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The Design of Metro Stations in the (east flank) metropolitan areas of Rotterdam

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Living Stations for Hybrid Urban Configurations

Olindo Caso

More than ever before, cities today are the frontrunners in social, economic, cultural innovations. They attract new inhabitants for they produce opportunities for many. Especially large cities are in the focus of complex migration fluxes from (peripheral) national and international regions, [1] fostering diversity and cultural multiplicity and raising relevant management issues: social cohesion, spatial and environmental qualities, variable time-space geographies, sustainable economies and ecologies. In the near future, these dynamics will increase the pressure on cities and territories. What new urban configurations emerge from these processes?

The larger cities in the Netherlands do not escape the urbanization trends. Amsterdam and Rotterdam are experiencing raising demands and are preparing plans to accommodate the expected population growth. [2] However, the specific territorial conditions of the Netherlands, and in particular of the Randstad Holland, makes it difficult to manage the growth by strategies of expansion. Large Dutch cities have reached their limits; space must now be found inside the existing boundaries. Strategies of densification and transformation are required, that are able to intensify the use of the existing urban ground by accommodating multiple programmatic dimensions. For doing this, new opportunities are to be found in underused / interstitial areas, in a smart re-use of the existing, or by expanding into the air and/or under the ground. Dutch cities are therefore exploring urban configurations that are dense and compact, where the scarce spatial resources are precious: a multiple use of ground in time and space, a more efficient exploitation of the urban area. This approach explicitly demands place-making operations that create local identities and that establish active urban roles in the different city parts. Space is transformed in place by equipping it with specific combinations of spatial and programmatic characters, in which architectural devices often operate as agents of identification. A dense patchwork of architectural signs, programmatic diversity and local identities describes well these *compact urban configurations* in the making. A crucial planning aspect for these configurations is to organize this plural patchwork into a cooperative urban system, interlinking city locations and opportunities to give form to an interconnected urban field. For doing this, efficient matches between local qualities and reachability are essential. Therefore, a high-value, integrated interurban[3] mobility network is a necessary condition to make the local qualities and opportunities thrive, and hold them accessible to a wider pool of people. A good-working mobility network minimizes the risks of fragmentation and segregation, and maximizes the advantages of time and space compression.[4] This is true for the (large) Dutch cities too, which keep investing in the modernization and expansion of their urban infrastructures, in this way improving interurban mobility also beyond *mainports* and central stations. [5] This approach is meaningful for the way people use and experience the living context. How does the integration of urban infrastructures in compact urban configurations influence collective life in cities, and thus their public places?

The hundreds of thousands movements flowing through the interconnected corridors and gates of the urban infrastructures, promote the interurban travels into central experiences in the daily behaviour of urban dwellers, therefore pushing the micro-hubs of mobility to the forefront of urban life. Due to their position in the local socio-spatial geographies, these *small* stations[7] in the urban networks have a central meaning for the collective behaviour, as obvious places of encounter, meeting, exchange, serendipity. For this, the design of these small interurban stations is a key assignment in compact configurations, especially when we recognize their value for the collective. Their role of public anchors in the daily action-spaces of people requires new narratives and designs that celebrate this *collectiveness in motion* as significant representation of the multiplicity

[1] Urbanization is a global phenomenon. According to UN data (2018), already today 55% of world population lives in cities; and the expectation is 68% by 2050 (https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html). Larger cities and cities in wealthier countries are the main attractors in the urbanisation trends. They are not only absorbing from rural areas, but also from smaller cities and peripheral areas.

[2] Over the past five years, Amsterdam population has grown by 11.000 per year (CBS: https://www.cbs.nl/en-gb/news/2017/45/amsterdam-is-expanding-mainly-due-to-immigration). In 2040, Amsterdam municipality expects to need 70.000 additional dwellings with all the related amenities and services (Structuur Visie Amsterdam 2040: https://131f4363709c46b89a6ba5bc764b38b9.objectstore.eu/hior/Documenten/Structuurvisie%20Amsterdam%202040%20(2011).pdf). In the same year 2040, Rotterdam expects to need 50.000 new dwellings for accommodating the rising population (Strategische Verkenning Verstedelijking, Rotterdam 2019: https://rotterdam.raadsinformatie.nl/document/7827160/1/s19bb017999_3_50801_tds). The increasing demand for dwellings goes hand in hand with a corresponding demand for services, amenities, work.

