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Guidelines and Rating Systems as Tools to Foster Climate Change Adaptation of Ho Chi Minh City's Urban Infrastructure

Ronald Eckert

(Dipl.-Ing. Ronald Eckert, Department of Urban Planning and Spatial Design, Brandenburg University of Technology Cottbus, Konrad-Wachsmann-Allee 4, 03046 Cottbus/ Germany, ronald.eckert@tu-cottbus.de)

1 ABSTRACT

As the urban area of Ho Chi Minh City experiences increasing impacts by heavy rain events, tidal, and fluvial flooding it faces challenges in adapting its urban infrastructure, policies and institutions. While the old challenges of providing basic services to all remain, new tasks are emerging, such as improving the efficiency and capacity of infrastructure, in particular the urban drainage systems, refining planning processes and accessing new sources of finance to encourage private finance of infrastructure. Due to limited financial capacities, investments in Vietnam's public infrastructure were mainly funded by international donors from the development assistance in the past. With the anticipated transition of Vietnam to MIC-status, these ODA flows are likely to decrease in the future. Therefore, the private sector has to be more involved in infrastructure investments.

The paper addresses the risks for the emerging megacity brought by the ongoing rapid urbanization and future climate change impacts as well as the challenges to adapt the current construction and infrastructure practice. It argues that a more regulatory planning environment will foster the involvement of private stakeholders into the future cost-intensive adaptation process of HCMC's urban areas. It became evident that the low extend of planning regulations is symptomatic for the Vietnamese planning system. Plan-making processes and construction projects are regulated just by a few legal provisions and building codes, whose compliance is almost not observed. There is consent, that an increased regulation of the current urban development practice not only ensures and raises general environmental and quality standards. It can also serve as an effective approach to mainstream climate change adaptation and energy efficiency into urban planning. The presented approach aims for a transfer of urban planning guidelines into binding directives, forcing planners and architects to integrate adaptation and mitigation measures into urban development and construction plans.

2 HO CHI MINH CITY – AN EMERGING MEGACITY

2.1 Economic growth and rapid urbanization

The opening of Vietnam in the course of Doi Moi policy since the mid-eighties and the country's transition from a centrally planned economy to a free market economy initiated a transformation process, which the metropolis of Ho Chi Minh City (HCMC) benefits most of. The region is the most important target area of foreign direct investments and possesses growth rates far in excess of the country's average. Today, the city of HCMC generates 20% and the metropolitan region almost one third of the national GDP (GSO HCMC 2008). Therefore the city and the surrounding provinces are the most important driving forces for the economic growth and the renovation of Vietnam. However, better living and working conditions as well as the country's highest living standard result in an enormous rural-urban migration into the region of HCMC. The economic upswing was therefore attended with a doubling of the population within almost 20 years. Today, in HCMC live 7.1 million inhabitants and approximately 2 million additional migrants (see fig. 1; GSO HCMC 2009).

2.2 Changing settlement pattern and environmental impacts

The population growth led to a significant transition of the existing urban structure of HCMC and a rapid urbanization at the outskirts. The high urbanization pressure on the inner-city districts led to a continuing densification of the existing structure, horizontally in terms of new constructions on vacant sites as well as vertically in terms of floor extensions on existing buildings. The typical orthogonal grid land development divides the city into 30-60 m blocks, which were optimally utilized by double-row parcels. The individual parcel of land, and thus often the entire block, are overbuilt by up to hundred percent. With building heights between three and six floors, very high density levels of 50,000 up to 80,000 inhabitants per sqkm are achieved (UPI and Nikken Sekkei 2007). The only free space is often made up by the public street areas,

which have partly been kept to a necessary minimum for access (Storch et al 2008). This urban pattern seems to realize many of the classic aims of sustainable urban development, like reduced land consumption, mixed uses and short distances. However, the very high degree of impervious soil coverage and missing evaporation areas forcing the overheating of the urban environment.

