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Designing the metropolitan future of Shanghai: A local interaction platform looking to incorporate urban access design considerations in planning for a fairer, denser and greener mega-city

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Abstract

Urban design, that will formulate resourceful ways to promote more sustainable and socially inclusive mobility patterns, is the key to reversing the alarming energy over-consumption, the environmental degradation, and the negative distributional impacts associated with today's cities that tend to relegate anthropocentric design considerations to the status of a non-issue. Urban access is an innovative and truly trans-disciplinary design axiom that aims to incorporate these considerations to mainstream future urban planning. It does this by ensuring that every member of the society has access to those locations and resources one needs to achieve a sustainable standard of living and productivity without limiting other people's rights of access. Designing built environments for achieving optimum urban access levels for everyone, regardless of possible age or mobility limitations, serves as the thematic framework for the research studies of the Local Interaction Platform (LIP) Shanghai discussed in this paper. This is a Sino-Swedish research scheme goaled towards increasing capacities, in order to transform current, unsustainable urban development pathways to more sustainable urban futures for the metropolitan environment of Shanghai. This paper presents a research synopsis of the various

and diverse urban access driven studies that are on the focus of LIP Shanghai regarding the city's: existent road network infrastructure limitations, bus systems accessibility design, potential to have a public bicycle programme in place and existing car travel demand management mechanism and its possible alternative.

KEYWORDS: urban access, social inclusion, sustainability, livability, anthropocentric design

Introduction: The urban access research initiative for designing

Research in today's society, regarding the sustainable design needs of a truly socially inclusive metropolis, needs to gradually shift its focus from urban mobility to urban access. Simply studying urban environments within old-fashioned and uninspiring conceptual frameworks, and then providing society with design solutions that will enable its members (and especially those with adequate physical or monetary resources) to move at will, is not enough from a livability[*] point of view. What this *MISTRA Urban Futures* centre research programme is committed to do is to influence and encourage the design sector to increasingly integrate social justice considerations into the city planning of tomorrow, concentrating on people and their quality of life instead of simply upgrading mainstream urban infrastructure and services in place today, that could be lacking a scientifically informed humanistic approach. The urban access research initiative is about putting the urban system user in the centre of design attention by revisiting some of the conventional urban design norms regarding future mobilities.

The core idea behind the "urban access" design criterion that this paper is introducing, is to look into ways that will allow all the members of an urban society to be able to engage in all the activities that are required for them if a sustainable standard of living and productivity, that serves the needs of their human nature, is to be achieved. The concept of access means, therefore, more than just gaining entry into somewhere; it also means having access to societal resources and immaterial goods, and being able to participate actively to what happens in the community (Andersson & Thynell, 2011).

Consequently, the "urban access" initiative, which is the building rock of the research work presented herein, is a term that incorporates not only the straightforward dimension of the transport-oriented city accessibility, but also a more generic, multidimensional and anthropocentric perspective looking at people's potential to be socially included in the built environment in which they function. For example health, education, access to natural environment and also less quantifiable things like affection, participation, leisure time, creativity, identity, safety and freedom, which are necessary if human beings are to achieve acceptable

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[*]With the term livability the authors define a city's potential to provide acceptable levels of human living for all the people functioning within its premises.

standards of living, are included in the urban access approach. This means, that there is a strong correlation between a city's potential to offer good means of urban access and the city's overall livability.

The research work that is being discussed in the paper, represents parts of the miscellaneous scientific activities of the interactive Sino-Swedish programme named LIP Shanghai. This is a programme initiated by MISTRA, the Swedish Foundation for Strategic Environmental Research, supporting research of strategic importance for securing good living environments and sustainable development in cities around the world. The initials LIP stand for the words Local Interaction Platform and refer to a diverse research-industry-governance-society co-production programme with five different case study platforms around the globe (i.e. Gothenburg, Greater Manchester, Kisumu, Cape Town and Shanghai). LIP Shanghai in particular, is looking to update the current understanding of how three balances (all of vital importance for planning sustainable urban futures for vivid metropolitan environments) could be achieved from a designer's point of view. These three important balances are namely the ones between human and environment, between human and society and between past and future. These balances essentially refer to the focus areas of research as allocated by *MISTRA Urban Futures* referring to *GREEN, DENSE*, and *FAIR Cities* respectively. More specifically, the *DENSE Cities* theme is about identifying and thoroughly examining ways of promoting access to urban qualities and services. *FAIR Cities'* importance lies upon securing urban equity, social inclusion and urban common assets, while the *GREEN Cities* initiative means to inform designers about managing resource constrains and climate change.