[3] In this article, *interurban* refers to the connections among urban places within the city. In the same way, with *interurban stations* we intend the local mobility centres (or hubs) inside the city.

[4] The growing population in the larger Dutch cities is essentially due to immigration (PBL 2019: https://www.pbl.nl/publicaties/trek-van-en-naar-de-

of urban life. These stations should reflect vibrancy, efficiency, and the public ambitions of the city. The intersections between local infrastructure and urban activities, being them bus hubs, metro halls or other nodes of interchange, cannot be conceived any longer as simple services only defined by the complexity of their logistics, but as public living places - moving away from their univocal understanding of step-in / step-out engines. In this sense, it is appropriate to define them as *living stations*. The underground stations of metro urban lines are probably more familiar to the inhabitants of the contemporary urban densities than many well-established public typologies. What different declinations can assume the assignment of the design of living stations as public places in compact configurations?

Of course, the core-business of interurban stations still lays in providing access to an efficient mobility system, in this way facilitating exchanges among the qualities and the opportunities urban areas offer. However, besides the efficiency, the design of interurban stations is in need of stronger elaborations around the key aspects of collectiveness and publicness, in relation to their spatial implications. This is particularly important for dense urban configurations, where the assignment of the urbanization of city infrastructures meets compact spatial solutions to maximize ground exploitation. In this framework, the construction of public identity by place-making approaches expects more from the urban station as a public agent, often asking far-reaching syntheses across artefacts bearing private as well as public relevance. These are *complex projects*, [8] whose ultimate goals are the co-creation of added urban value in the public ground through creating the conditions for people, places, programs to interact, and identities to develop. Following on Research-through-Design (RTD) experiences [9] about the convergence between spaces of interurban mobility and public places, the main challenge for the design of living urban stations is to configure them as integral, active part of the public field of the city, being them (a) hybrid centres of multicultural public life, (b) efficient nodes in the local geographies of qualities and opportunities, or (c) inspiring city-embedded public realms of mass agency.

(a) The synthesis of public gates (interurban stations) and public (cultural) typologies represents a most interesting opportunity for creating vibrant public centres in compact urban configurations, and potentially a successful one. Combining and integrating these different types of public attractors in a hybrid setting can offer advantages for the urbanism of place-making, providing spaces for the convergence of public programs that are relevant to the urban community and that can functions 24/7. Cross-overs between the *moving* users of the mobility infrastructures (the public field as transition) and the *staying* visitors of the cultural infrastructures (the public field as permanence) can increase the reciprocal interactions, requiring design solutions that are able to add urban quality to a shared space of mediation among city areas, people, (micro) cultures. Stations on the metro lines and the related mobility programs can merge by design with local cultural institutions like the (branch) library, a small museum, an exhibition hall, workshops and a social centre. By combining these small scale public activators at neighbourhood level, larger public assignments can be developed that hold a higher public significance than the sum of the parts, making possible to mobilize more resources for ambitious architectural projects and for creating identity. (Key aspects: public place; programmatic diversity; creator of urban values; use and re-use of infrastructures; users profiles).

