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Enhancing Quality of Life through Sustainable Urban Transformation in Cambodia: Introduction to the Build4People Project

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សារគន្លឹះ

- ✓ សេចក្តីសង្ខេបគោលនយោបាយជាលទ្ធផលស្រាវជ្រាវក្នុងដំណាក់កាលបឋមរបស់គម្រោង "ការសាងសង់សម្រាប់មនុស្សរស់នៅ ឬហៅកាត់ថា B4P" (គម្រោងនេះមានច្រើនដំណាក់កាល) ដែលឧបត្ថម្ភដោយរដ្ឋាភិបាលអាល្លឺម៉ង់ក្នុងកម្មវិធី "ការអភិវឌ្ឍប្រកបដោយចីរភាពក្នុងតំបន់ទីក្រុង"។ ដំណាក់កាល

បន្ទាប់មានរយៈពេលបួនឆ្នាំ ដោយផ្តោតលើការស្រាវជ្រាវ និងអភិវឌ្ឍន៍ (ដំណាក់កាលអង់អែនឌី ឬសរសេរកាត់ថា RD) ដោយយកដំណាក់កាលបឋមជាមូលដ្ឋាន។ គម្រោងស្រាវជ្រាវនេះមានកិច្ចសហការពីអ្នកស្រាវជ្រាវនៃសាកលវិទ្យាល័យអាល្លឺម៉ង់ចំនួន៤ ក្រុមហ៊ុនអាល្លឺម៉ង់ចំនួន២ និងដៃគូស្រាវជ្រាវ អនុវត្តនិងផ្សព្វផ្សាយនៅកម្ពុជា។

- ✓ បុព្វហេតុនៃគម្រោង "B4P" គឺសន្ទុះរីកចម្រើននៃសេដ្ឋកិច្ចនៅភ្នំពេញ រួមផ្សំនឹងការសាយភាយនៃនគរូបនីយកម្ម និងវិស័យសំណង់។ ប៉ុន្តែ អាគារនិងបូរីថ្មីៗកម្រនឹងបានសាងសង់ឡើងប្រកបដោយចីរភាព ដែលបណ្តាលឲ្យមានផលប៉ះពាល់ទាំងវិជ្ជមាន ទាំងអវិជ្ជមាន ទាំងដោយផ្ទាល់ និងដោយប្រយោលទៅលើបរិស្ថាន។ អ្នកសម្រេចចិត្តធំនៅក្នុងវិស័យសំណង់ ក្រសួងពាក់ព័ន្ធនឹងសំណង់ រដ្ឋបាលសាលាក្រុង និងអ្នករស់នៅតាមអគារ មិនសូវបានចាប់អារម្មណ៍លើបញ្ហាចីរភាពនេះប៉ុន្មានទេ។
- ✓ វត្ថុបំណងចម្បងរបស់គម្រោង B4P ដែលមានអ្នកជំនាញមកពីពហុវិស័យ ក្នុងដំណាក់កាល RD គឺគាំទ្រ និងវិភាគរកវិធីផ្លាស់ប្តូរពីរបៀបអភិវឌ្ឍទីក្រុងដូចសព្វថ្ងៃ ទៅរបៀបអភិវឌ្ឍមួយទៀតប្រកបដោយចីរភាព និងភាពងាយស្រួលរស់នៅកម្រិតខ្ពស់។ ការស្រាវជ្រាវនេះផ្តោតលើផ្នែកផែនការសាងសង់អាគារនិងផ្ទះល្វែងក្នុងបូរី។
- ✓ ដើម្បីសម្រេចវត្ថុបំណងក្នុងដំណាក់កាល RD យើងបានប្រើប្រាស់វិធីសាស្ត្រឧបករណ៍ស្រាវជ្រាវ និងនីតិវិធីគន្លឹះមួយចំនួន ដែលរួមមានសិក្ខាសាលារៀបចំផែនការរួមគ្នា វិធីគ្រប់គ្រងយុទ្ធសាស្ត្រពិសេស វិធីគ្រប់គ្រងអំឡុងពេលអន្តរកាល និងការអនុវត្តបទពិសោធតាមដំហាន។ វិធានទាំងនេះនឹងផ្តល់ចំណេះដឹងដល់អ្នកពាក់ព័ន្ធនៅមូលដ្ឋានក្នុងការអនុវត្ត ក្នុងនិងការសម្រេចចិត្តដោយយកកស្តុតាងជាមូលដ្ឋាន។
- ✓ ការវិភាគគុណភាពជីវិតនៅទីក្រុងដោយយកមនុស្សជាកត្តានាំមុខជាចំណុចតភ្ជាប់គ្រប់ទិដ្ឋភាពទាំងផ្នែកវិទ្យាសាស្ត្រ ទាំងក្របខណ្ឌទស្សនៈ ទាំងការវិភាគស៊ីជម្រៅ និងទាំងនិយាមសង្គម។ ក្នុងអំឡុងនៃការស្រាវជ្រាវ យើងនឹងរួមគ្នា

