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Transit Oriented Development as a smart city's interface, a GCC perspective

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Is there in our cities anything smarter than trains and train stations? Already driverless since 1967, the first fully ATO system was just unveiled last month in Hamburg. Train stations are based on a computerized synchro of travel schedules and a well-experienced system of fluxes management through digital screens, tickets, recorded messages, and flashy advertisements. Train Stations are nodes of exchange, a manifestation of technology integration and social needs, designed and built on fluxes of trains, goods, and people. Less traceable are the flows, when those spread in the city, commuting in different ways, by bus or bikes, cabs, or just by walking.

Mobility, as public, smart, hybrid, and micro, is a big component of smart cities, with metro stations as the district's core: hyper connectors among multiverses. But, how different cities or districts (the multiverses) do exist around stations? That is where the smart city meets TOD.

GCC cities still need a robust increase of public transport, only available in the major cities. Here the wide availability of land, and the urge to grow, brought naturally to the urban sprawl of monofunctional and social neighborhoods instead of mixing and densifying. That exasperated the reliance on private vehicles and the possibility to relinquish to a well-established public transportation system. We can add how the extreme climate is making the promotion of cycling and walking around almost utopic, and the chance of a late shift from private to public transportation and extremely difficult integration of last-mile connectivity.

The GCC's social and physical constructs require an approach to TOD, which is more complex than usual, and a significant need to adjust to the local conditions. It involves providing stakeholders with a robust, cyclic process for decision-making on multiple scales of intervention. The principles, remanding to an inclusive and resilient TOD, require the alignment of human/economic densities, mass transit capacity, and network characteristics for greater accessibility; the creation of compact regions with short commutes, connected resilience by mass transit, planning, and zoning for mixed-income neighborhoods allowing the creation of vibrant, people-centric public spaces around stations; the development of communities that foster walking and biking, a good quality, accessible, and integrated public transit, and management of private vehicle demand..[1] Decision-making and implementation, however, span into a much wider multi-criteria evaluation. A pre-implementation plan considers economic baseline, real estate assessment, and revitalization; travel demand projections, road safety assessment, and alternative analysis & infrastructure design. However, in a context not offering any precedent in terms of mobility and mixed-use. An active and multi-stakeholder engagement is essential in this context, and both ways: top-down and bottom-up.

TOD's benefits are multiple and only need the right way to be addressed. Besides the obvious environmental and benefits, it enables lower-stress living and dependence on a car for mobility, it is environment-friendly and inclusive, especially for the poor. TOD can augment agglomeration economies by enhancing access to the economical mass and collocation of productive economic activities in nodes with the potential to engineer growth. That leads to benefits of backward and forward linkages, market access, sharing of common infrastructure facilities and resources, specialized labor pooling, human capital accumulation, knowledge spillovers, and networking. It can lead to economies of sharing, matching, and learning; they promote specialization, diversity, and competition. Increased revenue yields, the efficiency of investment. At the same time, TOD can enhance affordable housing and social

[1] www.openknowledge.worldbank.org/handle/10986/34870

inclusion while increasing the accessibility to jobs, health care, education, recreation, and socio-cultural interactions. TOD enables Smart Growth in the exchange of urban design with strategic growth promotion. It elevates the discourse on urban planning from growth control to how and where growth should be accommodated to shift the traditional public vs. private dichotomy into a PPPP management. TOD could be a befitting reply to sprawl, congestion, pollution and provide an effective way to restructure existing cities. By integrating public transport and land use planning, TOD provides ways to intensify agglomeration economies and weaken congestion diseconomies.

Years ago, UAE, Saudi Arabia, and Qatar launched national TOD programs under implementation in Dubai, Riyadh, and Doha, under dedicated National Framework Programs. Qatar's NDF targets 2032 through Municipality Spatial Development Plans and the concept of Urban Centers Plan. The new transportation system is the Qatar Rail Metro and moving now into TOD as phase one. Pilot districts focused on sustainability, smart growth, and transit-oriented development after data collection and approached through combined analysis on qualitative and quantitative methodologies. The case study of Al Sadd, a mixed-use neighborhood in Doha, investigates key factors to be addressed for enhancing urban livability within this neighborhood. Geographical information system (GIS) software—a framework for analyzing, gathering, and managing data to collect information on land use and the site's current state other geographic data, visualized using 3D maps and images. It proposes a large use of inter-mobility and transportation hubs..[2]