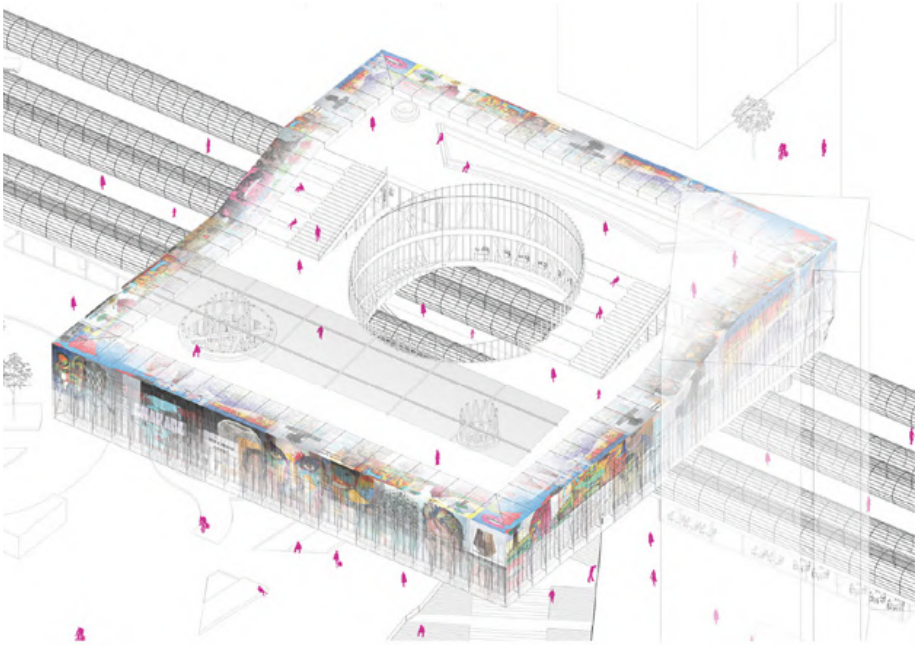
(b) The hybridization of public urban conditions at station locations acquires more complexity in the case of the urban node, when the station is the connector among many different mobility networks and logistic systems in the city. Indeed, taking into considerations new transportation technologies (e.g. smart, flying, self-driving, flexible), raising sustainability

stad). Many new inhabitants are expats, knowledge workers, millennials, urban nomads, attracted by the opportunities offered by the active socio-economic climate of Dutch cities. They are characterized by (inter-) urban mobility and flexibility, their 24/7 life-styles often supported by ICT applications.

[5] Since its opening in 1968, the metro network of Rotterdam (first in the country) has developed constantly supporting the different phases of city urbanization, and is appreciated for its efficiency (also economical). Rotterdam metro line is still keeping at pace with the city development Rotterdam. New lines are planned for the development to 2040. In Amsterdam, recent developments have seen the realization of the Amsterdam North-South line which is expected to be developed further.

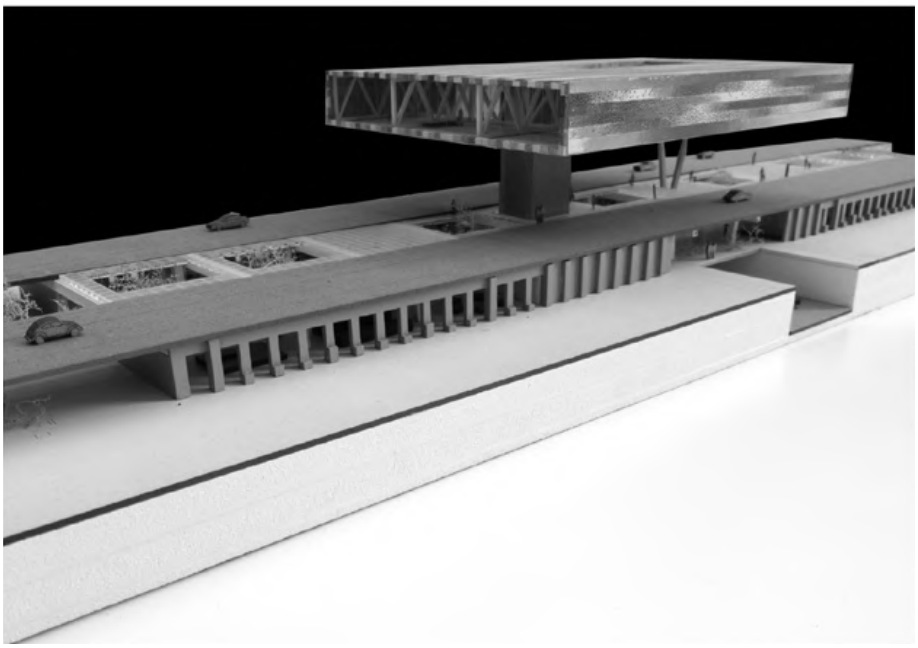
[6] For a successful compact configuration, efficient connections to other larger urban areas and to nearby smaller cities and towns are fundamental, to relieve the pressure by managing space with time. However, in the national agenda the issue of the quality of these main city gates already resulted in the renewal of many among the major mobility stations in the Netherlands, like in Rotterdam, Breda, Tilburg, The Hague, Delft.