បង្កើតក្របខណ្ឌទស្សនៈ បង្កើតគម្រូផ្សេងៗ និងវិធីសាស្ត្រវាស់វែងគុណភាពជីវិតនៅទីក្រុងដោយផ្សារភ្ជាប់ជាមួយកត្តានយោបាយ និងកត្តាចីរភាពជានិច្ច។

Key Messages

- ✓ This policy brief introduces preliminary research results of the Build4People project, funded by the German government as part of the multi-phase focus programme "Sustainable Development of Urban Regions". Furthermore, the research agenda of the upcoming main four-year Research and Development phase (RD phase) will be introduced based on insights gained in previous shorter funding periods. The Build4People research consortium consists of representatives from four German universities and two German companies with their respective research, implementation and dissemination partners in the Kingdom of Cambodia.
- ✓ Build4People's rationale is based on Phnom Penh's dynamic economic growth, which is coupled with a local urbanisation and construction boom. However, new buildings and neighbourhoods are rarely constructed in a sustainable way with direct and indirect negative environmental impacts. Issues of sustainability are hardly addressed by decision-makers in the construction sector, related ministries, city administrations or building users.
- ✓ The overall aim of the multi- and trans-disciplinary Build4People project during the RD phase is to support and analyse the transformative shift in Phnom Penh's current business-as-usual urban development pathway towards a pathway with higher sustainability and liveability levels. The entry points for the research are the building and neighbourhood planning sectors.
- ✓ Methods, tools and key instruments to achieve the objectives of the RD phase are collaborative planning workshops, strategic niche management approaches, transition management approaches and subsequent experimental implementation. All of these measures will generate applied knowledge for local stakeholders and a basis for evidence-based decision-making.
- ✓ Urban quality of life as a people-driven approach serves as the integrating link for all of our scientific, conceptional, analytical

and normative dimensions. During our research, we will jointly conceptualize, measure and model urban quality of life and consider its political dimension and its often-ambiguous relationship to sustainability.

Keywords: Sustainable buildings, sustainable urban transformation, integrated urban people-centric development, urban quality of life, sustainable urban development pathways, pro-environmental behaviour and sustainable living, Royal Kingdom of Cambodia

Introduction: General problem description

The current COVID-19 pandemic not only highlights the requirements and necessities of services, functions and infrastructures that urban areas need to provide for their citizens. It also highlights *"the gravity of the current crisis makes the need for transformative urban change clearer than ever"* (WRI, 2020). UN General Secretary António Guterres recently introduced policy recommendations with regard to this challenge, arguing that the COVID-19 crisis is *"an opportunity to reflect and reset how we live, interact and rebuild our cities"* (UN 2020). In a policy brief, Guterres suggests that the capacities of local governments must be strengthened and the economic recovery must be realised as a green, resilient and inclusive one (UN, 2020). Furthermore, the crisis revealed that residents, unable to commute and travel during the lockdowns, have been thrown back on their neighbourhoods, community networks and direct personnel urban environment. Urban citizens are more aware than ever that a high quality of life within their neighbourhoods is very valuable for living, working and recreation.

As part of the global megatrend towards urbanisation, an increasing share of buildings is concentrated in urban areas. Decarbonising the buildings and construction sector responsible for about 38% of energy- and process-related emissions worldwide is critical for achieving the UN Sustainable Developments Goals and the Paris Agreement commitment (United Nations Environment Programme, 2020). In fact, sustainable buildings can arguably be identified as *"one of the most significant, cheapest and fastest approaches to reduce greenhouse gas emissions at the local scale"* (Preller et al., 2017: 217–218; OECD & IEA, 2013; UNEP & Global ABC, 2016).