More specifically, the design approach that the LIP Shanghai research package is embracing refers to a rational, logical and systematic process involving interdisciplinary consilience that will integrate applied social research, engineering and planning problem-solving strategies together, trying to address the needs for human-centred urban transportation innovation. The research-driven design process that will be employed begins with the identification and analysis of an urban access problem. It then proceeds through a structured sequence in which the societal needs referring to the problem are thoroughly examined and ideas are explored and evaluated until the best possible solution is devised. Utterly the paper refers to design as a trans-disciplinary innovation tool that in this particular case means to craft (in some respect) Shanghai's next urban development footsteps by making planning, introduction and eventually the very use of truly needed metropolitan infrastructure and service improvements a shared activity between designers, industries, local politicians and people functioning within the city.

The research is still in its initial stages and thus there is not an actual results section communicated through this paper; only expected outcomes. Nonetheless, the paper has in its own right a sufficient scientific merit since it describes in a detailed way the foundations of an interactive collaboration bringing together academics from across the world that will be examining in depth: a) urban infrastructure and service realities that constitute barriers to the transition to more sustainable development pathways and b) design applications in terms of engineering or policy-making that will overcome these city-imposed barriers.

More explicitly, the projects presented herein, guided both conceptually and contextually by the urban access oriented research principles that have been described so far, aim to provide satisfactory answers about Shanghai's:

1) existent road transport network infrastructure limitations,

2) possible bus system accessibility design improvements in terms of infrastructure and potentially provision of services for both the vehicle and the environment in place to accommodate the bus fleet (e.g. bus stops, bus stations, bus lanes etc.),

3) potential to have an eventually city-wide public bicycle scheme of innovative character well adapted to the city's identity,

4) car plate auctioning system that is designed to restrain car ownership in comparison with road pricing, which is a more mainstream travel demand management tool aiming to keep car usage in sustainable measures.

There are two specific case study settings, both of them providing a very interesting (although quite different) context for the research conducted. Yangpu District is a very urbanised area; and provides the researchers with the context of an ever-transforming part of the city. Yangpu District is ideal as it represents a highly congested metropolitan environment. The other case study area is Chongming District, which is equally intriguing, from a sustainability point of view. It has the potential, if designed properly, to be a unique equivalent of a fully functional eco-island, which takes the concept of urban access a step further by bridging what is now considered as rural, with its soon to be more, urban future.

Inclusive road transport infrastructure

Despite the importance of the rapidly increasing numbers of older populations, the current reality is that there is a lack of scientific studies meant to consult them (Kovalchick et al., 2004) and subsequently focus on the technical measures, and the necessary alterations in existing transport infrastructure that could make sure that there are no age-related accessibility issues in modern cities today (Nikitas et al., 2011). Identifying the special requirements of older people in regards to road transport provision is an important issue, in societal terms, for the urban futures science due to a number of reasons. The first one is that the population of this age group is escalating tremendously. Secondly, they are facing, to a higher degree, the danger of transport related social exclusion (Gaffron et al., 2001). Thirdly, they are more likely to influence political decisions because of the significant share of wealth that may lie in their hands (Fennel et al., 1993). Lastly, they are more likely to vote than younger adults (Goerres, 2007) and have a more specific interest for local democracy (Jordan & Avineri, 2008). Moreover, there is a universal appreciation of the significance of urban design issues, regarding the right of access for people with disabilities (Burton & Mitchell, 2006). Older and disabled people belong to a group of road users that could

be characterized, in terms of their potential inability to embrace the full spectrum of a city's transport choices, as "mobility challenged".

As in most urban environments today, the provided road transport infrastructure in Shanghai is primarily designed to cater for the needs of the average road user, who in today's automotive-dictated metropolitan standards, is bound to be a younger, physically and cognitively competent car user. Thus, the transport system itself, due to its design characteristics, can be a source of inefficiency providing hurdles for the older and less mobile members of an urban society in gaining access to those locations and resources they need to achieve a sustainable standard of living and productivity. This study aims to build a sound theoretical and empirical understanding of the mobility challenged people's needs that have the potential, if fulfilled, to significantly improve their urban access but also urban access as whole for society in general. Some of the specific urban transportation applications that this work means to examine refer to dysfunctional (or not particularly functional for mobility challenged people at least) design such as road pavement design, traffic signals and signage design, bus stops and train station facility design and road lighting provision design.

