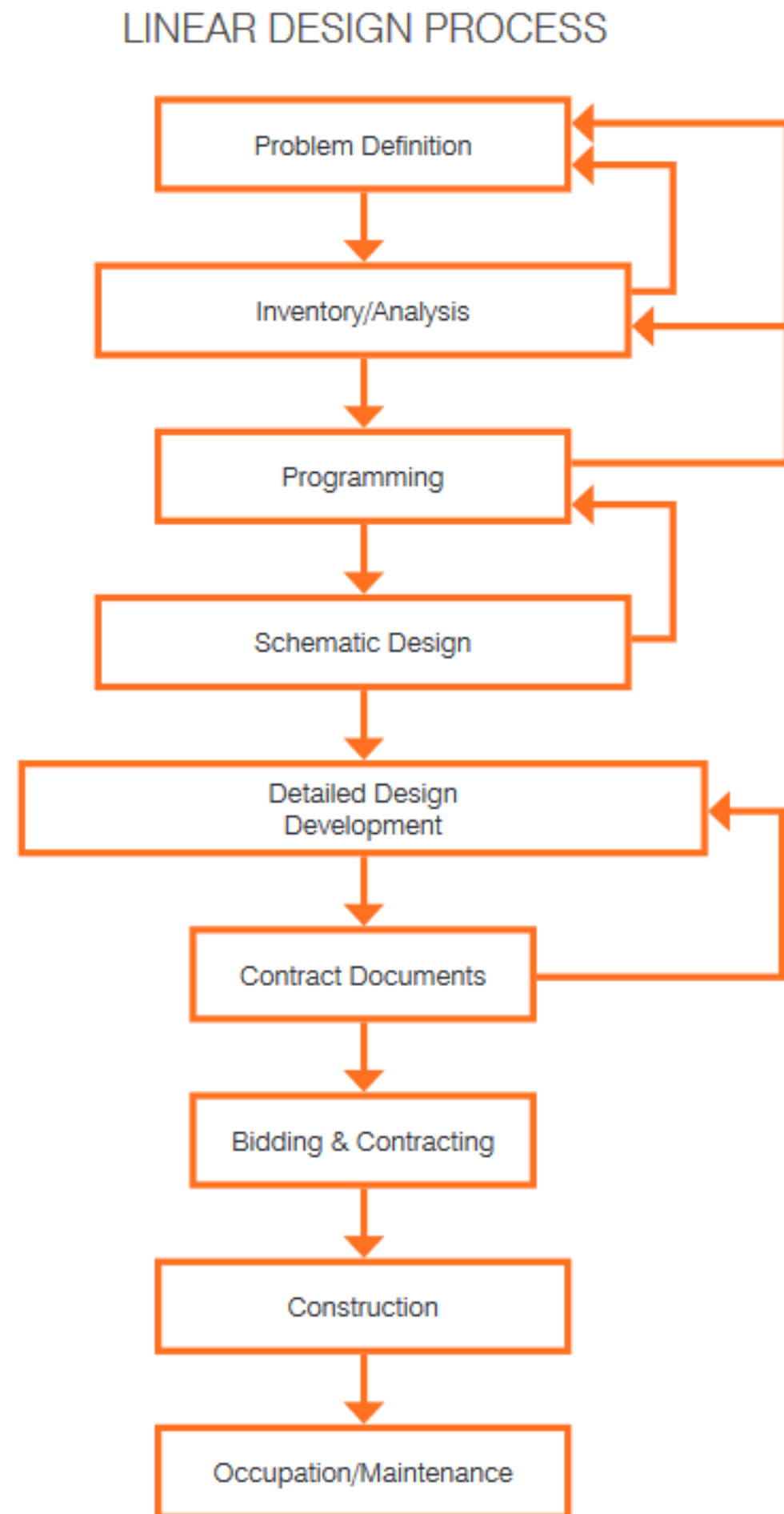
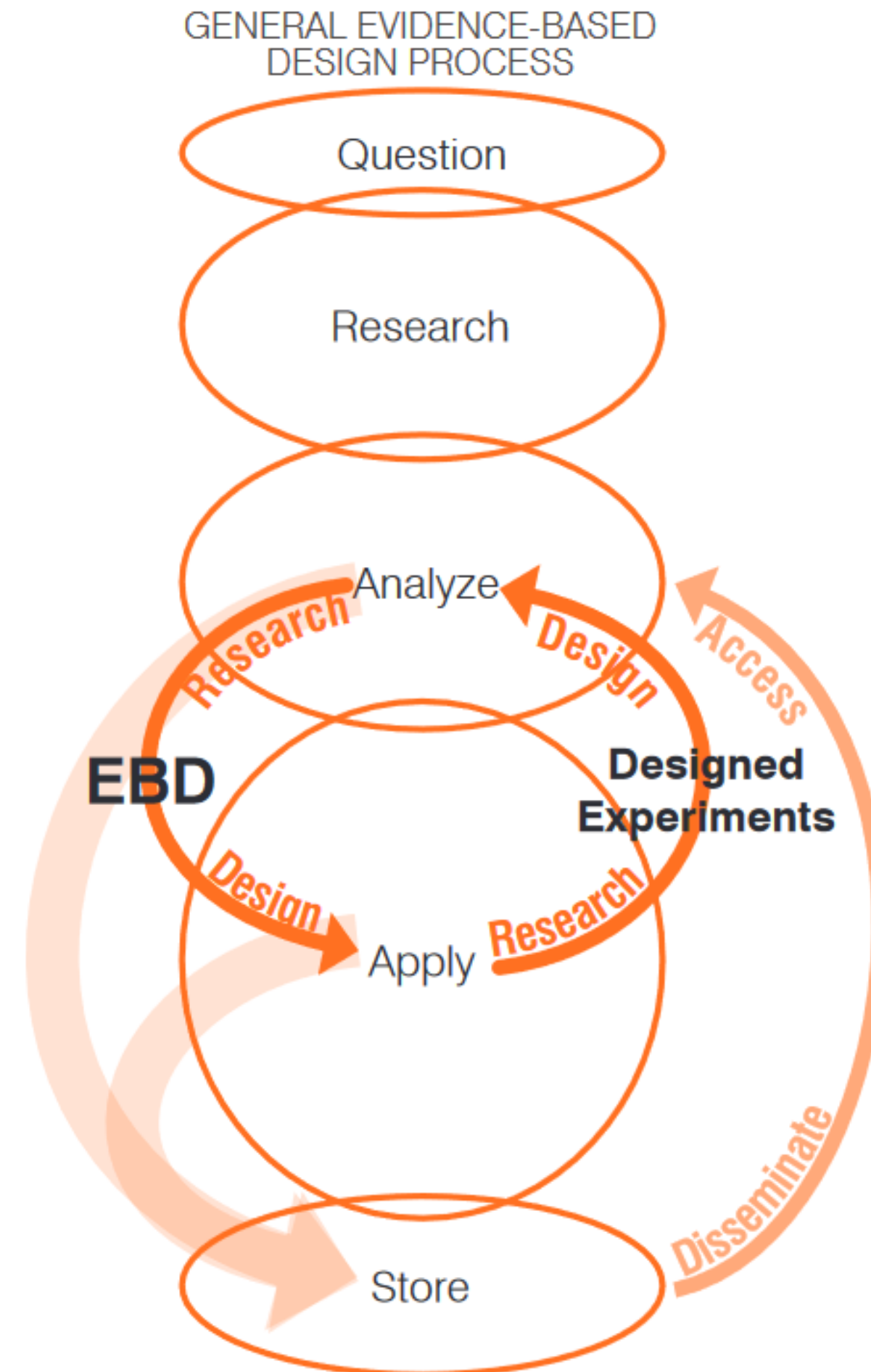
