

The MXI (Mixed-use Index) an instrument for anti sprawl policy ?

1 Introduction

It is commonly stated that societal change is one the driving forces for urban development and the definition of urban projects. In the 20th century economy transformed from industrial production and distribution to knowledge based service and creation. The rapid development in modern times of economy and technology increased the scale of operating from a local to a global scale. During this “process of modernization” The physical presence of our urban configurations and networks has become both a product and a witness of these historical forces of change. This is exemplified in urban development by aspects like scale-enlargement and functional specialization. Take for instance a European city like Amsterdam and analyze a square mile of historic texture. One will see that within this historic texture there as many jobs as there are beds. Take the same square mile of 20th century texture and most likely one will end up with counting only jobs or only beds as is shown in figure 1.

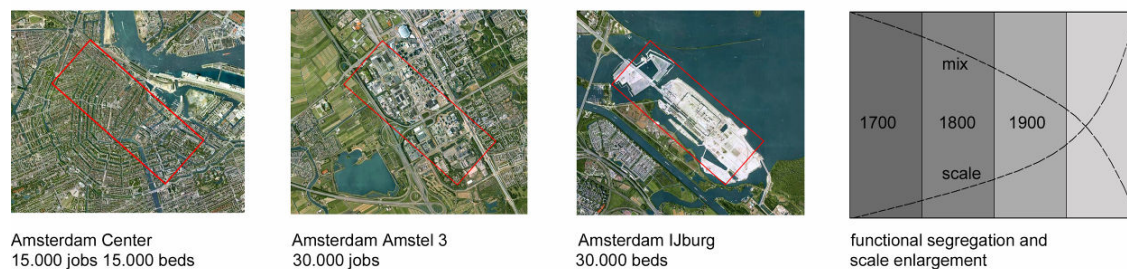


Figure 1. Functional segregation and scale enlargement in urban history.

Now that we are watching the deindustrialization of Western cities, in the Netherlands the segregation of a spatial and functional nature is a process that is still taking place at an increasing speed (Louw 2005). This is often explained along the lines of rudimentary “modernist” planning principals that as a matter of fact are a product of the industrial revolution. At the same time new types of urban projects are emerging in the periphery of the 20th century cities where the mono-functional territories of the industrial area, fit for either housing, production or recreation are transformed into territories of a new kind. Examples of those projects in Amsterdam are the IJover projects, the Eastern Harbor islands, the Metropolitan South-axis, Amstel Two and so on. All those urban transformations have in common that they are aimed at creating attractive urban environments reminiscent of the classical European city with equal amounts of housing amenities working and public space within a walk-able territory in order to create liveliness, urbanity and a dynamic diversity. The working facilities in those new urban projects are aimed at the knowledge based economy and exemplified by the emphasis on the “creative class”. The housing program is not any longer meant to emancipate the collar workers but to provide attractive, communicative environment for the knowledge workers and creative professionals of the 21st century. As Richard Florida puts it in his new book: “Who is your city”, professionals of the creative class are drawn to the mixed districts he calls “Design digs” and “Urban mosaic” (Florida 2008).

Amongst the quintessential dynamics in the European city is the simultaneous transformation of many centrally located low density mono-functional industrial territories into high density mixed-use urban districts. One could state that this type of urban project, no matter in how many ways these interventions can be designed or appear, is the product of a societal change from an industrial to a knowledge based economy. The main actors in this

transformation are no longer the omnipotent, postwar city governments, but more and more public private partnerships and even privately owned companies for city development (Meyer 2005). The role of citizens or “consumers” has become more emancipated. The modernist perspective that inhabitants are victims that need to be taken care of by clarity hygiene and daylight has dramatically evolved to a perspective where citizens have become spoiled highly individualized consumers that like to pursue an “all inclusive” metropolitan lifestyle. Seen from a global perspective the keywords for the new urban European dynamics could be formulated as: quality, wealth, individuality and sustainability. They are quite different then those that characterize the postwar period or for instance the contemporary Asian urban dynamics that are to some extent defined by quantity over quality and improvement rather than emancipation.