This is particularly relevant for countries like the Kingdom of Cambodia, which are confronted with enormous building activities in their biggest cities like Phnom Penh, Sihanoukville and Siam Reap. With an annual contribution of 9-10% to GDP, the construction sector is one of Cambodia's key industries (Durdyev et al., 2016). The boom in this sector contributed to World Bank Group's reclassification of Cambodia from the status of a "low-income country" to the status of a "lower-middle-income country" in 2016 (McGrath & Kimsay, 2016). The International Finance Corporation (IFC) believes that 50% of the buildings with long-lasting impacts regarding sustainability that will be standing in Cambodia in 2050 have not been built yet (IFC, 2016). The IFC also notes that incorporating (energy and resource) efficiency into new designs is up to ten times more cost-efficient than retrofitting them (IFC 2016).

In addition, further urban expansion of the bigger cities is to be expected. For example, the Global Green Growth Institute (GGGI) anticipates a

doubling of the urban population in Cambodia by 2030 and warns of housing shortages and an under-supply of infrastructure in this context (GGGI, 2016). GGGI, in its Phnom Penh Sustainable City Plan 2018-2030, has also demanded guidance on *"constructing or retrofitting energy-efficient housing and buildings"* as a priority action in regard to the built-up environment (GGGI, 2019: 59).

To reduce carbon emissions from buildings and energy supply systems effectively and economically, an energy-efficient urban layout is of key importance (Bott et al., 2019). In the context of Cambodia, this means that adapted climate-responsive solutions have to be explored and implemented within the next years. Besides the level of buildings, the planning and implementation of sustainable neighbourhoods plays a key role: *"As socio-spatial units, neighbourhoods offer a suitable scale of intervention for integrated planning and packages of measures for sustainable urban redevelopment."* (Bott et al., 2019: 22).

Whereas some developments in Phnom Penh might be connected to enhanced liveability levels, i.e., increased use of individually owned cars, the latter have had negative consequences on sustainability levels, i.e., higher carbon emissions and air pollution. They also have potentially detrimental effects in other liveability dimensions such as walkability or air quality. Liveability has increased more for some parts of the urban population than for others. For example, a significant number of high-rise condominium towers, urban and suburban residential enclaves and gated communities have been developed over the last years targeting the urban upper and middle classes "new consumers". However, many of the negative

consequences for public infrastructure such as an increase in traffic jams and the environment are externalised from the general public (Paling, 2012; Fauveaud, 2015). Striking examples of these processes have been large-scale evictions and re-locations of lower-income communities as well as the filling of urban lakes. Urban lakes that often formed the basis of their livelihoods, provided ecosystem functions such as serving valuable retention spaces in case of heavy rainfall events have been transformed into luxury housing and other speculative real estate investments (Beckwith, 2020). These developments don't seem to have improved the quality of urban life for the urban majority, nor are they conducive to urban sustainability. The Economist Intelligence Unit (EIU) in 2015 rated the liveability of the city as fairly low – at least compared to its regional peers and by international standards. Its ranking placed Phnom Penh only 126th out of 140 cities globally (EIU, 2015).

At the same time, the development towards a modern consumer society in Cambodia has resulted in more resource-intensive lifestyles than when compared to the last four decades. This strongly affects the way buildings are designed, built and operated. This can be simply illustrated by monitoring the increase in electricity consumption. Within just the past 15 years, development in Cambodia has pushed electricity consumption per capita from about 70 kWh in 2005 to 530 kWh in 2018 (IEA Data Services, 2021a). While this energy consumption may seem low when compared regionally (PR China: 4,910 kWh, Vietnam: 2,380 kWh), it is expected to rapidly rise in the near future (IEA Data Services, 2021b). Already now, electricity consumption is very much focused on the country's primate city: Phnom Penh accounts for

about 85% of the national electricity consumption, but only for about 10% of the Cambodian population living in Phnom Penh (Pode et al., 2015). Therefore, the Build4People project is timed to coincide with the beginning of an expected development expansion and can additionally benefit from past research and trans-disciplinary project implementation experiences of Build4People team members in Vietnam or China. Applying lessons learned from those previous experiences can improve and strengthen the Build4People project's implications and recommendations for Cambodia's sustainability practices in the urban sector at its relatively early stage of development.