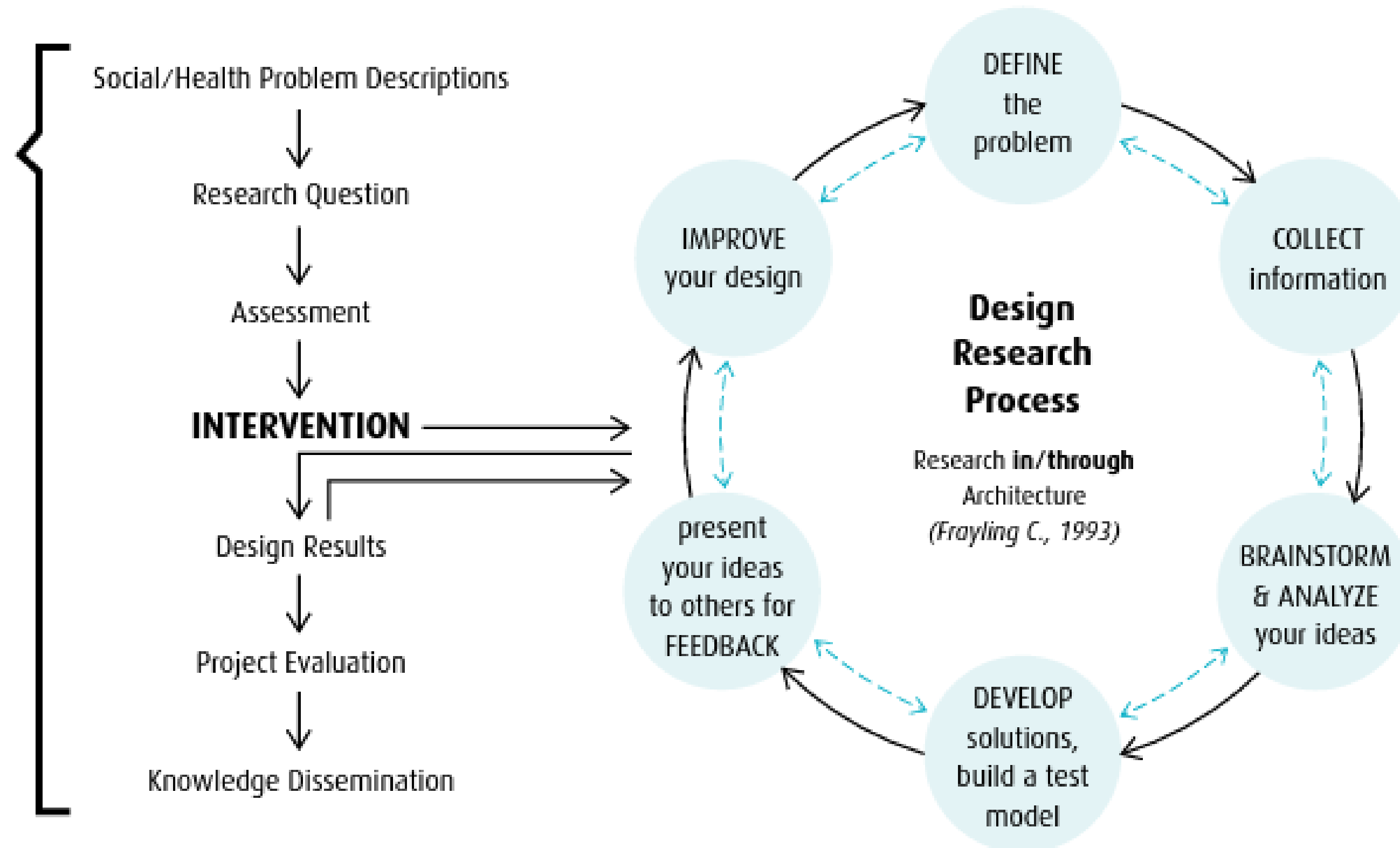