By exploring the attitudes that people hold about some parts of the road transport network of Shanghai that need to be improved, this study will promote a "more accessible city to all" design philosophy, that makes transparent age and health barriers that system users might have. There are several research methods that fit the requirements of this particular initiative. The actual involvement of some members of the group in focus (i.e. mobility challenged road users) as true participants in the study by the means of experiments, surveys, focus groups or individual interviews has been universally regarded as one of the most effective approaches in any scientific work that has an evident applied social research perspective (Musselwhite, 2006). Ethnography will also be employed as an important apparatus in identifying road transport infrastructure and service limitations for this work, since some of them could have a strictly technical character and thus could only be identified by experienced transport experts.

More specifically this work will:

1) Test whether the attitudes of mobility challenged people associated with their problems, needs, and general views on road transport provision limitations, in the districts of Shanghai chosen, are significantly different than those of other adults.

2) Assess the current mobility behaviour and the ease with which mobility challenged people meet their urban access needs; and how some age-specific and disability-oriented improvements referring to road transport provision could possibly help them. This would be achieved through travel behaviour diaries that the participants of the study would be keeping during the duration of the project.

3) Identify and evaluate relevant answers for existing accessibility problems; and provide directions for developing and implementing policy measures or technical solutions that could be

adopted from the authorities of Shanghai, in order to keep people regardless of age and health issues, mobile.

The impact of this research could be very important for eventually upgrading parts of the metropolitan environment of Shanghai in regards to sustainable and socially inclusive transport. The research could underline the need to put an end to the conflict over road space between non-motorised and motorised transport, providing more accessible and inclusive facilities for walking and cycling even for people with special needs, while also improving the provision of road infrastructure that could promote drastically public transport over private means of transportation. Identifying, assessing and subsequently satisfying the special needs of these people could improve the transport related urban access that a society as a whole profits from. The findings of this work could work as an example or as a lesson to be learnt for similar metropolitan environments across the globe.

Age-free design for Shanghai buses

In the next five years, for the first time in human history, the number of adults in the world aged 65 and over will outnumber the children under the age of five. While the global population is rapidly ageing, developing countries will experience the most rapid and dramatic demographic change with China leading the way. China already has the largest elderly population in the world. According to the 2010 national census, there are 119 million people aged 65 and over, which accounts to about 8.87% of China's overall population (World Health Organization, 2012). Thus, older people in general, especially in one of China's most populated cities, constitute a group of people that need to be taken under serious consideration when designing for a more socially inclusive urban future.

This study will be examining the accessibility issues, or more precisely the inaccessibility issues, that older populations may face while trying to access Shanghai's bus system. This is of particular importance since older people in a worldwide scale: are less likely to drive (Banister & Bowling, 2004), are more likely to use buses as their prime means of transportation (Alsnih & Hensher, 2003) and are more likely to be disappointed, afraid or even self-excluded than other age groups, due to their very particular age-specific mobility requirements (Musselwhite & Haddad, 2010) caused by a challenging or relatively inaccessible bus system. All in all, this scientific effort has as its key aim to study the system's potential inefficiencies and consequently assist in making Shanghai's buses a more adaptive transport mode to ageing needs, by informing the State's policy-makers of the current situation and proposing explicit bus related policy measures and technical upgrades.

More specifically the strategic research objectives of this study are:

1) To test whether the attitudes of older people, regarding their problems, needs and general views on Shanghai's bus system provision, are significantly different than those of younger age

groups. This research objective reflects the principally quantitative part of the study and is set to examine the very hypothesis suggesting that older bus users (actual or potential) have age-induced differences, when compared with younger age groups, in their attitudes towards the current bus service provision in Shanghai.

2) To assess the older generations current bus mobility behaviour both by actively engaging them in participatory research and by doing an ethnographic in-vehicle and bus-stop allocated study. This would be achieved mainly through travel behaviour diaries that the participants of the study would be keeping during the duration of the study commenting on their bus experiences.

3) To identify and evaluate relevant answers for existing accessibility problems and to provide directions for developing and implementing in-vehicle and bus-related environment improvements (in the form of technical solutions and policy measures) needed to protect seniors' rights for easy urban access by bus.

The study's needs dictate the actual participation of the group in focus (i.e. older people) by the means of experiments, surveys, focus groups or individual interviews since this is the most effective approach, in any scientific work, which has an evidential applied social research perspective. Ethnography and observational studies will also be employed as an important apparatus in identifying thematic areas where Shanghai's bus system could be upgraded.

This research scheme could well result in enriching the learning and sharing of knowledge processes that LIP Shanghai aims to build in regards to social policy and public transport. It also has the potential to motivate people-oriented future actions by the responsible authorities and stakeholders, by making inconsistencies in bus accessibility, for the older generation, transparent. Policy-makers could be also informed through the means of this study about the obstacles that they may face in introducing some of the technical design improvements that could promote Shanghai's urban access, accessibility, equity and livability, as a whole.