As pointed out by the French urban theorist Francois Ascher (Ascher 2005) our current processes of urbanization are determined by deindustrialization and a reflexive modernization. This goes along with the re-appreciation of mixing uses in order to create the right conditions for urbanity, economy, consumerism and by aiming at compactness contributing to sustainability. The problem however is that the theoretical framework on mixed-use from a perspective on planning and development is ambiguous, fragmented (Louw 2004) and does not provide answers to questions like; How does one define mixed-use, what is a good mix, what are scales of relevance and especially how can mixed-use development be made instrumental by planning policies. Looking at current planning policies and talking to planning officials and urban designers and other developmental actors one could draw the conclusion that the re-appreciation and implementation of mixed-use is rather an empirical and practical matter and by no means positioned within the academic or theoretical debate. One of the standard works on the history of the European City “ the rational City” (Castex 1990) only notes that the mix of uses on the level of the block has gradually disappeared, starting from the late 19th century without analyzing what that meant for the workings of the urban realm. Therefore a framework within which the history, the definition and the instrumentality of mixed-use development are integrated would contribute greatly to a better understanding and acting in the modification of our urban environments.

2 Mixed-use in the perspective of the 20th century

In the classical city of Amsterdam the diversity of the urban mix in terms of program and socio economic categories was a natural fact (Wagenaar 1991). Descriptions from mercantilist Amsterdam at the in the 18th century projects an image of a city where production and consumption, rich and poor , administration and commerce were very neatly interwoven. The transformation from a mercantilist economy to a industrial economy led to scale enlargement and specialization also in terms of urban space and functions. A rudimentary system of zoning and separation of functions has always been present in Dutch cities since medieval times especially when it came to patient care for contagious diseases, storing explosives and activities needing a lot of space or the proximity of open water like windmills and shipyards. An early example of concentration of production dates back to the 15th century where for instance a whole city district in the city of Leiden within the city walls was appointed for the production of textiles (Taverne 1978). The phenomena of mixed-use urban tissue was self evident and actually did not become a theme until the introduction of modernist city planning.

In most reviews on mixed-use planning the separation of functions is always proclaimed as a product of the ideology of Le Corbusier and the CIAM charter of Athens (Van der Woud 1983). Indeed it is true that that in this Charter of Athens a voracious plea is put forward for the separation of functions of living working infrastructure and recreation in appropriate specialized districts. However as has been a dispute amongst planning historians, what the modernist movement did by their plea for separation was in retrospect embrace a development that already had proved to be irreversible and had its origins dating back to the

late 18th century (Sieverts 1998). The distinctive quality of the modernist movement was that they made the implacable separation of functions an aesthetical goal in order to create urban projects that at least looked clean, efficient and well organized, in contrast with the dirty sloppy cities of the late 19th century. The first one to criticize on a global scale the results of a separation of urban functions that went to far, and killed the city life, was the much acclaimed Jane Jacobs (Jacobs 1961). Looking back at “the life and death of great American cities” one can state that the plea for mixing primary and secondary uses was the central message of her deliverance. The occurrence of the notion of mixed-use which before the modern times had been self evident became a relevant issue in the 1950's.

After the introduction of the mix of uses as one of the elementary criticisms on modernist city planning a second important moment in the life of the concept of mixed-use was after the oil crisis in the 1970s when the idea of the “compact city” entered the stage(DRO 1984). The preconception of the compact city had its origin in the notion that the concentration of people and activities could contribute in lowering energy consumption by lowering the amount of commuters traffic by enhancing densities and bringing work and city in a relative proximity. One of the fundamentals underlying this relatively naïve idea was that before the notion of the “network city” began it was assumed that most people live in neighborhoods close to their work. The plea for mixed-use mostly resulted in a better care for amenities needed for housing areas for a social perspective like shopping and community centers. At the same time during the 70s many corporate offices and urban amenities were leaving the citycenter. A substantial mixing of work and housing in new developments was out of the question. For instance in Amsterdam the rise of the office as production platform for the service economy was accommodated in mono-functional office parks (DRO 1980), analogue to the accommodation of factory complexes, positioned next to newly built ring roads without thinking about what mixing these offices with housing could contribute to urban quality or an urban lifestyle.