At the same time Vietnam's economic liberalization induced rising income disparities, an increased social and spatial fragmentation as well as a high significance of the informal sector (Waibel 2005). The ongoing influx of migrants and the increasing prices of the property market led to a permanent shortage of affordable houses for the urban poor. Many inhabitants and migrants have no alternative as to take the issue into their hands and to construct their own houses, predominantly on occupied "remaining urban areas" along the wide-spread canal network and on river banks. The portion of residential buildings without an official permit is estimated to be more than 50% (Tran Kim Phat 2002). The risks of these squatter settlements are severe infrastructural deficits which results in unacceptable living conditions for the inhabitants and environmental problems for the city (Wüst et al 2002). In particular the uncontrolled settlement construction on natural flood plains increases the risk of flooding.

Even the new housing practice of the last two decades hardly considered climate-related risks for the built environment and its inhabitants and was focussed on a "growth first strategy". The majority of the formal housing construction activities in HCMC were concentrated in large-scale urban expansion projects like Saigon-South or Thu Thiem at the city's periphery in the south and the east. Here, completely new urban districts were or will be created on low elevated, predominantly marshy land, which previously served as buffer area in times of flooding (Eckert 2009). These neighbourhoods are basically influenced by imported international urban design concepts and neglect traditional life styles and behavioural patterns of the Vietnamese population. The lack of working facilities, social and commercial infrastructure nearby induces enormous traffic flows. Additionally, large parts in the northern and western territories of the city had become built-up areas (UPI and Nikken Sekkei 2007). This uncontrolled urban expansion and land use change go along with an excessive change of natural land cover to sealed surfaces, the removal of natural retention and infiltration areas for precipitation, increased traffic volumes, and increased emissions related to transportation and industrial production. The settlement area of HCMC has almost tripled in the past 20 years (Tran Thi Van and Ha Duong Xuan Bao 2007).

2.3 Infrastructure bottleneck and urban renewal practice

As a result of the mostly spontaneous land occupation, the adequate provision of technical services often lag behind in the marginal settlements on the outskirts as well as in inner city slums, causing considerable negative effects on the environment and urban society of HCMC (Wüst et al 2002). The public administration reacts to the pressing demand for renewal of the inner-city slums with various upgrading programs. The "Nhieu Loc – Thi Nghe Canal Project" was already initiated in 1995 as one of the HCMC's first large-scale canal sanitation projects. With the aim of increasing the canal's flow rate, which had been reduced by spontaneous building construction, and improving both the water quality and the precarious living situation, the banks of the canal were cleared along a stretch of more than 8 km. Since then, there were further efforts in HCMC which aim at the sustainable improvement of the inner-city housing situation. They usually deal, however, only with certain technical fields like canal sanitation, refuse removal, slum upgrading and wastewater treatment or are spatially limited that they have only limited effect on the level of the overall city (Eckert and Schinkel 2010).

It is evident that the urban renewal process achieved considerable progress in Vietnam. In 2006 almost all urban areas and 88% of households in rural areas had access to electricity. And the portion of fresh water supplied households has been doubled from 26% in 1993 to 49% in 2002 (Worldbank 2006). However, with the past legacy of urban neglect the upgrading and adaptation of urban infrastructure to current and future demands is still a major challenge for HCMC and Vietnam. The poor are particularly disadvantaged and access to basic services still needs to be extended to all urban residents.