A public bicycle scheme for Shanghai

Urban and transportation design should focus on inventive and practical methods to encourage more sustainable mobility patterns in metropolitan environments. Sustainability is one of the keys for designing ways to improve societal well-being as a whole; it is a prime design axiom in enhancing the merits of urban access. Therefore, a shift of focus from planning cities prioritizing car use to actually introducing or improving more sustainable urban systems of alternative transportation and raising consciousness about the social benefits of their use, is the right way forward for a voluntarily rather than regulatory modal share change (Bonsall, 2000). A city-wide public bicycle scheme could be the very definition of such an alternative transportation system that could secure the transition to more sustainable urban futures from a designer's perspective.

Recent experiences suggest that public bicycle systems can indeed act as a door opener for increased bicycle use (NICHES, 2007). A public bicycle system (which is synonymous to a bike-

sharing system) is a combination of bicycles that can be picked up and dropped off at numerous points across an urban area with an appropriate transport infrastructure built to accommodate their use. The bicycles are available to the general public for short-term use for free or for a small fee and provide a fast, convenient and flexible inner urban transport option that can be seen as part of the public transport system (Transport Canada, 2009).

More specifically, public bicycles have the potential to increase the acceptance of cycling as a legitimate urban transport mode in cities, which still lack a good level of bicycle use. In cities that a good cycling mentality is already in place, even if this has been seriously challenged during the last decade or so by the huge numbers of cars that have conquered the road network, a competent community based bike-sharing scheme adds a valuable element to existing mobility services by providing a low cost and green public transport alternative and encouraging intermodal travelling. This means that Shanghai, which for many years has been a city with an iconic cycling culture, could be closer to realising its urban access potential only if similar systems become an integral part of its new sustainable mobilities agenda.

At the moment the one major bike-sharing scheme that exists in China is located in Hangzhou and was launched in 2008 in an attempt to prevent further decline of bicycle use. It is a scheme that in 2010 operated 50,000 bicycles with 2,000 fixed stations in five core districts. Recent research (Shaheen et al., 2011) clearly states that the 'Hangzhou Public Bicycle' programme is indeed promoting modal shift and acts as both a competitor and a complement to existing public transit. Approximately 30% of the scheme's members had incorporated bike-sharing into their most common commute, while there was some evidence suggesting that bike-sharing is particularly attractive to car owners in comparison with other road users. This case further solidifies that China is actively examining bike-sharing opportunities making the merit of the study described herein even more timely.

The research seeks to allocate the design needs for a bike-sharing system that would serve the increased urban mobility needs of the city of Shanghai for a more sustainable modal share. The researchers are in the process of initiating a study, meant to capture the requirements that the potential system users might have from the public bicycle system, in terms of its overall design. The system consists of the vehicles, the bike-sharing stations, the relevant road infrastructure that the programme needs in order to be fully operational and finally the promotion aids that will communicate its merit to road users. A survey will take place in order to quantitatively assess the likely opportunities and challenges that such an innovative public transport system may present to its potential users. This will be followed by a more qualitative research approach employing focus groups and/or individual interviews to examine in more detail the results of the survey. All in all, the study is going to test the hypothesis that such a system could be a success in Shanghai.

Identifying, and subsequently communicating ways to make concrete clear that design innovation of such character is of indisputable importance for any metropolis that looks to be in the frontiers of human-oriented urban development, is an outcome that this work aspires to provide. Some of the results regarding what needs to be done in order for such a public bicycle system to

become acceptable and fully serve its purpose as a colossal investment in providing more sustainable urban futures, could be generalised in the context of another mega-city with similar preparedness to make cycling a truly viable public transport solution.

Evaluating Shanghai's car plate auctioning system and examining the viability of introducing road pricing

For a span of one and a half decades, Shanghai has been attempting to manage its travel demand requirements by regulatory controlling private car ownership levels, and consequently car usage, through releasing only a moderate number of new license plates on a monthly basis (Notar, 2006). The authorities have been auctioning 5,000 to 10,000 new private license plates per month but as more people compete for the right to have a car on Shanghai's streets due to the rapid urbanisation and modernisation progress of the Chinese lifestyle, bidding prices have kept rising (Inch, 2012). This has transformed car ownership to a rather expensive luxury available only to the most affluent members of Shanghai's society. The price of a private car plate can be approximately up to 16 months' salary for a typical office worker and can actually eclipse the price of an economy car, nearly doubling the cost of owning a car in Shanghai (Inch, 2012).