The third reoccurrence of the mixed-use ideology in a new form happened during the late 90's. Creating new excellent urban concentrations in a global competition for the information economy was carried by the believes that if one wants to create a vibrant urban area that can compete on a global stage a diverse and concentrated mix of all urban activities imaginable is a necessity. This belief had become visible in projects like Docklands in London or Potsdamerplatz in Berlin. In the masterplan for the Amsterdam South Axis (DRO 1998) a mixed-use environment on the level of both a district and a city block became a real issue in the Netherlands again. The idea that attractive urban environments with a intense mix of different attractions in a close proximity has been amplified to extremes by Richard Florida in his book the rise of the creative class (Florida 2002). He states that being positioned in an attractive urban conglomeration where economy, leisure, entertainment and living are interactively organized has become one of the key essential elements for economic success in the information age. In the information age the key capital is intellect and talent and only companies located in top class urban environment can attract the best minds and people to work for them. A mediocre highway office park without amenities doesn't do anymore, professionals of the information age want to bike to their offices, go to lunch in designer restaurants and end the day at a gallery, a museum or a concert.

In the end one could also argue that urban diversity is always a product of a process of cyclical transformation since almost no quarter or district shows a rich diversity immediately after being built. In this perspective mixed-use urbanity can be seen as the urban patina after numerous steps of transformation and redevelopment resulting in richness and diversity. One could argue whether creating mixed-use high-density urban districts to comply with the requirements if the information age and the information economy is something unique for our era or a historical phenomena that is always bound to take place in the long end. May be a return to a more mixed classical urban tissue in the 21st century is a correction on modernity in the 20th century. Nowadays the classical urban environments and inner cities are more

popular than ever (NRC 2008). The mixed-use character of city districts will be subject of analysis in paragraph 8 and 9 after a more investigative approach of the theoretical framework for mixed-use development.

3 Urban mix-typologies

As is shown by the Amsterdam flagship projects from the last ten years more and more urban projects can be considered “mixed” and the grain sizes of both housing offices and amenities are diminishing within those projects, in order to result in lively and urbane environments. One of the essential questions however is what it takes to define a good mix in order to create the benefits of mixed-use on district scale. Take for instance the IJburg project, an artificial island east of Amsterdam with over 20.000 houses, a relatively high density project with a very little share of non-housing functions. Based on what facts did the planners choose to take this mix proportion? How is a mix generally defined within new urban projects? Is it solely based on market expectations or demographic extrapolations or can a mix be proportioned according values that result in good effects based on experience and reference districts ?

In order to get a grip on mix proportions two examples of urban mixes are analyzed, the poor mix of office parks and the rich mix of metropolitan downtowns. When we look at the land use of our cities one can see that still many offices are located in monofunctional area's. Not surprisingly rent levels for the relatively low amount of office space located in mixed area are usually substantially higher (Van den Hoek 2007). In the Netherlands where a huge office vacancy dominates the office market, the vacancy is concentrated to monofunctional office parks whereas all offices at mixed locations show vacancies lower than 5% of the total floor space, which is considered to be a healthy rate. When asking office end-users it becomes clear that it is not the buildings itself that are the problem, they simply prefer to reside in a location that offers a civic quality and a public realm. It is obviously the mix or better the lack of mix in those areas that make them unattractive. Based upon these facts one could assume that there is a big potential for a further integration of office space within mixed urban districts and developmental projects, especially when one realizes that still 85% of all working locations is in monofunctional territory.

The second example is found when shifting the attention at metropolitan centers. The common sense approach in these areas is that the proportion between residential and non-residential uses should be 50/50 in order to create urbanity. In the Amsterdam canal-zone the residential /non-residential has been 50/50 for a long time. The Non-residential floor-space is occupied with a heterogeneous mixture of institutions, amenities, offices, shops, restaurants, etc. As a quick check of the validity of this 50/50 division in Amsterdam City-center, literature on other metropolitan city-centers is studied like for instance Barcelona. It does not come as a surprise that inside the city ring of Barcelona the proportion of residential vs. non-residential has always been kept on the same 50/50 already since the very beginning of the 19th century (Busquets 2005). The metropolitan urbanity of Barcelona within the ring and the canal zone of Amsterdam provide proof from experience that in order to create a lively and vibrant city-center the 50/50 proportion works. After introducing those two examples the question arises how this mix proportions should be defined for other city-districts in order to create an apt mixed that creates an urbanity fit for the place.