Riyadh's Metro and BRT system is expected to be operative in the coming year. The public space around its main stations is already getting re-shaped with great attention to inclusive streetscape design. A dedicated department manages Riyadh's TOD within the Royal Commission for Riyadh City. Its project covers six phases: International TOD experiences & strategic principles, the Review of Existing Studies and Findings in Riyadh – Real Estate Investment Analysis, a High-level functional classification of TOD opportunities, suitable TOD Strategy Options and a Preferred Strategy, Urban Planning and Design Guidelines– Overall Implementation Strategy, selection of Priority TOD Case Studies for Design and Implementation, Final TOD Strategy which is now getting implemented. Moreover, walkability and streetscape re-design is being implemented in selected districts, opening the debate on real estate management and the involvement of private investors in the densification process.

Real estate concepts have been already implemented in Dubai, which has denser tertiary and mixed-use districts, and a functioning public transport system, including the metro with its background of already 204 million served passengers. On the occasion of the World Expo the system has been further implemented by Route 2020 and other mixed commutes. In Dubai, the Roads & Transport Authority (RTA) has identified at least three potential locations for a transit-oriented development TOD: Al-Nahda, Salah el-Din, and the ADCB station, invested by a large segment of passengers commuting to residential communities..[3] The goal is to re-zoning the plots within 800meters from metro stations, double the number of residents, and implement the mobility system by a total length of cycling lanes to 668km by 2025. TOD strategy will also be further implemented in the southern stations to be..[4]

All the ingredients are in place for the future smart shape of GCC metropolis; however, still, the need for dedicated TOD principles is there, including passive design strategies to reduce buildings' energy demands and to maintain streets and open spaces active in all seasons, targeting what is called as "passive urbanism". The issue was highlighted by interesting research work in the UAE while proposing adaptive recommended solutions. They are applying form-based architectural and urban strategies and a mix of natural and artificial shading systems. The breakdown of the classic 200m walking distance into 70-100m is integrated by an extended function of segments' ends as semi-public spaces providing thermal comfort and rest within the pedestrian trips..[5] Transit becomes attractive by giving dependable service, user-friendly multi-modal integration, easy accessible dense and diverse land use such as shopping, work, recreation, etc. around the transit nodes. That's why TOD planning can bring more people to transit. A further step in making the system smarter would be the application of measurable indicators for each nodal area and its actual TOD qualities and further comprehensively put them together into a TOD Index by using ArcGIS software. All indicators have different units of measurement. Some are spatial, some non-spatial, so their aggregation needs a Spatial Multi-Criteria Assessment (SMCA) by an ILWIS software..[6]

[2] www.dryfta-assets.s3.eu-central-1.amazonaws.com/assets/isocarp2019/pdf/2021-11-20-1637410314dryfta.pdf
[3] https://www.cbre.ae/en/research-and-reports/UAE-Transit-Oriented-Development-Report-2020
[4] https://www.emerald.com/insight/content/doi/10.1108/JCHMSD-09-2018-0062/full/html
[5] https://scholarworks.aub.edu.lb/handle/10938/10618
[6] www.webapps.itc.utwente.nl/librarywww/papers_2016/pres/singh_pla_ppt.pdf

At the end, TOD is a situational mise en place that enables hardware and software infrastructure to make people enjoy and choose the experience of commuting. Cities are global collectors and catalysts of shared experiences. Using the common metaphor of the city as a computer and the streetscape as its interface and shifting from the hyper-connected stations into the multiverses of the urban districts, specific place-based pieces of information are needed because a purely technology-based approach could get lost in translation. “Instead of more gratuitous parametric modeling, we need to think about urban epistemologies that embrace memory and history; that recognize spatial intelligence as sensory and experiential; that consider other species' ways of knowing; that appreciate the wisdom of local crowds and communities; that acknowledges the information embedded in the city's facades, flora, statuary, and stairways; that aim to integrate forms of distributed cognition paralleling our brains' own distributed cognitive processes.”[7]

Dr. Anna Laura Petrucci is an accomplished academic and architect active between Europe and GCC, pioneer in community service through applied research and exceptional scouter of local identities.

[7] https://placesjournal.org/article/a-city-is-not-a-computer/?gclid=Cj0KCQiAys2MBhDOARIsAFf1D1e48F0v7IJWfPnzUI-ZkSEsC2m-5Hj1NEK6YPzGVpEHxRkQ2s0hoawaAtuPEALw_wcB&cn-reloaded=1

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