Preliminary research results

Preliminary research results of altogether six scientific work packages have been gathered during a six-month so-called Preparation phase (November 2017 until April 2018) and an 18-month so-called Definition phase (August 2019 until January 2021). Build4People's research has generally confirmed that the awareness of sustainability issues in Cambodia's building and construction sector is low, although gradually gaining support from stakeholders. Though the basic principles and necessities of sustainable buildings and sustainable urbanisation have been widely disseminated worldwide in recent years, including through major donor organisations like the Asian Development Bank (ADB) or the United Nations Development Programme (UNDP), local stakeholders and practitioners complained that they lacked knowledge about how to apply sustainability solutions within the existing technocratic and top-down planning approaches and the existing socio-institutional environment. In short, the most important issue was a lack

of actionable knowledge, e.g., how to overcome implementation gaps in the field of sustainable urban development. It became clear that effective implementation requires a detailed analysis (including of the socio-economic environment), development of adapted and localised measures (including the use of action research), long-term strategies, and more collaborative and strategic planning approaches.

At the same time, local stakeholders in Phnom Penh showed general interest in the holistic concept of urban quality of life that was communicated as the overall normative aim of the Build4People project. Initial discussions on how to reconcile individual life satisfaction with objective standards of sustainability also revealed that more research is needed in this field.

An important insight from the perspective of environmental psychology with regard to the environmental awareness of people in Phnom Penh was the difference between local and global environmental issues. The awareness and understanding of environmental problems seem to be directed towards local problems, such as air pollution and the lack of waste management, rather than global environmental problems such as climate change. Local organizations and institutions have already taken some measures to address those environmental problems, e.g., by promoting the avoidance of plastic, saving of drinking water, enhanced waste management, etc. Posters and other awareness-raising materials on these topics are observable in public spaces, official institutions or restaurants. The problem awareness and understanding of global environmental problems such as "climate change" turned out to be less salient.

Citizen's "climate awareness" can be defined at two levels: In a local context, and in terms of a global problem understanding of climate change (Li, 2015). There seems to be a need to strengthen awareness of the global consequences of individual and local behaviour and the importance of sustainable lifestyles in the long term. From the sustainable building perspective, it was perceived that common practices include reliance on (often imported) construction methods and standards, building designs and materials that are often inappropriate to local climates and conditions (see also Bodach, 2019). Despite the high electricity prices, passive energy-saving potentials applied to building techniques are rarely taken into account. All this happens notwithstanding the rich heritage of building designs from the modernist era, known as New Khmer Architecture, and from the colonial era that was erected following bioclimatic design principles (Kolnberger, 2014; Waibel, 2017; Bodach & Waibel, 2017).

Furthermore, construction professionals displayed a lack of knowledge in adopting sustainable design principles, construction methods and in advancing low-energy building system technologies. Often, no consideration is given to life-cycle issues or bridging the divide between the economic life-cycle phases of the buildings by making sustainability transparent, e.g., by employing evidence-based and predictive design techniques and instruments such as building certificates. The research showed that necessary sustainable technologies for the change from traditional bioclimatic design to technically equipped modern buildings are not available in the Cambodian market and must be developed strategically, along with their necessary market context (Schwede, 2020). Finally, various local experts confirmed that recently

erected buildings and neighbourhoods primarily target the high-end of the market and are only partially in line with the urban population's actual demand.

Major insights from the perspective of sustainable neighbourhood development were gained through the organisation of the Build4People Ecocity Transition Lab at Phnom Penh City Hall. This was an interactive workshop and charette stretching over one week, which proved very valuable for understanding local issues, capacity-building, and the implementation of transdisciplinary collaboration in complex sustainable urban developments. During the Ecocity Transition Lab, it became clear that there is a strong demand for sustainable urban renewal and neighbourhood development approaches. A particular outcome was that while there is a framework of planning systems and multiple planning policies, there is hardly any synergy between the Socio-Economic Development Plan and the Spatial Plan, which are the major planning systems. Furthermore, a lack of capacity (funding and technical skillsets) has been identified as a bottleneck for developing qualified urban, spatial and land use plans, especially at the Khan and Sangkat levels (see also Makathy, 2016; World Bank Group, 2018). As a lesson learnt, the successful approach of the Ecocity Transition Lab will be extended and deepened in the upcoming project phase, along with creating a toolbox for sustainable neighbourhood development including strategies, guidelines and criteria as well as implementation strategies.

Based on the perspective of *"urban green"* as ecological infrastructure within cities, our research established that Phnom Penh has a growing need for the development of urban green space and public spaces. The city center

is mainly characterized by built-up and sealed-off areas. Apart from some existing urban historic parks and streets with old alley trees that provide shade in the hot periods, residents of Phnom Penh use green spaces for recreation, leisure, sports and cultural events.