The central assumption in this paper is that the contrast in uses of a working and a residential nature organized on a walk-able scale in a city-district creates an atmosphere of urbanity. Hence the character of an urban district is highly defined by the proportion of housing versus non-housing uses in a district, and the way these opposites are mixed in terms of grain size. The residential part represents the heterogeneous mix of housing program, ranging from canal houses to high-rise apartments. The non-housing part covers the whole spectrum from amenities, retail, shops, offices, production, administration and so

on. Could it be that in a historical perspective all types of urban districts have their own mix-typology defined by the division between housing and non-housing, which to some extent is a product of the historical period during which they were conceived? In order to get a grip on the differentiation of mix-typologies a number of districts in the Amsterdam context will be analyzed for their mix in terms of housing versus non-housing.

4 Conception of a Mixed-use Index (MXI)

Mostly urban projects are defined in qualitative terms that are strongly related to the urban design, the architecture and the intended atmosphere and identity. When talking about urbanity amongst design and planning professionals urbanity is seen rather as a product of design than the result of the programmatic ingredients. A quantitative approach to urban planning and the definition of urban projects is still underdeveloped in the Netherlands, especially when it comes to mixed-use. Well known indexes like FSI OSR and GSI are commonly used around the globe (Berghauser Pont 2004). They refer to the physical aspects of planning projects like the site area the floor size of buildings, the footprint of buildings, the size of the public space and the amount of floors. However, those indexations do not describe the distribution of different uses within the urban project. Those indexes can predict, an indication of the volume or the massiveness of the project. When talking about residential projects the aforementioned indexes can indicate the housing typology (Berghauser Pont 2004). When it comes to describing the urbanity or functional diversity of a project indexes like FSI, OSR and GSI don't really have a predictive value.

In order to make the urban mix and mix-typologies discussable, comparable and in the end instrumental it is vital that the mix and mix-typologies are becoming measurable and can be indexed in an easy way. The question is how the complexity of the functional mix of in an urban district can be reduced to a simple index. This requires a reduction of all aspects of a mix to the simplest of terms. In this paper the urban mix will be reduced to the proportion of residential versus non-residential. This has shown instrumental for at least a number of city centers where the balance between residential and non-residential is 50/50 in order to keep a certain urbanity. This proportion can be described in terms of people, by the amount of workers versus the amount of inhabitants like it is done by the city government of Amsterdam (DRO 2007). This proportion can also be explained by counting desks versus sleeping places, which says something about intensity of use. In this paper however in order to contribute to the series of indexes of FSI GSI and OSR the proportion of housing versus non-housing is expressed in terms of floor space. The physical entity of floor space is very precisely measurable in any planning project and is less dependent on temporary fluctuations concerning the actual use when counting numbers of people. As an indirect consequence of the use over a longer period of time it is a relevant indication.

The Index will be called MXI which stands for Mixed-use Index. In this index the floors space with residential use is expressed as percentage of the total amount of floor space in a specific area. This results in a dimensionless quantity that expresses a proportion analog to density, building percentage and open space ratio using physical parameters like floor space and plot size in a same manner. In a project with MXI = 100 there is only residential use and subsequently in a project with an MXI = 0 there is no residential use. Hence the MXI of mono functional areas will be either 0 or 100 and the MXI of a city center in Amsterdam or Barcelona will be around 50 since it has equal parts of housing and non-housing (figure 2).

MXI value	0	50	100
Meaning	No housing present	50/50 balance housing non-housing	100 % residential use
District type	Single use.	Mixed-use	Single use
Examples	Office park Factory Complex Harbor district Shopping center	City Center Semi Central	Newtown The projects Suburbia

Figure 2. meaning of the MXI

When the MXI is defined in this abstract way as a proportion figure and relates to known reference environments, the instrumental and organizational value of this index can be compared with the FSI. On one hand it is a fundamental index when it comes to dimensioning, yet it does not describe the actual reality. Obviously when it comes to describe an actual mix one would also like to know about the exact composition of the mix in terms of different uses, the grain size of those uses and the way the different elements of the mix are physically disposed. This refinement of the mix index via a subindex will be subject of further research. Any comment one can give on the limitations in the descriptive power of the FSI can be applied to the MXI as well. Yet the FSI is a world standard.

5 Indexing mixed-use in Amsterdam by the MXI

To establish the relationship between the MXI and the character of a district, a variety of urban districts Amsterdam will be taken as a casus. Following west/east lines of historical growth Amsterdam districts will be analyzed with the MXI. Since Amsterdam as a typical compact European city grew in a concentric way according to the model of the “Lobbenstad”, (De Hoog 2005) this east/west section organizes districts in a historical order. The oldest districts are in the center and the more distance is taken from the historic city center the younger the age of the districts is getting.



figure 3. Dissection of Amsterdam in 12 historic relevant district types.