[7] Here we use the term *station* as a gathering concept for all those places where people can access mobility, from the simple bus-stop to the complex transportation hub. With *small* stations we refer to the *interurban* scale earlier mentioned, targeted on the needs of the specific local area and inhabitants.



Hybrid centres of multicultural public life. This design combines a Public Library and a Metro Station into one public building at the centre of the neighbourhood.

Sjoerd Boomars, Complex Projects graduation project, 2017, TU Delft



Hybrid centres of multicultural public life. This combination of a Community (Art) Centre, a Museum, and a Metro Station soften the spatial barrier produced by the highway.

Magdalena Nalepa, Explore Lab graduation project, 2017, TU Delft

concerns (e.g. electric, not-polluting, responsible), a changing approach to mobility (e.g. management, information, human centrality), and a new zeitgeist of sharing, customizing, delivering (e.g. multiplicity, hiring, servicing), a large number of combinations exists from which travellers and goods deliverers can possibly choose, and that are better targeted on the particular needs. People can organize their trips *a la carte*, seamlessly combining and managing options and alternatives through dedicated mobility apps[10]. The reliability of the travel-time is mostly the leading criteria, but other options can be as well explored. In this changing context, it is useful to exploit as much transportation dimensions as possible, besides the usual ones: air (drones), underground, water; collective and individual; slow and fast; fixed and flexible. On the one hand, these developments multiply the spatial requirements for mobility; on the other hand they enlarge the pool of potential users, consequently increasing the attractiveness of these nodes as locations for work, retail, leisure, culture. This complexity is a design challenge per se, in which the public value of the node acquires a significance at a larger urban scale. (Key aspects: station as node; movement and wayfinding; vertical organization; virtual stations; logistics and people).

(c) The fluxes of masses of travellers and the users of hybrid urban nodes are also significant for conditioning the public realm, simply due to their size. The larger the station / hybrid combination, the more it has a public valence in socio-economic and political sense. However, also smaller stations can be significant for harvesting *big data* or as potential vehicles of political and social communication. The stations, even more when embedded in hybrid syntheses of public and private programs, are the places where large concentrations of people can be physically addressed almost at any time,[11] therefore being crucial locations where to compete for consensus or to influence the urban commons. This 'piggy-back' value not only attracts investments and *regular* urban activities, but also pop-up events, parasite programs, advertising, campaigners, in this way contributing to a vibrant environment and to a more lively public realm, feeding in turn a richer (and hopefully healthier) climate for civic debating. The design assignments of interurban stations should take this aspect in due consideration, recognizing its value and accommodating the field of socio-political and economic communication in the station's spaces, balancing between interior and exterior public spaces and between the digital and the physical. (Key aspects: public place; creator of urban values; movement and wayfinding; virtual stations; users profiles).

What aspects deserve careful consideration when conceiving living stations? The three design assignments and RTD experiences described above illustrate the plurality of variables that plays a role in designing urban stations in contemporary dense cities, and share an understanding of the station as a hybrid artefact. By reflecting on the theme of mobility as significant public realm, place of interaction and (individual, collective) agency, and on its hybridization in collective places by syntheses of public and private programs, a number of aspects comes to the foreground that possibly hold a key meaning for the design of living stations. [12]

1. The interurban station as public place, integral component of the public space

This is the basic motif in this article. Stations are familiar places to masses of people, for travelling but also for meeting, acting and for serendipity. They provide hierarchy and orientation. Their experience makes part of the public space of the city, both in its interiors and its exteriors; and both in its formal and informal meaning.