However, due to intensified urban sprawl and densification of urban land use, the spatial share of urban green space is rapidly decreasing in Phnom Penh since 2000, leading to increased flooding problems during the rainy season. One of the key findings of the 1st Build4People Ecocity Transition Lab in March 2020 was that officials and citizens alike consider urban green space to be an important feature for urban planning and sustainable development in Phnom Penh.

With regard to greater awareness-raising for the maintenance and promotion of more urban green space, we are fostering the idea of an Urban Green Infrastructure approach. This analytical framework allows for an analysis of urban green space in terms of its multi-functionality considering physical and functional connectivity and relates this to the capacity of ecosystems to provide multiple valuable ecosystem goods and services (EEA, 2017).

In analysing Phnom Penh's urban climate, the mesoclimatic conditions of the surrounding region must be considered. Therefore, a regional climate analysis was carried out to understand the ventilation effects during the different seasons. Here, two seasons are especially important, as they bring wind from two different directions that influence the urban climate. The urban climate analysis provided more quantitative results on urban heat islands and helped to formulate a methodology for deriving an urban climatic

map. The research showed a considerable temperature variation rate between urban and suburban areas ranging from 4 to 9 degrees Celsius. As this result is highly dependent on local city structures, more data on urban climate are needed to develop a valid urban climate model of Phnom Penh in the future. From land use data, building and vegetation information, the input layers for an urban climatic map were formed. These different datasets are needed to calculate an urban climate map (Ren et al., 2011) with a GIS-based method.

During a neighbourhood design project, the initial results were used to recommend climatically orientated urban structures to provide better ventilation for buildings and open spaces to reduce heat stress. Finally, a thermal comfort index was applied in the research on urban quality of life. With this classification, which encompassed indoor as well as outdoor conditions, various aspects of well-being were evaluated.

From the perspective of sustainable urban transformation, major problems may be related to institutional fragmentation and ambiguity. While governmental institutions do play a central role in urbanization processes, informal power structures and the entanglement of the private interests of political elites render the government's de-facto role much more ambiguous (Paling, 2012). Administrative responsibilities for sustainable urban development are scattered among many different national-level ministries and Phnom Penh City Administration (PPCA). PPCA itself has very limited financial and human resources and is generally considered to be in a relatively weak position with regard to land ownership and legal institutions between the central state and powerful private developers. Furthermore,

project implementation usually requires some form of *"buy-in from the local elite"*, i.e., a project-based and negotiated relationship between private-sector developers and state actors (Nam, 2017: 626). Local stakeholders have indicated in qualitative interviews that experimental pilot or demonstration projects, governmental incentive schemes as well as cooperative and multi-stakeholder platforms might be supportive or in favor of a sustainable urban transformation in Phnom Penh's building sector, whereas assumed cost increases, deficiencies of local capacity and a lack of market readiness might stand in its way.

Briefly, the preliminary problem analysis of the different work packages of the Build4People project showed that only systemic trans-disciplinary, cross-cutting and people-led enabling approaches can promote sustainability and to increase urban quality of life in Phnom Penh.

Objectives of the research and development phase

Based on the insights and experience of the previous preparatory phases, the overall aim of the Build4People project's upcoming four-year Research and Development phase (RD phase) is therefore to support and analyse a transformative shift in Phnom Penh's current business-as-usual urban development pathway towards a pathway with higher sustainability and liveability levels. For this purpose, the building sector will be used as the entrance point of the research.

Urban transition scholars have highlighted that such a sustainable urban transformation is not only a technological challenge but also a social, cultural, economic and political one (Rohracher, 2001; Rink et al., 2018). To contribute to an understanding of the challenges and to simultaneously

address these, the Build4People team will combine societal and scientific problem-based analytical research with transdisciplinary action research approaches. These aim to (i) understand and support possible transition pathways, barriers and drivers, and to (ii) align support of transformational change in the behavioural, environmental, technical and policy dimensions.