The process of buying a private car plate through the auctioning program is a great inconvenience to both buyers and sellers based on distance and time considerations that do not allow any flexibility whatsoever, shadowy promoting even further social exclusion. The monthly auction is held in Songjiang District, in a remote location outside the city limits that had no subway connection until recently from Shanghai's center, making the distance considerable, even by Chinese standards. The silent auction starts at 9:00 in the morning. A person has one chance to submit a computer bid and, since the number of plates available and the lowest winning price are predetermined, it is important to arrive early to place a bid before the numbers run out (Notar, 2006). The car plate auctioning system of Shanghai therefore, could progressively transform to a measure that could raise serious issues of societal imbalance in terms of equity and thus become a barrier to the function of urban access instead of a supporting device for it, as one would expect from a policy mechanism meant to be a natural supporter of alternatives to car transport modes.

Furthermore by now, it has become apparent that this travel demand measure, despite its proven value as a catalyst for dissolving traffic congestion and a massive revenue generator raising a total of $659 million for the city in 2010 alone, can also be a source of adverse side effects degrading the urban environment of Shanghai (Itch, 2012). Many people register their cars in nearby provinces, where the plate costs are lower, and use them in Shanghai, which is something bypassing the system in place. Moreover, the high plate prices in Shanghai could actually be having a negative impact on the environment since many consumers use the high plate price as a

justification to get a more expensive car, which will likely have a higher displacement engine and emissions, increasing Shanghai's carbon footprint and local pollution.

Road pricing on the other hand, is a concept that covers a range of policy measures, which involve payment for road access in direct relation to usage criteria, rather than paying a fixed network access fee unrelated to the actual use, or paying proxy charges such as road fuel duty (Nikitas et al, 2011). Road pricing might have the potential to be an adequate alternative system for Shanghai to keep modal share in a reasonable balance that can be fairer and more socially inclusive than the current system because it will control car usage directly instead of limiting car ownership as a whole. This is a policy that has been applied universally satisfying the twin objective of reducing traffic congestion and preventing environmental degradation in urban environments (Ison & Rye, 2005). Perhaps of equal importance is that road pricing is also a measure that will keep the necessary generation of revenue from transport taxation (that provides the funding basis of transport improvement packages in Shanghai) flowing, possibly in the same or even higher standards. It should be noted that road pricing is a measure that suffers from low public acceptability (King et al., 2007) but that refers to cases where the city was not already managing road space with other means of regulatory traffic policy. In the context of Shanghai, road pricing will be providing the alternative to a very socially exclusive travel demand measure that could be restricting someone's very freedom to simply own a car.

This study means to serve as a thorough and up-to-date discussion of whether the current system of charging for private car use in Shanghai is favorable, successful, equitable and adequately equipped to satisfy the societal needs for urban access, primarily from a road user's perspective. Examining these specific attitudes of Shanghai's road users will allow the study to generate critical information about potential opportunities, flaws or inconsistencies of the system and ways to improve it. The study also aims to demonstrate how a potential alternative measure to control car use (i.e. road pricing) could cope with the transport requirements of the road users and the sustainable agenda of the city. Therefore, specific questions regarding the acceptability and suitability of the potential introduction of such a system in the very urbanized Yangpu District will be asked to identify whether this policy-oriented urban design measure could be viewed positively in Shanghai.

The results expected could be a door opener to a new era of transport taxation in Shanghai and perhaps in other provinces facing similar traffic problems. This new era could be defined by the transition from regulating car ownership to directly taxing and therefore controlling car usage, which is the mainstream axiom in managing travel demand elsewhere in the world.

Conclusions

Shanghai is a metropolis with a population in excess of 20 million and an economy as important as any in a world scale. Since it is a city that looks to be in the frontiers of sustainable and inclusive urban development, Shanghai needs to continuously revisit its policies, its urban infrastructure and its built environment service provision that could produce social inclusion problems and have feasible design solutions in place to overcome any city-induced mobility related barriers. The LIP Shanghai research framework is an apparatus designed to help in the production of knowledge that breaks traditional academic disciplinary borders to create an interdisciplinary educational and research structure with strong links to industry and local governance that will practically cater for some of the city's more urgent urban development needs. The main vehicle for such a co-production is a design-based approach to research innovation that looks into specific design applications (both in terms of engineering and policy) meant to make sure that all the members of the society will be able to enjoy acceptable levels of urban access despite any physical, cognitive or financial limitation they might face. The research overall, has an added value because of its dual potential to: a) be a work with considerable generalisation merit for other metropolitan environments of similar characteristics especially in East Asia and b) provide through the collaboration with the other four LIPs, useful knowledge from comparative studies around urban access strategies that could be underlining how significant the cultural context that affect mobility management might be, for the system users' susceptibility to change what could be their habitual commuting behaviour.

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