3 CHALLENGES FOR THE FUTURE URBAN DEVELOPMENT

3.1 Climate change impacts

Located on the edge of the Mekong delta, HCMC is built mostly on low-lying and marshy land. Over 60% of the administrative area is situated below 1.5 m above sea level (Ho Long Phi 2007) and the estuary of Dong Nai River, Sai Gon River and Nha Be River forms a wide-spread network of rivers and canals with almost 8,000 km length, covering 16% of the city's area (Nguyen Minh Hoa and Son Thanh Tung 2007). The infiltration of tides into the urban water system results in a periodic raised water level. A sea level rise (SLR) of approximately 1 m until the end of this century would lead to an inundation of almost the half of HCMC's area, endangering more than 660,000 inhabitants or close to 12% of the city's population (Carew-Reid 2008). However, these figures are likely to be significantly higher. The urban hydrogeology regime is also affected by increasing heavy rain events and flooding from upstream areas (Do Thi Chinh 2008). A high groundwater level and an insufficient and mostly polluted sewer system cause backwater and retard the water run-off. This results in a frequently flooding of wide quarters of HCMC, even in high elevated areas. Urban flooding in HCMC has very severe impacts on the built environment. The increase of impervious soil sealing by the construction of houses and infrastructure on former retention and infiltration areas lead to a reduced drainage and storage capacity for flood and rain water. Flooding disperses the wastewater from sewerage, which causes water pollution, epidemic diseases, damage to houses and infrastructures. Flooding due to tide also causes salinity intrusion, which damages the crops and plants (UPI and Nikken Sekkei 2007).

In combination with a rising annual mean temperature the uncontrolled urbanization and the increase of building densities causes other consequences for HCMC and their inhabitants. Within the densely built urban districts the lack of vegetation, standing surface water and evaporation areas, reduced air convection, changes in thermal properties of surface materials and human heat generation by air conditioning, transportation or industry lead to an overheating of the urban areas (UPI and Nikken Sekkei 2007), the so called Urban Heat Island Effect (UHI). This effect is clearly noticeable in the inner city districts with up to 10 degrees higher than the temperature of the surrounding areas. According to the most likely projections the average temperature will further rise by 1-2 K until 2050 (Booth et al 1999). Urban heat waves will be intensified and will influence the health and comfort of urban residents in a negative way. In particular the elderly, invalids, and the urban poor are most vulnerable to high temperatures (Eckert and Schinkel 2009).

3.2 Urban Development Trends

Due to its geographic location, HCMC will always face natural hazards. However, vulnerabilities of lives and livelihoods to climate related processes are primarily the result of inadequate urban planning practices. Urban development scenarios for the mega-urban region of HCMC are closely interrelated with climate change adaptation. The population of HCMC will grow rapidly further on. Population scenarios estimate future annual growth rates between 2% and 3% and forecast a population of 9 to 11 million official inhabitants by 2025 (see fig. 1; UPI and Nikken Sekkei 2007). These trends might intensify due to a further influx of migrants and a recognised rising living standards (increased housing space per capita), which will lead to an even higher demand for construction sites and housing.

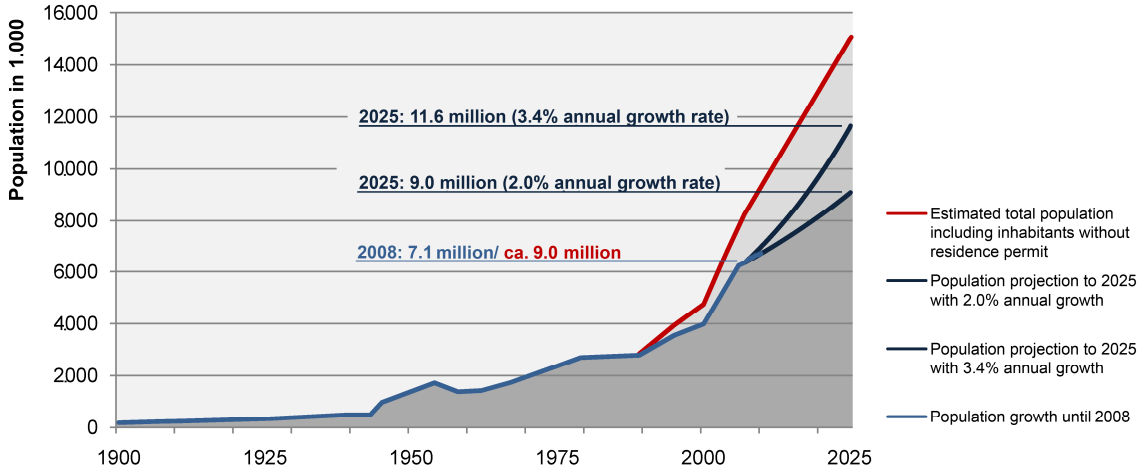

Fig. 1: Population development and population projections of HCMC (Source: GSO HCMC 2009; UPI and Nikken Sekkei 2007)