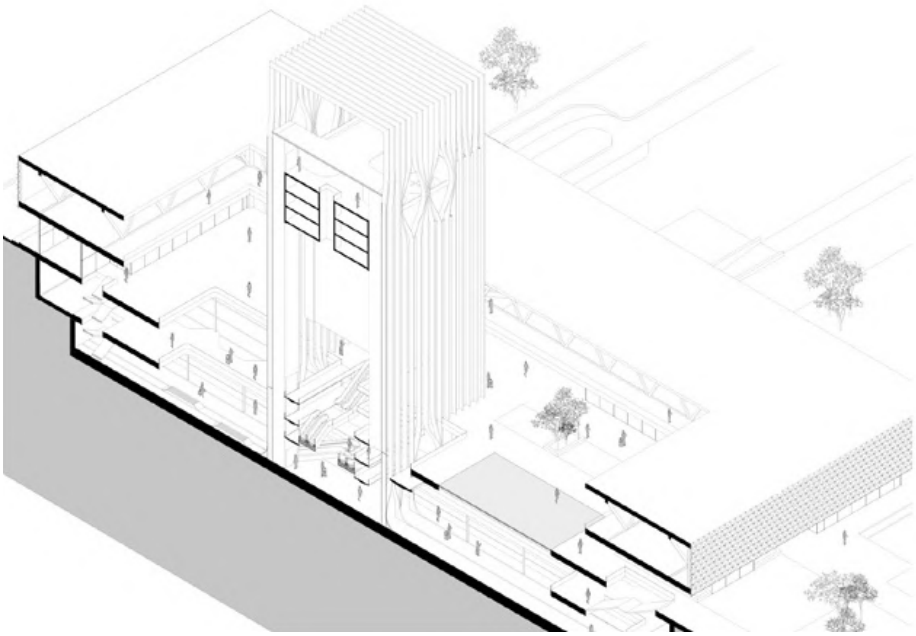
[8] See Kaan, K. "Complex Projects". In: *Domus*, 992, 2015 (pp. 6-9).

[9] These RTD experiences are part of educational activities conducted at the Faculty of Architecture and the Built Environment, Department of Architecture. In particular, they have been carried out in the Complex Projects graduation studios Amsterdam 2050 and ExploreLab. In these experiences, a sequence of interconnected steps have been followed and made explicit to inform the design. Also see: Caso, O. & W. Verhoeven. "A strategy for resilience. Alamar, Havana". In: I. Cabrera i Fausto (et al. eds.), *Reactive Proactive Architecture*. Valencia: Editorial Universitat Politècnica de València, 2018 (pp. 182-189).

[10] Like in the MaaS (Mobility as a Service) project, that is developing the integration of various forms of transport services into a single mobility service accessible on demand. These types of services will probably be part of the common mobility behaviour for inhabitants of future urban areas, maybe after a subscription (https://maas-alliance.eu/).

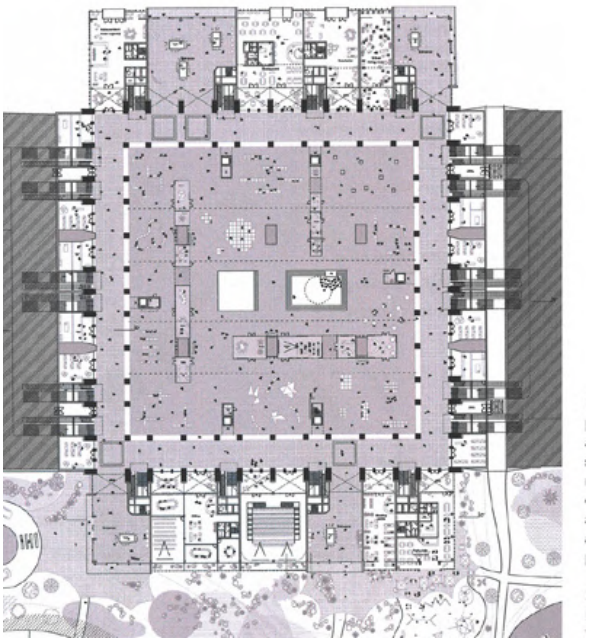
[11] Also stadia and event locations show similar physical characters of critical mass presence, but hardly 24/7 as in the case by urban stations.

[12] The following ten points have been integrated in a brainstorm with prof. Nacima Baron in preparation of a Dutch-French students' workshop on the design of 'small' stations. See page XY in this book.