Twelve districts are selected along the east west section that are representative for a specific era of city development. The boundaries of the selected areas are chosen in such a way that the development of the district can be described as product of a specific plan or a condition. The selected districts can each be described as product of a specific moment in the developmental history of Amsterdam ranging from the late 15th century to the late 20th century. The section line stretches from the garden cities in the west to the garden cities in the east as is shown by the diagram. The chosen districts are analyzed on two scale levels, the level of the district itself and the level of a typical building block within the district. The building blocks are analyzed in the disposition of residential versus non-residential use on the ground floor level of the different individual buildings within the block. The data needed for the analysis of floor space in m2 to generate the MXI has been provided by Klaas Bindert de Haan of the Amsterdam DRO.

Nr.	Name	Period	Develop- mental grain	Style	Position	MXI
1	Westelijke tuinsteden	1950	5000 m2	Open blocks, slab development	Periphera l	94
2	Admiralen Buurt	1900	2000 m2	Classical blocks, large grains	Semi peripheral	87
3	Oud west	1850	1000 m2	Classical block, incremental grain	Semi central	74
4	Jordaan	1750	250 m2	Traditional block, incremental grain	Semi central	79
5	Grachtengordel	1700	250 m2	Traditional block, incremental grain	Central	53
6	Dam	1550	250 m2	Traditional block, incremental grain	Central	7
7	Wallen	1600	250 m2	Traditional block, incremental grain	Central	48
8	Rapenburg	1650	250 m2	Traditional block, incremental grain	Semi central	32
9	Plantage	1750	500 m2	Traditional block, incremental grain	Semi central	34
10	Dapperbuurt	1875	1000 m2	Classical blocks, large grain	Semi peripheral	75
11	Watergraafsmeer	1925	1000 m2	Classical blocks, large grain	Semi peripheral	80
12	Nieuwe Meer	2000	5000 m2	Open blocks, slab development	Periphera l	96

Figure 4. the MXI of 12 Amsterdam districts.

The assumption to be tested is that being the result of a specific time and a specific distance to the city center each district has its own typical MXI. In order to understand the way the MXI develops throughout the city the next diagram has been created. This diagram can be understood as a functional section of the city where the proportion of housing versus non-housing becomes visible moving from one district to another. The area in red shows the percentage of housing comprising both apartments and houses. In different grayscales the subdivision in different types of non-housing are represented e.g. office, retail, administrative, care, public transport etc. A more detailed explanation on the division of different uses with the domains of housing and non-housing reaches outside the boundary of this paper.

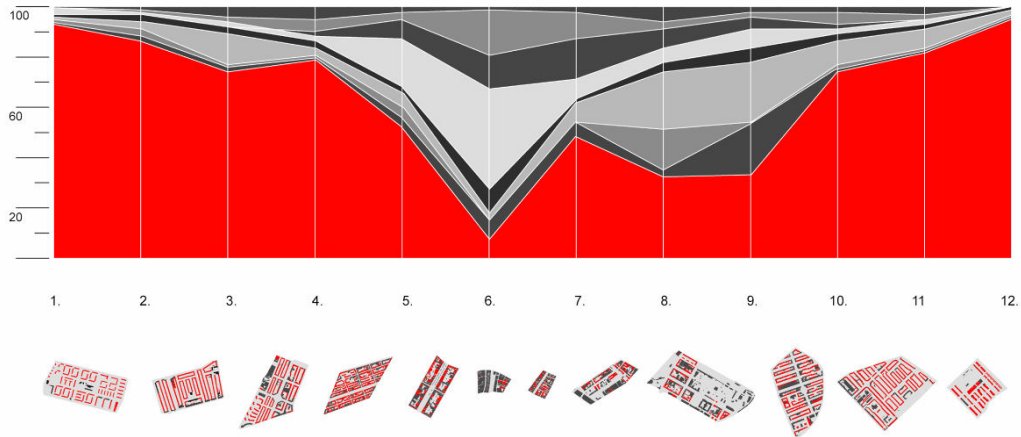


Figure 5. Development of the MXI sliding through Amsterdam from west to east via the city-center.

