

Appendix 1: Typo-morphological survey of Karlstad

What is typo-morphology?

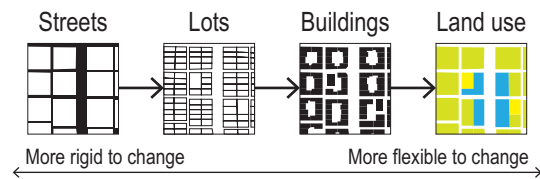
There are different schools of urban morphology and perspectives on the physical form of cities (Moudon, 1992; Kropf, 2009). Typo-morphology identifies and dissects various urban elements (Moudon, 1997, p.3) or recognizes and abstracts urban forms and patterns (Marshall & Çalışkan, 2011, p.421). M.P.G. Conzen conceptualizes the townscape through: 1) plan elements (streets, lots and buildings); 2) configuration of buildings in 3D space or the urban fabric; and 3) land and building utilization (Conzen, 1960; Whitehand, 2001). This school investigates historical layering of patterns of: 1) streets, 2) lots and their aggregation in blocks, 3) buildings; and 4) land use (Birkhamshaw & Whitehand, 2012). Figure 10A illustrates the elements of the Conzenian School.

How to create a neighborhood typology?

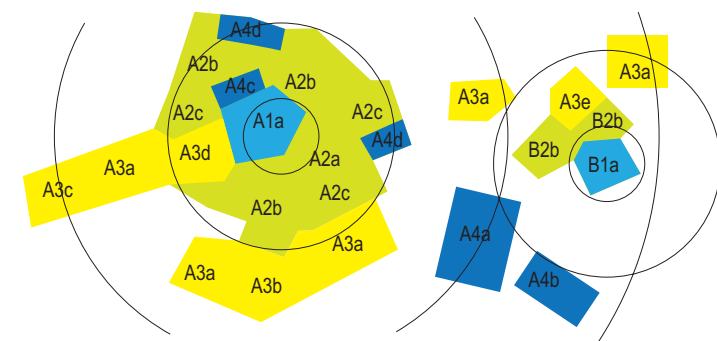
Neighborhood type in typo-morphology indicates a combination of underlying elements: building type, street layout, lot division and land use (Figure 10B). These elements have rules of combination (Alexander, 1979). Street types do not support every lot division or building type available. An apartment building for example cannot exit on a motorway. This urban pattern is non-sense. The number of urban pattern as combinations is not very high. Instead, there are many variations of few genotypes. Morphogenesis means a process of creation and change of cities. (Alexander, 2002, p.508). It is understood as process of emergence and variations of urban patterns. Despite the fact that it is possible to combine many urban elements, only few genotypes/specific patterns of urban and architectural elements and rules to combine these elements emerge and shape urban areas (Alexander, 1977; Alexander, 1979).

A Elements in urban morphology (Conzenian school)

A1 Urban form elements



A2 City elements (historical layers/development cycles)



A, B... Cities/towns

1, 2... Neighborhood emerging from transportation eras

- 1 Era of walking and horseback
- 2 Era of carriages and coaches
- 3 Era of public transportation
- 4 Era of private automobile

a, b... Neighborhood types (differentiated by distinctive patterns of streets, lots and buildings; e.g. a=AACAC, b=CCBAD...)

B Neighborhood type (period+street layout+lot division+building type+land use)