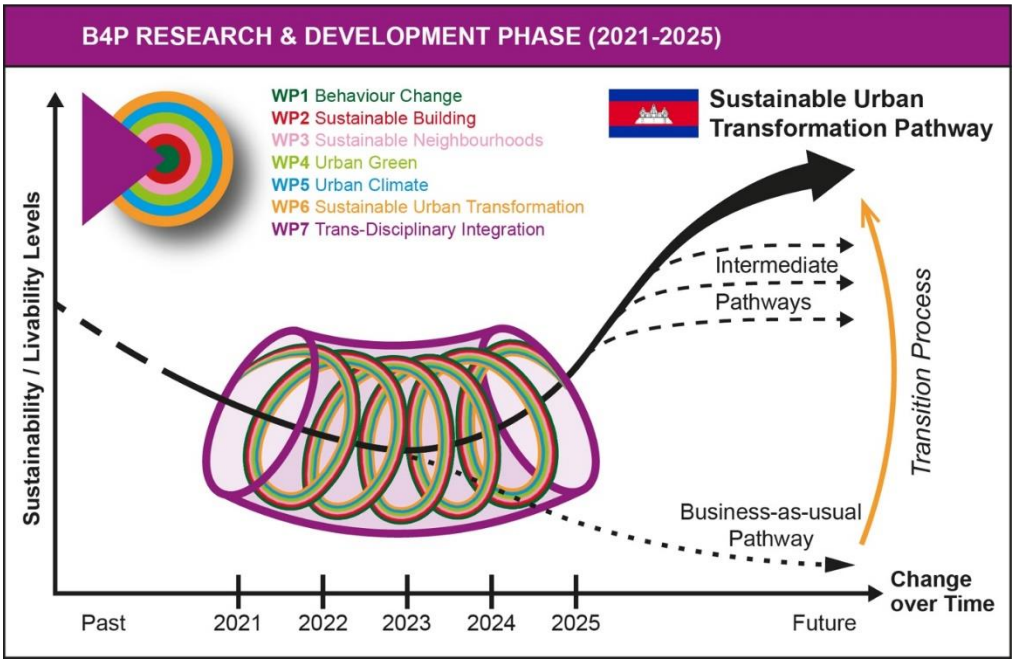
In general, the project's activities will support the gradual shift from a top-down planning culture, which so far has been rather technocratic and based almost exclusively on issuing static plans in a top-down manner, to a planning culture in which urban planning is more integrated, people-led and understood as a process and dialogue involving a broad spectrum of actors from government, civil society and the private sector in the development and implementation of strategies.

Figure 1 illustrates the ideal-typical impacts of the Build4People project. It shows the development path of Phnom Penh over time with stagnant or even decreasing liveability and sustainability levels in the recent past. In the figure, the Build4People interventions and action research (explained in more detail in the following) successfully support a sustainable urban transformation towards a pathway with higher sustainability and liveability levels. The project itself is visualised as an iterative set of interventions (helix) that are implemented in a transdisciplinary manner by the different work packages (WPs), distinguished by specific WP colours, under the guidance of WP7 (purple container).

Being fully aware that a transition is subject to complex and systemic processes, and that a complete and project-induced transition is, therefore,

unrealistic, the Build4People team considers the facilitation of intermediate transition pathways to be more feasible within the funded timeframe.

Figure 1. The overall aim of the Build4People Project (ideal scenario)



Source: Own design

Distinguishing our project from other predominantly poverty-led approaches implemented by state donors or non-governmental organisations in the Kingdom of Cambodia, additional focus will be put on the so-called *"new consumers"*, a key group in terms of global sustainability (Myers & Kent, 2003; Waibel, 2009). Despite the ongoing coronavirus crisis, a significant improvement in living standards can be anticipated with the expected boost of urbanisation in Phnom Penh. The predicted massive expansion of the urban middle-class population is expected to create an increasing demand for construction, prompting a sharply rising ecological

footprint due. The urban middle-class population will have specific requests in terms of urban quality of life, which may conflict with overall sustainability goals. The environmental psychologists of the project team will therefore scrutinize urban middle-class values, norms and behaviour to better tailor their intervention measures for effectiveness.