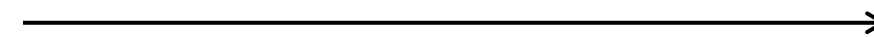
Figure 2.5
 General Evidence-Based Design Process.
 Non-linear, more iterative, and focused on the generation,
 application, and dissemination of new knowledge.
 (Elise Fagan, developed based on information from
 Augustin and Coleman 2012; Brandt, Chong and Martin
 2010; Brown and Correy 2011)



EbD Research for Architectural Interventions
(Valera Sosa, 2014)



FORMS OF ANALYSIS



Scales of Analysis



DESIGN PROBLEM DEFINITION

DATA COLLECTION AND MODELLING

MICRO

OPTIONS EXPLORATIONS



Empirical Approaches

MESO



Quantitative Methods

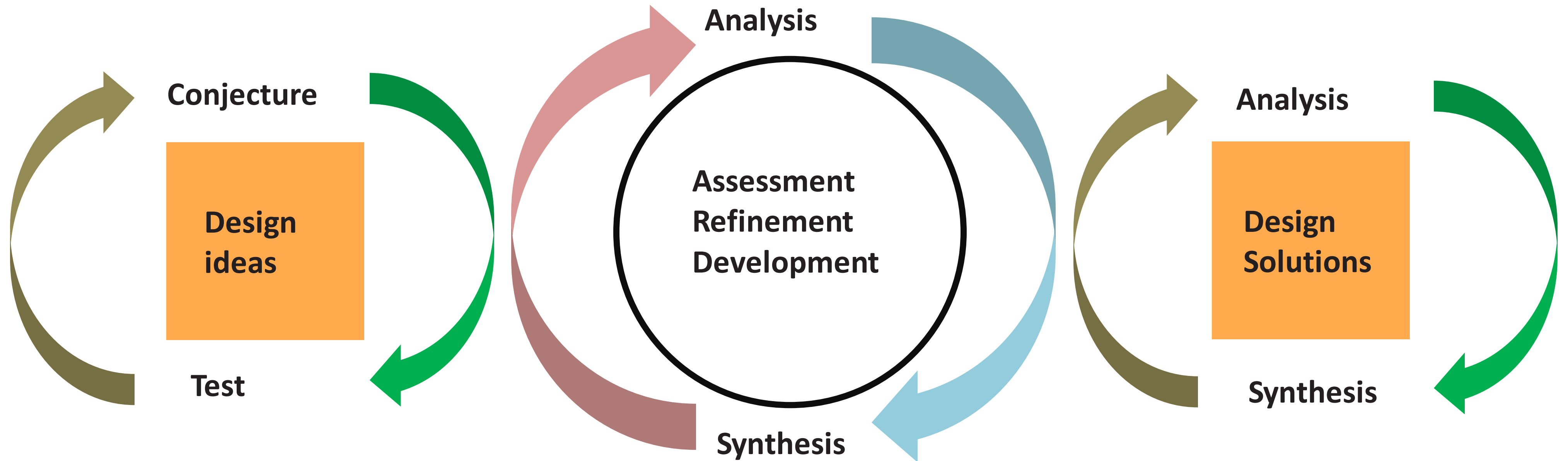
EVALUATION CYCLE AND ITERATIVE
FEEDBACK

MACRO

DECISION SUPPORT

FRAMEWORK DEVELOPMENT

The intuitive part of the design process cannot be addressed by an analysis-synthesis cycle.