Efficient nodes in the local geographies of qualities and opportunities. This hub connects different public transportation networks (also including water and air) creating an anchor for urban program (public space, retail, office, event spaces).

Cas de Heij, Complex Projects graduation project, 2018, TU Delft



Inspiring city-embedded public realms of mass agency. This intercity station includes trains, metro and busses. It is designed as a public plaza, an environment for civic actions and 'piggy-back' politics.

Roel Schiffer, Complex Projects graduation project, 2018, TU Delft.

2. Station as node in a network
Being part of a networked system, stations cannot be detached from the lines they connect: they bear the expectations of a before and an after, of what precedes and what follows. The relationships between the node and the network are both of logistics and of identity. The convergence of program opportunities and different mobility options informs the node.

3. Station as a creator of urban values
As a public agent, the station contributes to the creation / redefinition of urban values in cities. It creates spatial polarities and sometimes social polarities. Stations are public buildings embedded with public ambitions, places potentially contributing to the shaping of urban commons. For this, their design often deal with cogent socio-spatial issues of common interest, like items related to climate, ecology, sustainability, accessibility, equity, social representation.

4. Use & re-use of infrastructure and stations
Most infrastructural corridors have a history with manifold links to the phases of the urban development. Some old infrastructures turn into new (public) urban artefacts, while others are rediscovered, updated and fertilized with new lines or new types of mobility. Infrastructural heritage offers continuity in time by connecting old and new.

5. Program diversity in stations
A diffused hybridity in programs characterizes many contemporary stations. This includes living, working, recreating, and amenities. This hybridity is connected to the changing modalities of acting in time and space, to emerging life-styles, and to the concentration of travelling masses that make station locations attractive for many users and for investors.

6. Virtual stations
Mobility today knows a strong digital component enabled by ICT applications, both for managing / planning and for gathering big data's. At the same moment, stations are also key places in the daily behaviour of thousands of travellers. Here a mass of people can be reached by information, announcements, campaigns, influencers, pop-ups. The station is thus a potential interface for bearing messages impacting on society, economy, politics. This knows both a physical and virtual side (from graffiti to interactive screens), and reaches outside the walls of the station.

7. Movement and wayfinding in stations
In complex infrastructural hubs, and in particular those with relevant invisible extensions (e.g. underground) it might be difficult for many to orient themselves, eventually affecting station efficiency and the perception of safety and liveability. Therefore, a good understanding of the factors / devices that positively help orientation and movement is essential. Wayfinding strategies can greatly contribute to liveable designs.

8. Station's users profiles
The traveller / station user is by definition heterogeneous. But in some cases we can observe a predominance of specific typologies of users, maybe because of the social characters of the location or the selective agency of some types of programs. A good understanding of users profiling is essential for conceiving and designing inclusive stations. This also apply to the mobility of goods, as delivery accounts a great deal for travels in urban settings.

9. Vertical organization
Although stations are more and more becoming urban hybrid places, their core-business remains to ensure efficient, safe and reliable access to the mobility networks. For the increasing complexity of growing transportation typologies, an efficient organization of intermodal connections is a crucial factor. In particular, multi-storey stations and stations with a high height difference between city floor and platforms (like underground stations) essentially are vertical organization confronted with issues of vertical connections.

10. The hidden side of stations – people & logistics
Neither all the parts of stations are visible, nor all its users are. Think for instance to the logistics supporting the basic program, the staff, the machinery; or to the use of the station by emarginated people (homeless, junkies), micro-cultures, street artists, or as an event location. Some requirements are invisible and necessary; other uses imply a parasitic relation to the station and its social meaning.

These ten points obviously form a non-exhaustive list of key aspects for conceiving living stations in compact urban configurations. They are deduced from previous RTD experiences pointing out different interpretations of their public relevance, and therefore assignments. This list can help to take into consideration many of the layers that constitute the public fields of action in cities, when mobility is a socio-spatial player. More RTD is needed to enrich the casuistry of city-mobility relationships, for testing the design possibilities of these ten aspects, to gather precedents about their application, and add new items to the list.