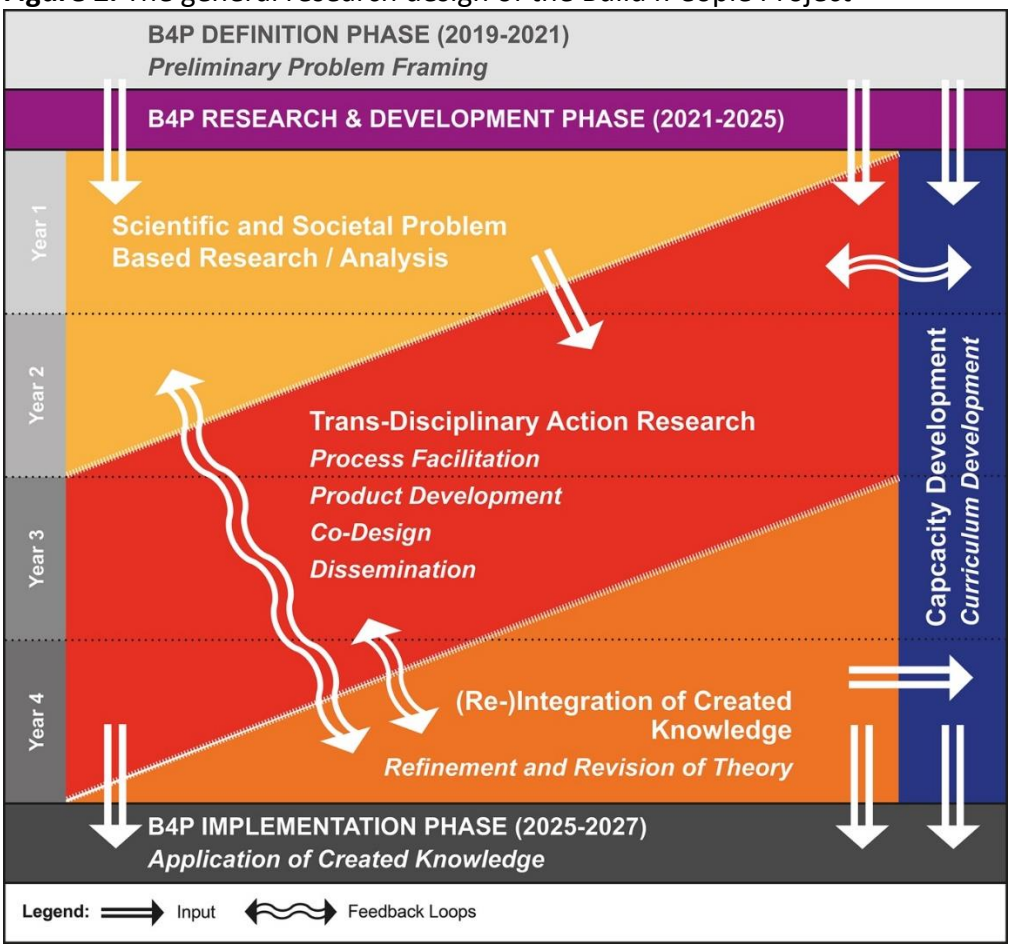
The common link of the Build4People project's scientific-conceptional, analytical and normative dimension is the urban quality of life (UQoL), which is considered to be the general foundation for our people-driven approach. Our team considers the notion of UQoL to be a multiple-dimensional concept that brings together "physical, psychological, social and ecological aspects and takes into account both subjectively perceived well-being and objective conditions" (WBGU, 2016: 86). Consequently, we will jointly conceptualize, measure, and model UQoL and also critically consider its political dimension and ambiguous relationship to sustainability. We will approach UQoL in two ways: based on an analytic research approach that enquires about the relative impact of different objective and subjective factors on urban quality of life, and a more normative approach that understands sustainable transformation as an essential prerequisite for UQoL. Finally, a multi-dimensional UQoL is also a linking factor when considering each level: the individual; the household, the building; the neighbourhood; the city.

Research design and methodology

The research design of the Build4People project consists of three overlapping spheres based on transdisciplinary research approaches in sustainability science (Lang et al., 2012; Noboa, 2019) (see Figure 2): (1) societal and scientific problem-based research; (2) transdisciplinary action

research, and (3) reflection, refinement & re-integration of created knowledge. In the first year, all work packages will approach the societal and scientific problems against the backdrop of the existing physical, socio-economic, cultural and political context. Within this sphere, the overall focus is on empirical data collection and data analysis, mostly done separately by each work package in cooperation with their local research partners (see Figure 2).

Figure 2. The general research design of the Build4People Project



Source: Own design based on Lang et al., (2012: p. 28)

The most significant joint empirical research activity during this sphere is a large-scale joint household survey that aims to assess the status quo of UQoL by combining objective and subjective factors as a basis for intervention measures. A stratified representative sample is required for the evaluation of different factors that are expected to have a significant impact on their quality of life. The variety of factors is determined by results from previous research.