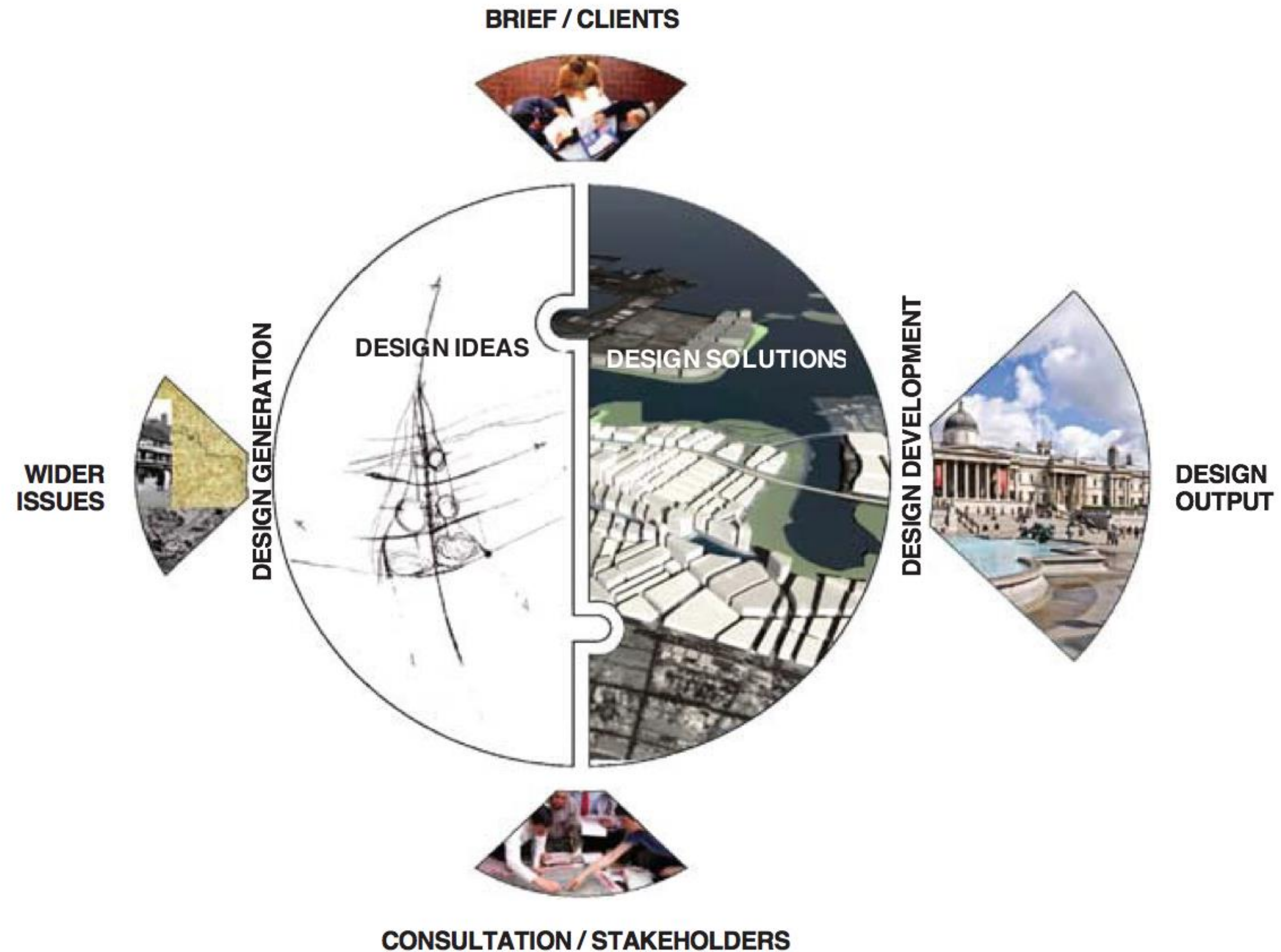


Design Ideas Begin with a conjecture-test cycle
 The Design idea is assessed analytically
 The design solution is then further assessed analytically

The design process

Conventional route

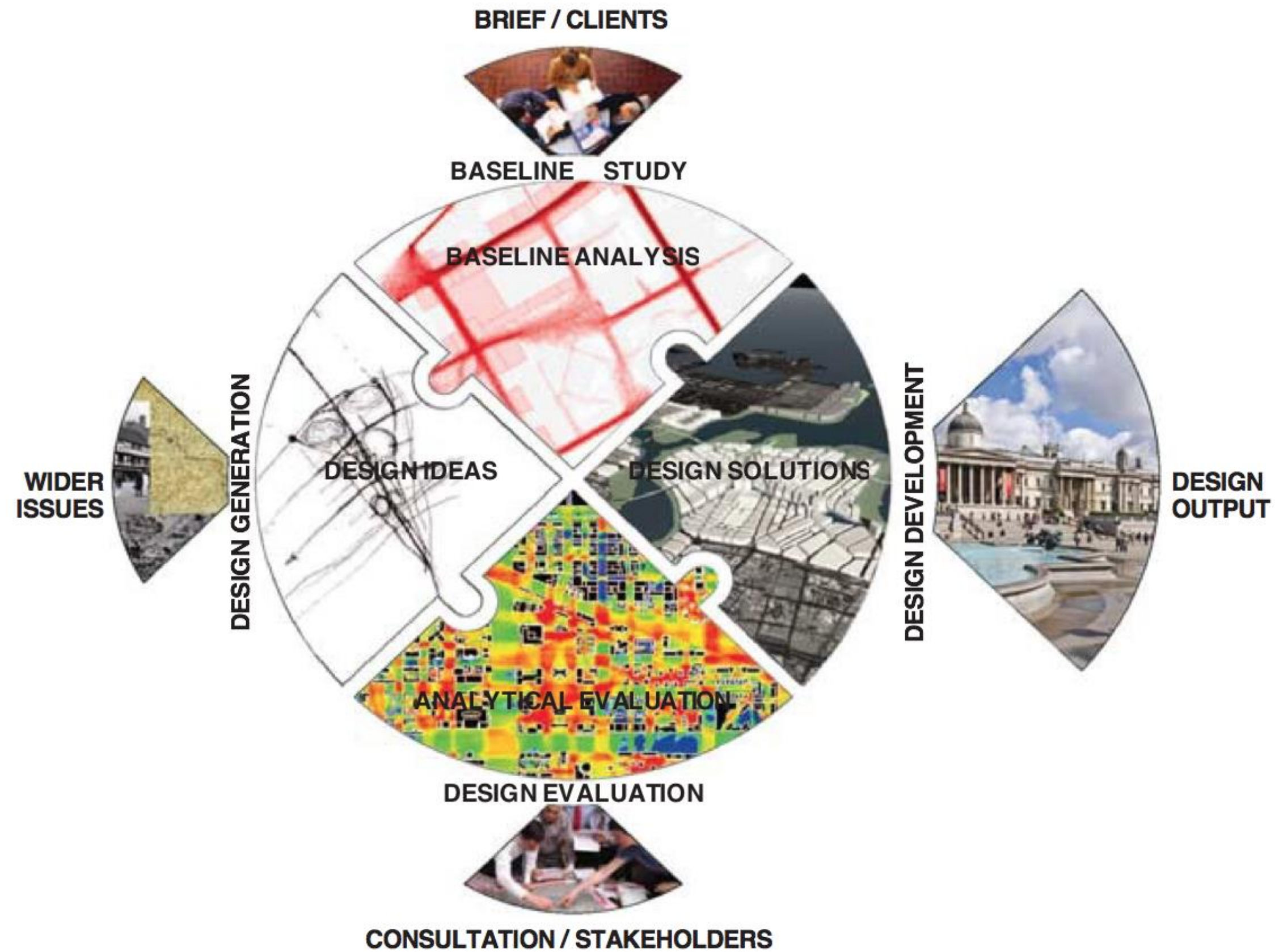
A generic urban design process. Two main stages of 'design generation' and 'design development' create a cycle that is induced by a design brief, wider urban design issues and stakeholder consultations. The urban design output comes normally after the design development phase, but the entire process could be reiterated until a satisfactory output is obtained.