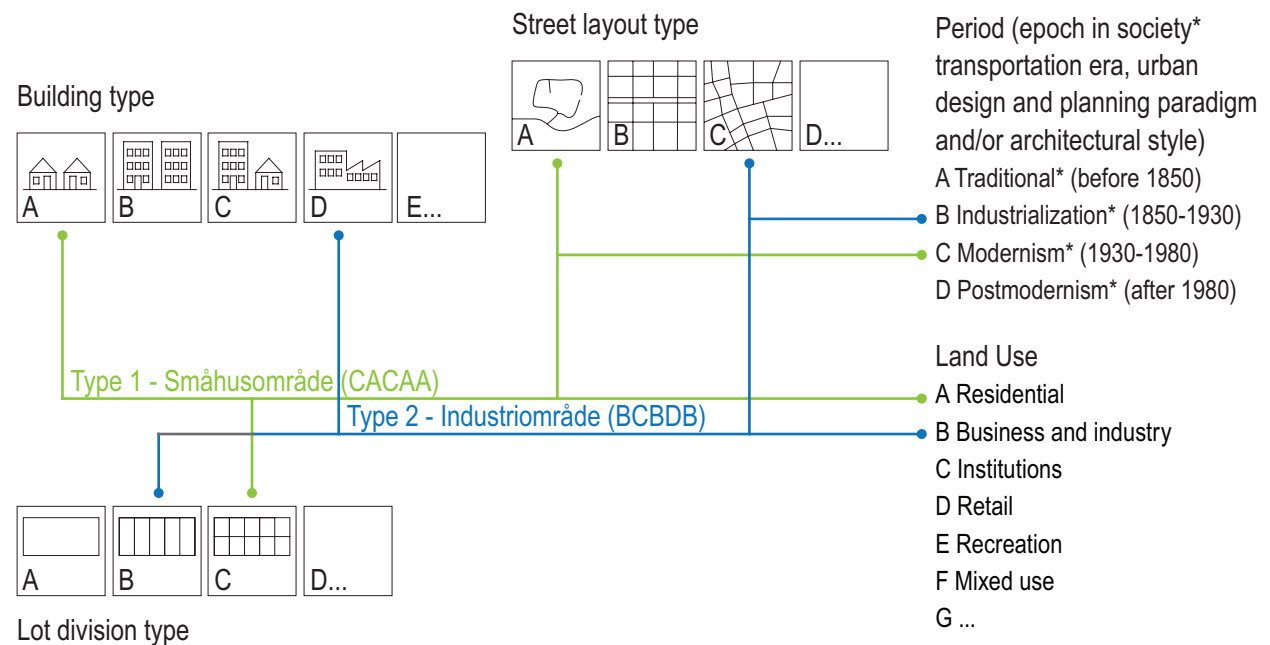


Figure 1: Definition of neighborhood type (inspired by Whitehand, 2001; Marshall, 2005)

The Swedish neighborhood typology

Many Swedish urban morphologists, architects and geographers have focused on categorizing neighborhood typologies by industrialization epochs (Engström et al., 1988), planning paradigms (Rådberg, 1988; Rådberg & Friberg, 1996), or historical urbanization, for example of

Stockholm (SSBK, 1997, 2000). Figure 11 shows a Swedish neighborhood typology that combines all these typologies. This typology includes additional neighborhood types with business and industry land use in addition to the original. It differentiates commercial (office parks), retail (shopping districts) from industrial zones on most general level. The Swedish typologies present these neighborhoods as working areas (*verksamhetsområde*). A detailed classification and evolution of industrial and commercial typologies (see Southworth, 2005, for evolution of shopping malls; Scheer, 2015, for retail districts) is left for future research.

Many researchers (Whitehand, 2001; Marshall, 2005) argue that different transportation mode become fashionable in specific historical period. Some neighborhoods emerged in the periods of walking flâneurs, coaches and carts; others in the ages of public buses, trams and trains; or private cars. The societal embracement of transportation technology materializes in neighborhoods and immobile infrastructures (street types) that in turn produce distinctive habitation and mobility patterns, sociabilities and mobilities (see Urry, 2007). Table 5 below summarizes the characteristics of the different neighborhood types in respect to different factors.