4 ADAPTATION OF PLANNING AND RENEWAL PROCESSES

While the old challenges of providing basic infrastructure services to all remain, new tasks are emerging as the urban areas of HCMC experiences increasing impacts by climate change. In particular, the predicted SLR and changes in urban climate will affect a high proportion of the urban area of HCMC and can lead to a new dynamic in the medium up to long term urban development, which the current planning system is not prepared for. One of the most outstanding challenges will be the adjustment of the current land use management and common urban design principles within the HCMC region to cope with the limited availability of flood-safe land on the one hand and the rising demand for housing areas on the other hand. Moreover, many of the residential areas in Vietnam's cities have developed on an ad-hoc basis as tightly packed warrens of narrow, twisting lanes, without properly functioning drainage or sewerage systems, or open spaces for recreation (Coulthart et al 2006). Therefore, approaches to the overall questions of: Which measures and strategies are required and feasible to adapt HCMCs urban infrastructure and which tools and methods facilitate their financing and their implementation into Vietnamese planning processes will be discussed.

4.1 Urban Planning and Design Principles

Based on the hypothesis, that adapted settlement types linked with the regulation of the spatial settlement distribution can minimize negative environmental impacts, can reduce urban green house gas emissions and will still meet the housing demand in the HCMC region, urban design and planning strategies were identified for the neighbourhood scale. These principles are addressing HCMC's main environmental risks related to flooding and climate as well as related to a rising energy demand and emissions and are focussed on infrastructural issues. Urban infrastructure at the neighbourhood level is understood in its broader context, supporting the main function of housing, including technical aspects like urban drainage and mobility as well as the provision of open spaces and social facilities. The principles were related to overarching sectors. The sectors of flood protection, water management, greenery & natural systems and solar control comprise measures mainly related to the adaptation of urban structures. Measures regarding compactness, energy efficiency, spatial decentralization and sustainable mobility relate to the reduction of resource consumption (see fig. 2; Schwartze et al 2010b). Generally, climate responsive neighbourhoods call for an improved efficiency and capacity of infrastructure, in particular the urban drainage systems and compared to current housing projects, the average building density has to be increased on built-up surfaces, while open spaces have to be designed as climate function areas.