The design process

Analytical approach

Analytical urban design process. An analytical phase, or a baseline analysis, takes place before the design generation phase. The analytical tools are applied again after the formation of design ideas or design options, to evaluate them and feed back into the process.

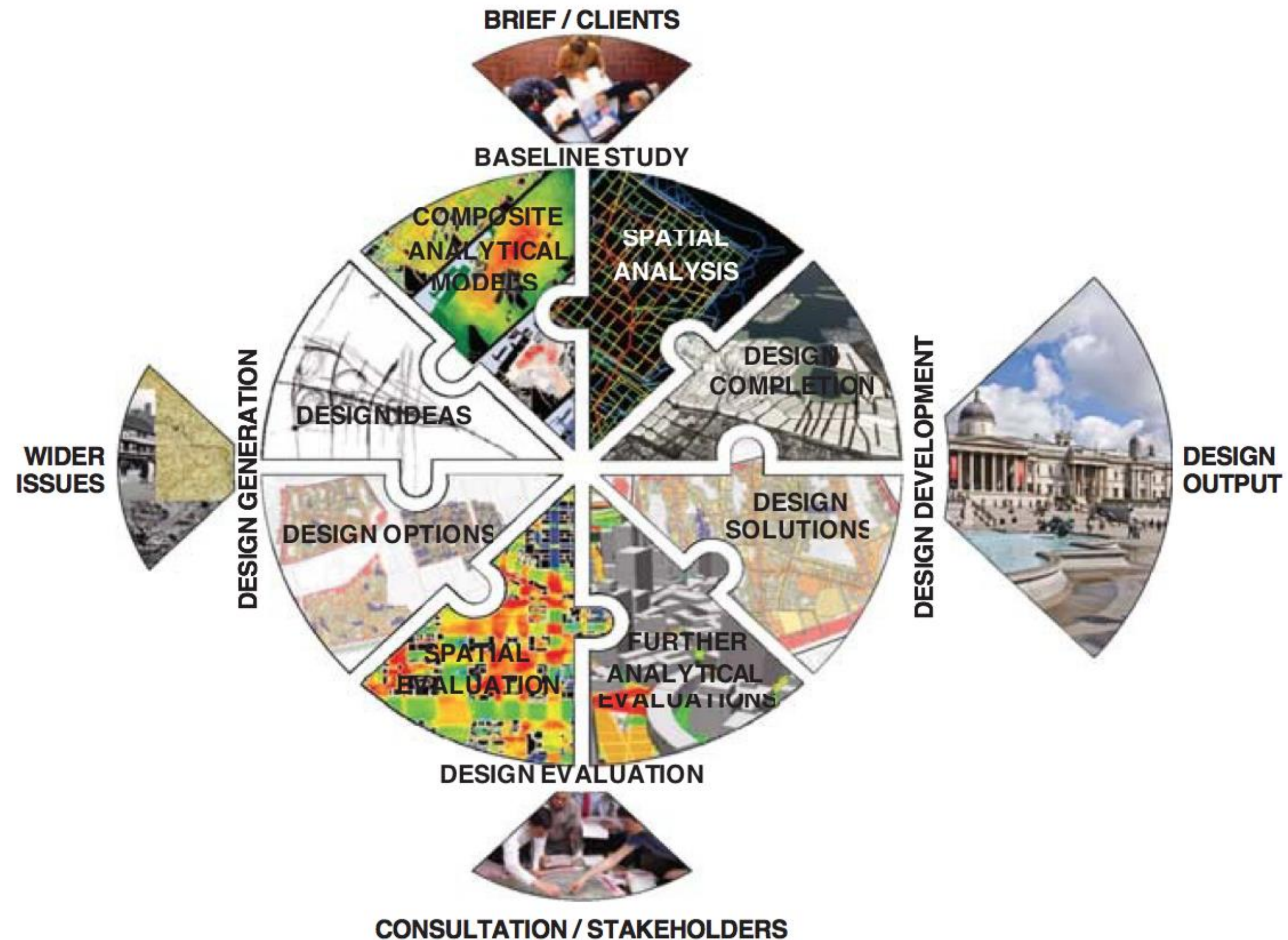


The design process

Spatial approach

Configurational approach to analytical urban design.