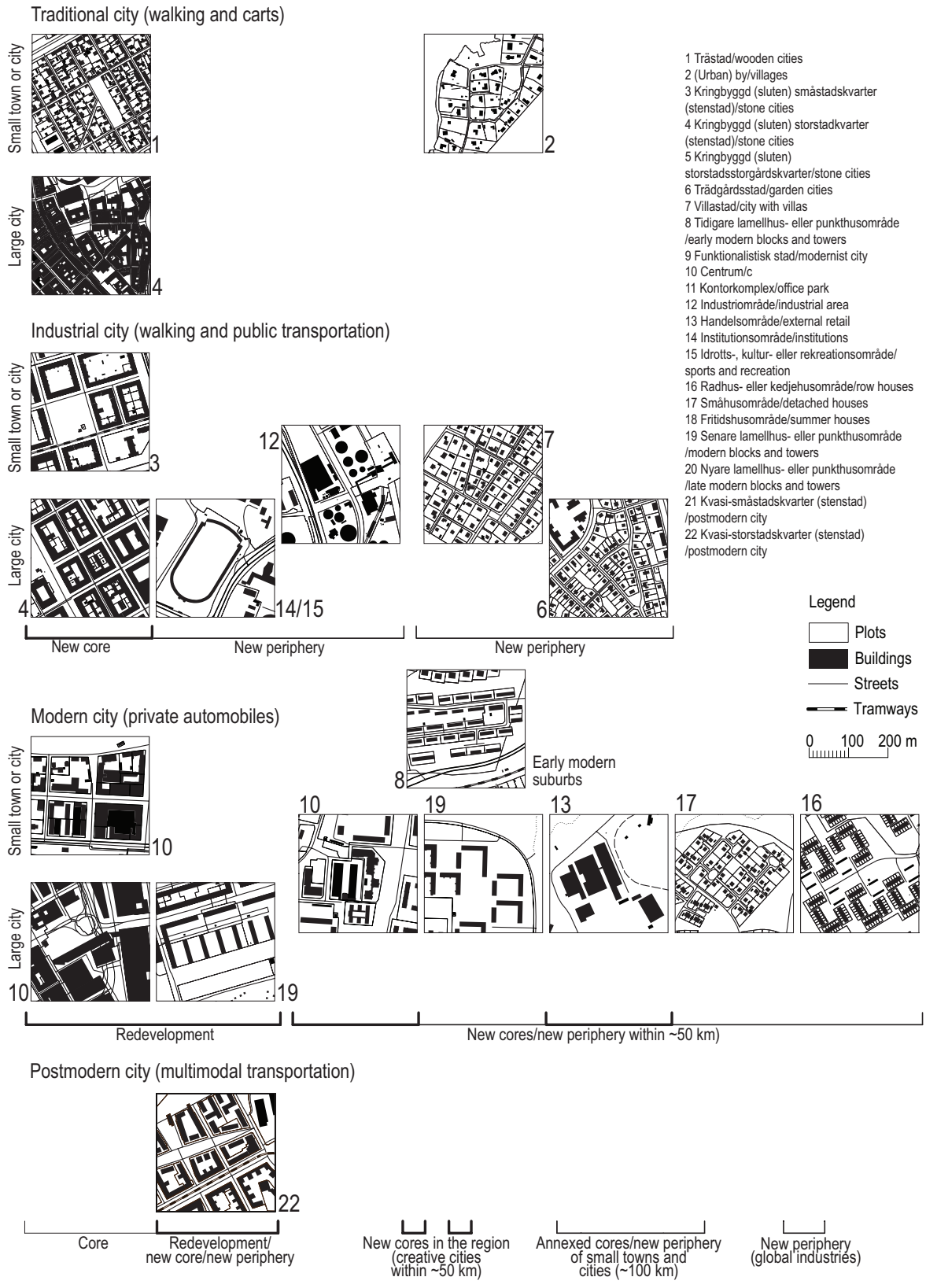


Figure 2: Swedish neighborhood typology

Table 1: Swedish neighborhood types and their morphological characteristics (inspired by Engström et al., 1988; Whitehand, 2001)

Neighborhood type	Period	Street layout	Building type	Land use	Transportation mode	Daily activity
Urban by	Traditional	Linear	Detached buildings	Agricultural/ Residential	Walking/ private car	Non work hours
Trästad	Traditional	Interconnected streets	Quadrangles	Mixed/ agricultural	Walking	Perpetual
Kringbyggd (sluten) småstadskvarter (stenstad)	Traditional	Interconnected streets	Enclosed blocks	Mixed	Walking	Perpetual
Kringbyggd (sluten) storstadskvarter (stenstad)	Traditional	Interconnected streets	Enclosed blocks	Mixed	Walking	Perpetual
Kringbyggd (sluten) storstadsstorgårdskvarter	Traditional	Interconnected streets	Enclosed blocks	Mixed	Public transit	Perpetual
Trädgårdsstad	Industrial	Interconnected streets	Detached buildings	Mixed	Public transit	Perpetual
Villastad	Industrial	Interconnected streets	Detached buildings	Residential	Public transit	Non work hours
Tidigare lamellhus- eller punkthusområde	Early modern	Road hierarchy	Detached buildings	Residential	Public transit	Non work hours
Funktionalistisk stad	Modern	Road hierarchy	Mix	Mixed	Private car	Perpetual
Centrum	Modern	Road hierarchy	Complexes (big box)	Retail and services/ community services	Private car	Work hours
Kontorkomplex	Modern	Road hierarchy	Complexes	Business	Private car	Work hours
Industriområde	Modern	Road hierarchy	Complexes (big box)	Industry	Private car	Work hours
Handelsområde	Modern	Road hierarchy	Complexes (big box)	Retail	Private car	Work hours
Institutionsområde	Modern	Road hierarchy	Complexes	Community services	Private car	Work hours
Idrotts-, kultur- eller rekreationsområde	Modern	Road hierarchy	Complexes	Assembly and leisure	Private car	Events
Radhus- eller kedjehusområde	Modern	Road hierarchy	Buildings in rows	Residential	Private car	Non work hours
Småhusområde	Modern	Road hierarchy	Detached buildings	Residential	Private car	Non work hours
Fritidshusområde	Modern	Road hierarchy	Detached buildings	Recreational	Private car	
Senare lamellhus- eller punkthusområde	Modern	Road hierarchy	Detached buildings	Residential	Private car	Non work hours
Nyare lamellhus- eller punkthusområde	Late modern	Road hierarchy	Detached buildings /complexes	Residential	Private car	Non work hours
Kvasi-småstadskvarter (stenstad)	Postmodern	Quasi interconnected streets	Quasi enclosed blocks	Mixed	Multimodal	Perpetual
Kvasi-storstadskvarter (stenstad)	Postmodern	Quasi interconnected streets	Quasi enclosed blocks	Mixed	Multimodal	Perpetual

Appendix 2: Land-use categories

The land uses are categorized by translating Swedish land-use classification systems where mixed land uses is added (it is not included usually). The following categories are encoded in GIS for the different neighborhoods:

1. Mixed (translated in Swedish: blandstad)
2. Agricultural and forestry (translated in Swedish: lantbruk)
3. Residential (translated in Swedish: bostäder, bostadsområde)
4. Retail and professional services (translated in Swedish: centrum, handelsområde, köpcentrum)
5. Business and industrial (translated in Swedish: industri- eller arbetsområde, verksamhetsområde)
6. Community services (translated in Swedish: samhällstjänster)
7. Assembly and leisure (translated in Swedish: iddrots- eller rekreatiomsområde)

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