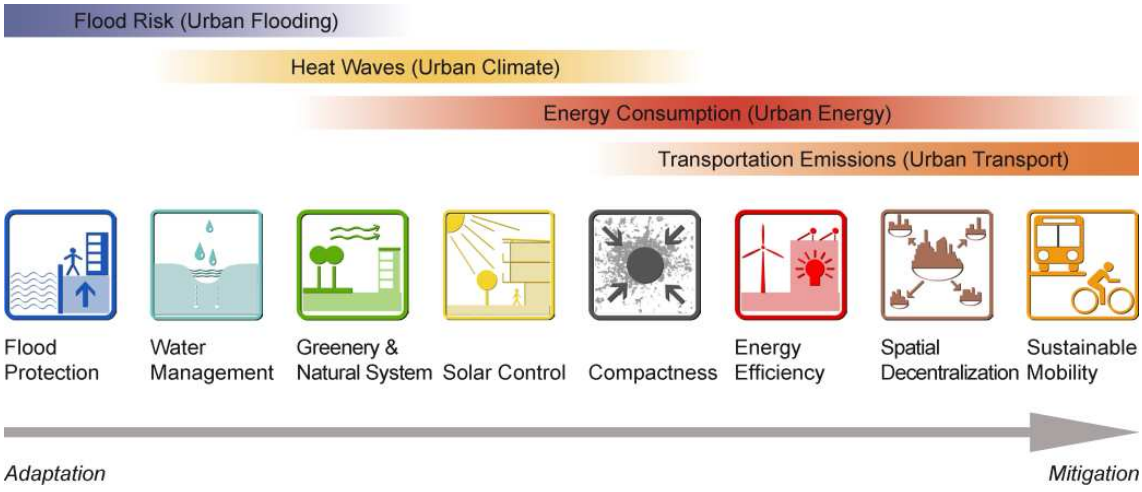

Fig. 2: Sectoral modules for urban design strategies and principles

As already mentioned above, even new construction activities in recent years hardly consider climate change issues. Neighbourhoods are often not properly designed to provide adequate open and unsealed space to ensure on-site rain water infiltration, to provide facilities for water retention, to provide sufficient vegetation to increase evaporative cooling and shading effects or to provide an effective sewer system to drain high peaks of water, just to name a few examples. However, installing properly designed infrastructure after unplanned development has taken place is significantly more expensive, because of land acquisition and resettlement costs and the difficulties of working in confined space, than would have been the case if it had

been built at an earlier stage. Moreover, these new urban developments will shape the spatial pattern of the urban agglomerations for many decades. It is therefore of utmost importance to plan in an integrated manner from the outset, how the spatial development direction in general and how buildings and infrastructure in these highly vulnerable regions can be adapted to cope with the climate change related impacts (Schwartze et al 2010a).

4.2 Financing urban infrastructure

Due to limited financial capacities, investments in Vietnam's public infrastructure were mainly funded by international donors from the official development assistance (ODA) in the past. Around 80% of the average annual expenditure of around 100 US$ million in the 1990s came from ODA contributions and around 40% of the investments were made in Vietnam's four largest cities (Coulthart et al 2006). Compared to estimations for future infrastructure demands the previous investment volumes were heavily undercharged. The UNFCCC estimates up to 33.5 US$ billion additional investments to adapt infrastructure to climate change risks for Asia's low- and middle- income countries in 2030 (UNFCCC 2007). And a study by IIED answers these estimations with calculations of up to 217.5 US$ billion annual costs to remove the existing infrastructure bottleneck (Parry et al 2009).

However, with the anticipated transition of Vietnam to middle income country-status (MIC), the past ODA flows are likely to decrease in the future (Massmann 2008). Therefore, Vietnam needs to reduce its reliance on the state budget and to start preparing for the transition away from donor financing for urban infrastructure services. The necessary transition strategy must involve diversification of financing sources for infrastructure development, focusing on increasing the role of the private sector as a source of finance for infrastructure and as a developer of infrastructure.

Focussing on the developer-driven housing construction market, the realization and funding of urban infrastructure for middle- and large-scale housing projects is mainly transferred from the responsible local administration to the property developer themselves through the sale of land use rights. However, as mentioned above most of the infrastructure is not properly designed and once officially committed, the public administration is in charge for future maintenance and upgrading costs. The revenues collected through the so called "land for infrastructure"-deals could be increased if more transparent and competitive procedures were adopted (Coulthart et al 2006). Additionally, the level of technical standards for urban infrastructure to be realized by the developer could be increased on a level which is more appropriate to the demands brought by current and future climate change impacts. The following chapter presents approaches, how these standards could be transferred to obligatory standards implemented into the Vietnamese planning processes.

5 IMPLEMENTATION OF CLIMATE CHANGE RESPONSE INTO THE VIETNAMESE PLANNING SYSTEM

The development of a comprehensive concept for the adaptation of urban land and urban structures requires the integration of planning strategies, regulations and measures into the existing planning processes. The overall aims of these regulations are to limit and prevent damage on buildings and infrastructure caused by climate change impacts, to improve the current urban design and construction practice and to optimize the current standard design based on a commonly approved risk-level. A more regulatory planning environment will foster the involvement of private stakeholders into the future cost-intensive adaptation process of HCMC's urban areas.