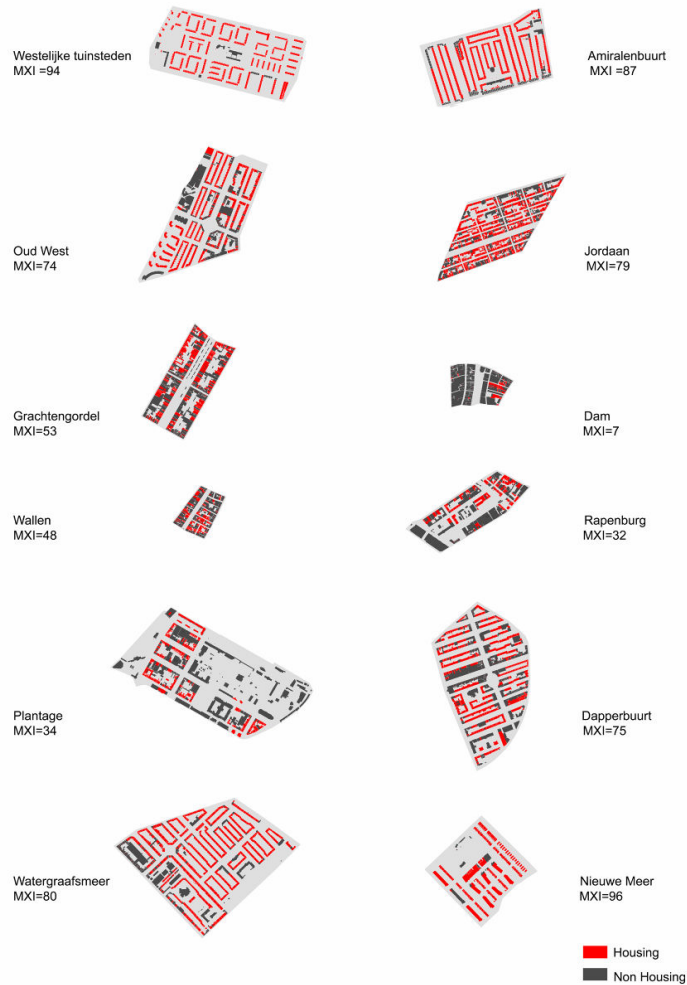


Figure 6. Housing versus non-housing in selected districts with their respective MXI values.

6 The instrumental value of the MXI

Looking at figure 5 that describes the relationship between the MXI and geographical disposition of the analyzed samples it becomes visible that there is a relationship between the centrality of the district, the character of the district and the MXI. In the city center the analyzed samples have an average MXI of around 50. The most centrally located one at Dam even has a value of 7 due to the limited perimeter which mostly includes retail and offices. Close to the city center the MXI swings in between 40-60. In for instance the Plantage, where the ZOO defines a large part of the district, the MXI reaches 40. Moving away from the (historic) city center the MXI gradually increases in steps. When entering the 19th century areas the MXI starts to get around 70-80. The typical late 19th century Neighborhoods have an MXI of around 85. When entering the more peripheral samples in the modernist garden cities the MXI gets to 90/95.

Assuming that there is a relationship between the MXI and the character and position of the district, districts could be organized according to value categories of the MXI. Based on experience with the first MXI analysis one could imagine to distinguish five typologies of districts as is shown in the next table. The method would have to be repeated in many cross-sections over the city in order to establish an absolute insight in the development of the MXI in relation to centrality and district character. It would be interesting in future research to see if the MXI only behaves according to the found pattern in Amsterdam or that it is an established pattern that also applies to other European cities.

MXI	0-20	20-40	40-60	60-80	80-100
District character	Factory complexes Office parks	Central business & leisure Districts	City center metropolitan downtown	19 th century city extensions	Suburbia Modernist town extensions

Figure 7. A provisional categorization of urban districts according to the MXI.

The descriptive power of the MXI especially gains momentum when combined with the FSI. Like the combination of FSI, GSI and OSR can describe residential volume typologies, the combination of FSI and MXI can describe the type of district in two relatively simple figures. In the next graph the MXI ranging from 1-100 is positioned on the X axis and the FSI ranging from 0.0 to 6.0 is positioned on the Y axis. The different urban districts from the previous table have been positioned within this scheme to exemplify the position they take within the system of coordinates. The graph shows that in general terms urban district can be determined with a unique position within this scheme.