In this approach, the foundation of the analytical baseline study and analytical design evaluation is spatial configuration analysis. Further composite models of evaluation could be built on the spatial layer to enhance the responsiveness of the methodology.



EBDP IN PRACTICE

4 types of EBDP processes

1. Design Criteria Generation

Based on analytical Models, the Framework provides a set of criteria for urban planning, such as important benchmarks, that should be reached, KPIs, lowest/highest values of key urban metrics such as densities etc

2. Design with/along with EBDP tools

Start designing along with analytical models to test and evaluate each design decision made

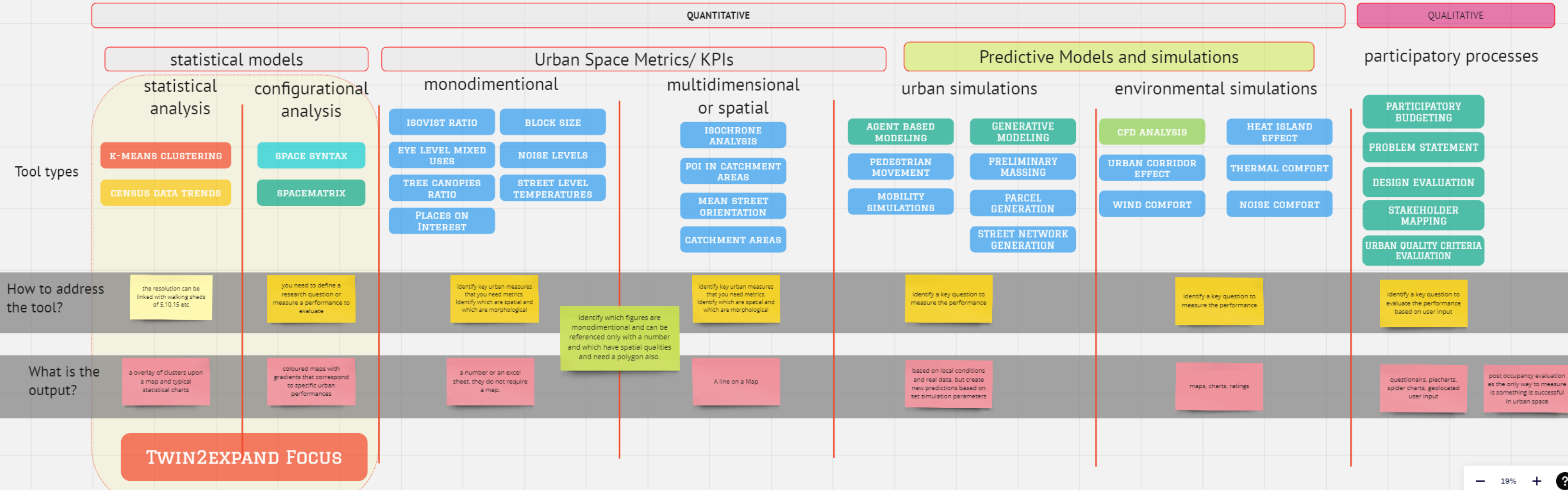
3. Design Evaluation

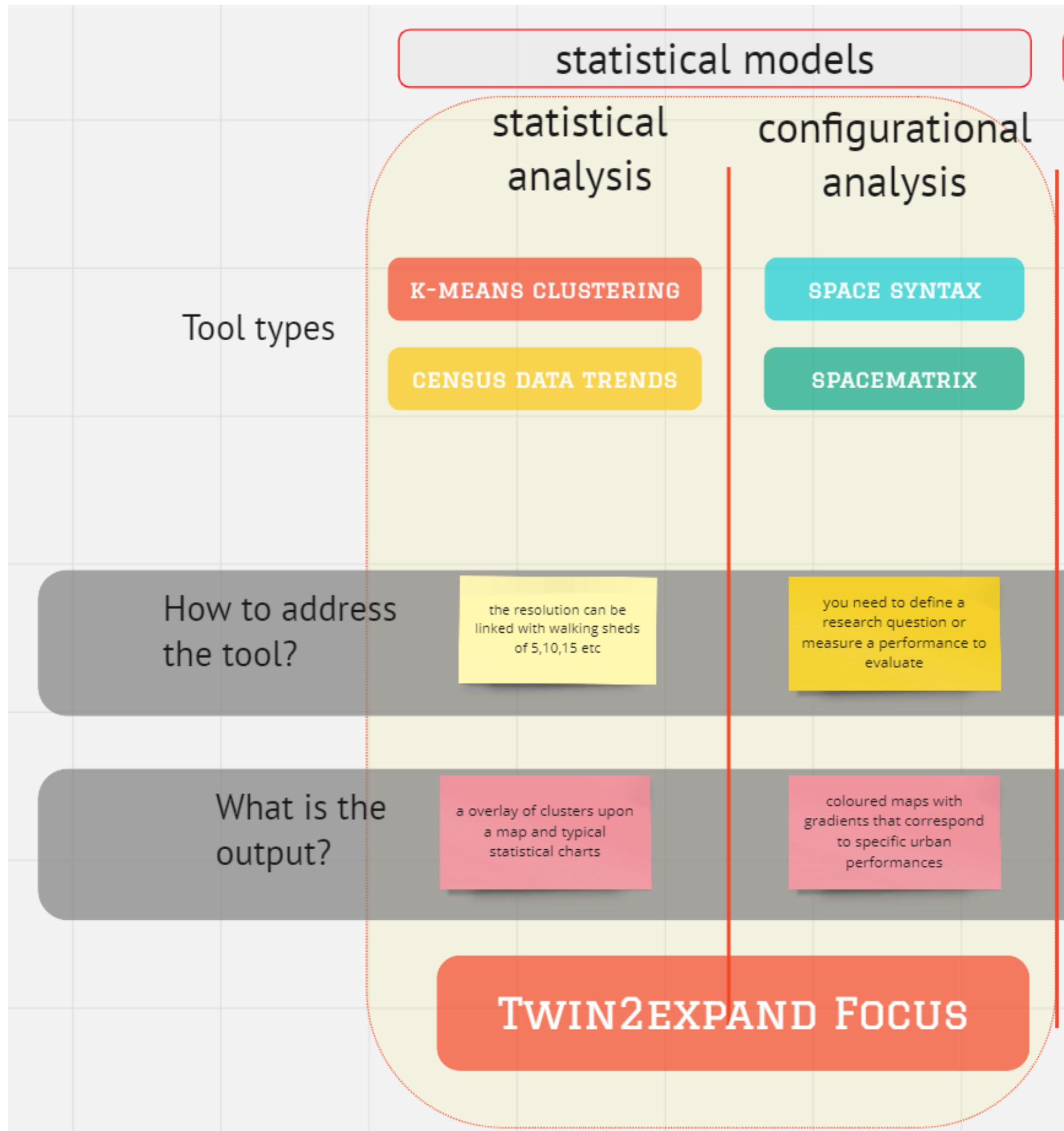
Rate and evaluate a design, based on the achieved performance of specific KPIs

4. Urban Data analytics generation

Create level of analysis for use in any given scenario

TWIN2EXPAND EBD FRAMEWORK





Urban Space Metrics/ KPIs

monodimensional

ISOVIST RATIO

BLOCK SIZE

EYE LEVEL MIXED USES

NOISE LEVELS

TREE CANOPIES RATIO

STREET LEVEL TEMPERATURES

PLACES ON INTEREST

multidimensional or spatial

ISOCHRONE ANALYSIS

POI IN CATCHMENT AREAS

MEAN STREET ORIENTATION

CATCHMENT AREAS

identify key urban measures that you need metrics. Identify which are spatial and which are morphological