5.1 Urban Planning and Design Guidelines

The regulatory approach aims for a transfer of urban planning guidelines into binding directives, forcing planners and architects to integrate adaptation and mitigation measures into urban development and construction plans. In the top-down orientated political and administrative system of Vietnam the implementation of regulations into the legal planning framework seems to be obvious. It became evident that the low extend of planning regulations is symptomatic for the Vietnamese planning system. Plan-making processes and construction projects are regulated just by a few legal provisions, whose compliance is almost not observed. In this context, binding guidelines were identified as one suitable instrument to transfer adaptation and mitigation measures into the relevant plan making and the political decision making processes

as well as to regulate the urban development of HCMC. There is consent, that an increased regulation not only raises general environmental and quality standards. It can also serve as an effective approach to mainstream climate change adaptation and energy efficiency into urban planning. Guidelines may improve the intersectoral communication in the field of planning and may enable the involvement of private stakeholders into the cost-intensive adaptation process (Schwartze et al 2010a).

At the national level, the statutory planning documents according to the Urban Planning and Construction Law (SRV 2003; SRV 2009) are the most appropriate. These laws define the main spatial planning levels, the related statutory plans and their content. Detailed specifications are noted in additional standards and codes. However, while at the building level binding standards like the Building Code or the Energy Efficiency Building Code exist, the levels of general and zoning planning are lacking effective regulations. In particular the amendment of the Urban Planning Law in June 2009 introduced the level of zoning, but without the formulation of respective specifications. Further, this law demands strategic environmental assessments (SEA) as well as declarations to the urban design and the technical infrastructure as inherent part of each planning level. Even there, specifications are lacking, yet. Therefore, the elaboration of these standards may serve as a platform for implementing additional regulations in terms of climate change adaptation and energy efficiency (see fig. 3; Schwartze et al 2010a). The spatially coherent approach of the Level 1-3 Guidelines will facilitate their integration into the planning levels of the Vietnamese legal framework (Level 1 General Planning, Level 2 Zoning and Detailed Planning, Level 3 Construction Planning).