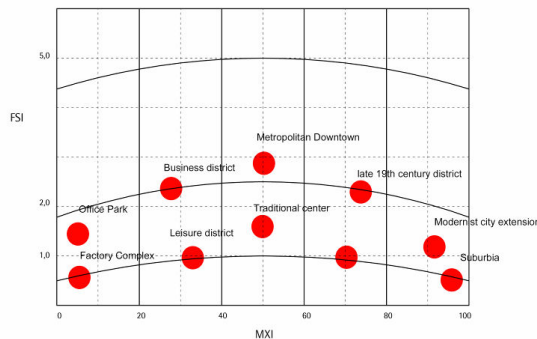


Figure 8. Combining the FSI and MXI to determine the character of urban districts.

Not only district types can be positioned within this scheme also the different characters of different periods in the development of our cities. In the next graph the typical projects of the classical “merchant city”, “the modernist city”, and “the city of the information age” (Francois Ascher 2005), have each been given their own territory within the FSI-MXI graph.

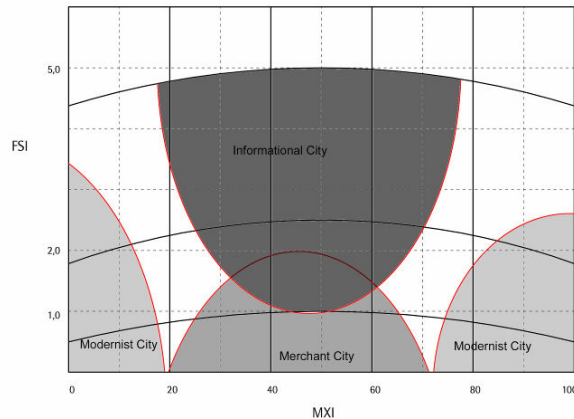


Figure 9. Typical projects of the merchant city, the modernist city and the informational city

7 Conclusions

In this paper urban development is analyzed from a mixed use perspective. Starting with a short historical overview and an actor-analysis, different meanings and implications of the concept of mixed-use are analyzed. This analysis results in reduction of the urban mix to the proportion of housing versus non-housing in terms of floor-space. This proportion is translated in an index called the MXI. Analyzing Amsterdam districts in east-west section with the MXI shows that there is a strong relation between the MXI and the centrality and character of the districts. The following conclusions can be put forward:

- 1 After the functional segregation of the city as a product of the industrial economy the theme of mixed-use in urban planning is becoming relevant again as the economy is becoming information and service based.
- 2 Emphasis on mixed-use at the beginning of 21st century has another meaning and implementation than emphasis on mixed-use in the 50's and the 80's of the 20th century.
- 3 Different actors in urban development use conflicting definitions of mixed-use, a neutral definition could start with the division of different uses within the build mass of urban districts.
- 4 The relevant scale of mixed-use is the walk-able scale of urban blocks within an urban district.
- 5 The mix of uses can ultimately be reduced to the proportion between housing and non-housing floor space within an urban district and result in the mixed-use index MXI.
- 6 The MXI of typical urban districts is related to the historic period of conception and the centrality of the district.
- 7 The combination of FSI and MXI potentially provide for a powerful determination of district characters.
- 8 Although further research is needed to provide an apt categorization of urban districts indexation by the MXI, one can predict a future instrumentality of this index in the fields of urban design, planning policy, urban analysis and real-estate development.

The goals to be achieved with the introduction of a mixed-use index MXI are fourfold:

- 1 On an *ideological* level the MXI combines different uses within one index so it becomes more natural to discuss and categorize mixed-use environments. This is a subtle but important step in terms of urban planning since mostly developments are described in terms of single uses instead of mix. Especially in Netherlands where the modernist legacy of monofunctionality is still dominant when thinking on urban planning.
- 2 On the level of *design* the MXI provides a new frame of reference in the conception of urban environments since different MXI's represent different types of urbanity
- 3 On a level of *policy* the MXI can become instrumental for the government in defining the conditions within which real-estate corporations can develop plots of land. For instance in Amsterdam projects like the IJoevers or the SouthAxis the MXI would provide clarity for all parties involved how to use the land and what is expected from a policy point of view.
- 4 On level of *urban analysis* the combination of MXI and FSI makes it possible to conceive numerous typologies of urban environments in just two single figures.

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Joost W. van den Hoek

Inbo, Advisers, Urban planners, Architects
Delft University of Technology, department of Urbanism
The Netherlands