identify which figures are monodimensional and can be referenced only with a number and which have spatial qualities and need a polygon also.

identify key urban measures that you need metrics. Identify which are spatial and which are morphological

a number or an excel sheet, they do not require a map.

A line on a Map

Predictive Models and simulations

urban simulations

environmental simulations

AGENT BASED MODELING

GENERATIVE MODELING

CFD ANALYSIS

HEAT ISLAND EFFECT

PEDESTRIAN MOVEMENT

PRELIMINARY MASSING

URBAN CORRIDOR EFFECT

THERMAL COMFORT

MOBILITY SIMULATIONS

PARCEL GENERATION

WIND COMFORT

NOISE COMFORT

STREET NETWORK GENERATION

identify a key question to measure the performance

identify a key question to measure the performance

based on local conditions and real data, but create new predictions based on set simulation parameters

maps, charts, ratings

QUALITATIVE

participatory processes

PARTICIPATORY BUDGETING

PROBLEM STATEMENT

DESIGN EVALUATION

STAKEHOLDER MAPPING

URBAN QUALITY CRITERIA EVALUATION

DESIGN BRIEF

identify a key question to evaluate the performance based on user input

questionnaires, piecharts, spider charts, geolocated user input

post occupancy evaluation as the only way to measure if something is successful in urban space

Figure 2.3
The Evidence-Based Design Process
(Adapted from *The Center for Health Design 2009*)