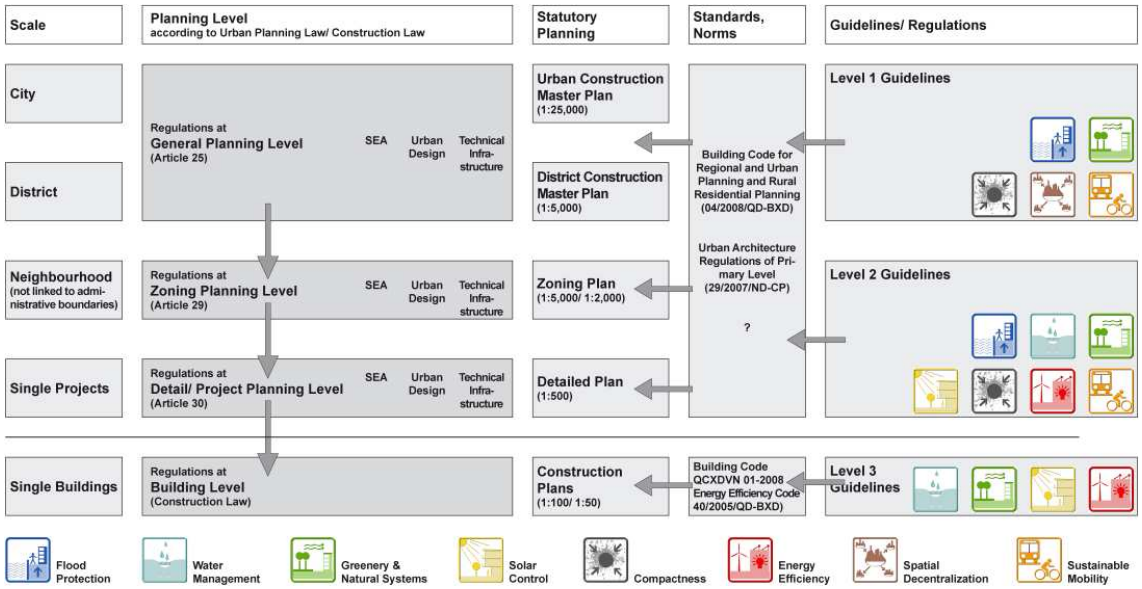

Fig. 3: Implementation approach for the integration of guidelines into national laws and codes

5.2 Rating Systems

However, the implementation of guidelines will be not sufficient to ensure a wide application of adaptation measures. Even from the national level, there is a strong need for the promulgation of policies and incentives to foster the utilization of these measures. In this context, the advantages of a national green building rating system as a complementary bottom-up approach can be discussed. As the housing market and the competition between developers will increase in the future, the individual profiling of housing projects will be crucial. The label of a "green community" or an "eco-friendly neighbourhood" combined with an independently and objectively determined high ranked rating score could be a suitable and effective way to highlight housing projects. Therefore, a rating system could foster an increased implementation of adaptation measures on a "voluntary basis". Furthermore, housing projects could be comparable assessed by a rating system, which served as a basis for future incentive-driven policies to support climate change adapted urban development. The Vietnamese Green Building Council (VGBC) has already provided a first draft of LOTUS (VGBC 2008), a rating system for energy and climate efficient buildings. An extension at the neighbourhood level, as its discussed for several international rating systems might be appropriate.

5.3 Design Coding

Design Coding is a further promising tool which is being used within the framework of recent climate protection and sustainability initiatives of different countries. This approach considers that guidelines at the national level could be too general to effectively respond to the specific conditions of a site or project. Design codes are a distinct form of detailed design guidance that prescribes the three dimensional components of a specific development project and how these relate to one another but do not prescribe the overall outcome. A Design Code is therefore a set of specific and illustrated components with rules to guide their use in order to generate the urban form of a site. The aim of design coding is therefore to provide clarity over what constitutes acceptable design quality and thereby achieve a level of certainty for developers and the local community alike. (Carmona 2009; Communities and Local Government 2006).

Up to now, similar experience at the local level has only been made by HCMC's administration in conjunction with exemplary urban design guidelines. According to HCMC's Planning Decree 29 the Department of Urban Planning and Architecture (DPA) issued directives for a small inner-city area in 2008 for the first time in Vietnam (DPA 2009). These guidelines regulate a mere of dimensions related to the urban form, but exceed national building codes and specifications from urban development plans. However, there is consent, that this method is suitable for further regulations (Eckert et al 2009). It is intended that these guidelines will be extended both spatially and in regards to content with the integration of climate change adaptation and resource efficiency issues in the near future.

6 SUMMARY AND OUTLOOK

To effectively involve private stakeholders into the necessary improvement and adaptation process of Vietnam's urban infrastructure, emphasis has to be placed on the mainstreaming of adaptation responses in all urban planning processes. The decisive question seems to be how responses can be implemented. Approaches for a regulatory legal integration of planning guidelines were presented. However, the strengthening of the acceptance for adaptation measures by local decision makers, developers and own-home builders, architects and planners and the improvement of the local response capacity by a set of diverse bottom-up strategies will be crucial. Here, the potentials of a green building rating system as well as of the instrument of design coding were introduced briefly. However, the introduction of the LOTUS rating system in Vietnam is at the very beginning. The current system only focuses on the scale of single buildings and is not considered for residential housing at this time. Therefore, it has only little impact on how buildings are designed. Furthermore, a broad application of design coding for future housing developments needs personnel capacities, which the heavily overburdened administration not have.

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