The research focus in years 2 and 3 will then shift to transdisciplinary action research in continuous exchange and cooperation with local stakeholders. In this context, the Build4People team defines action research as a reflective process of progressive problem solving and learning system that integrates research, action, and analysis (Riel & Lepori, 2014). This is to ensure that the project will bring together, apply and extend the initial research findings with the overall aim of generating actionable knowledge for local stakeholders and a basis for evidence-based decision-making. At the same time, this offers the opportunity to implement people-led perspectives. Here, learning systems such as the *Build4People Ecocity Transition Lab*, the *Build4People Sustainable Building Arena* and the *Build4People Sustainable Building Incubator* (see Figure 3) are facilitated, and the local stakeholders are actively engaged in a transdisciplinary knowledge co-production process with scientific inputs from all WPs.

From the perspective of sustainable urban transformation, the facilitation and analysis of those action research processes can provide valuable scientific insights into how socio-technical and socio-institutional

change can be influenced with the overall aim of supporting an urban sustainability transition in Phnom Penh.

Finally, tangible knowledge products as outcomes of Build4People transdisciplinary processes will be co-designed and developed step by step within the Build4People team. One prominent product is the *Build4People Toolbox for Sustainable Neighbourhood Development* (see Figure 3), which will include a catalogue of strategies, guidelines and criteria. These will be developed in the action research process and derived from the integrative masterplan framework for the case study site in Phnom Penh, as well as through adaptation of Southeast Asian and European approaches. In particular, the advanced assessment system for sustainable urban districts developed by the German Sustainable Building Council (DGNB) will be an important starting point. The Build4People toolbox will be presented in an easy-to-access and interactive web platform addressing different target groups such as city administrations, developers and consultants as well as universities. A special focus will be on the visualisation of the interrelations between the involved sectors for achieving comprehensive planning results and synergetic effects, which often make sustainable design economically feasible (Messerschmidt & von Zadow, 2019). Another related product that targets a wider audience is the *Build4People Handbook for Green Housing and Sustainable Living* (see Figure 3). This richly illustrated publication will be developed in a co-design process involving local stakeholders and designed to present, in an easy-to-understand language (thus being accessible to non-experts), information about technical, constructive corporate and behavioral solutions for climate-adapted green residential buildings. It will be published

as a soft copy and also via a web platform including interactive learning tools. In general, we do not regard the finalisation of products such as the handbook as the end of our research effort, but as a starting point for intensive dissemination and intervention campaigns through multi-stakeholder coalitions. This is to ensure application and mainstreaming with maximum outreach.

Finally, the Build4People toolbox and the Build4People Handbook are also regarded as key transdisciplinary instruments to integrate expertise and empirical research results from all work packages of the Build4People project and to foster engagement of partners from various institutions in Germany and, more importantly, in the Kingdom of Cambodia.

Furthermore, we aim for less tangible outcomes such as alternative discourses and narratives, new stakeholder coalitions, socio-institutional spin-offs and increased pro-environmental behaviour among the urban population. Empowered actors or change-makers /frontrunners, various participatory procedures, e.g. focus groups, multi-stakeholder workshops and a world café (Brown & Isaacs, 2005) will enrich the analyses of the Urban Quality of Life (UQoL) dataset, allowing a deeper, context-sensitive and joint concept of UQoL together with all its influencing factors. This will allow for the development of an empirical data-based and theory-driven framework for awareness campaigning to foster ecological awareness, pro-environmental social norms and sustainable lifestyles in Phnom Penh.

During year 4, the main focus will shift again to reflective research activities. Here, the findings from the transdisciplinary action research phase are connected to the theory-based research of year 1 in an iterative way

through feedback loops (see Figure 2). It will lead to the (re-) integration and refinement of created knowledge and finally to the revision and extension of theory and will also serve to re-adjust the processes and products that will be applied during the subsequent Implementation phase. An initial theory-driven and data-based draft of a UQoL-Model will be refined with respect to the outcomes of the transdisciplinary action research and with respect to the ongoing integration of more and more objective and subjective data. Based on this, the UQoL model will thereby identify promising measures to foster urban quality of life in Cambodia to be applied during the subsequent Implementation phase.

All in all, it can be safely assumed that due to the Build4People project's inter-/ trans-disciplinary approaches, new fields of scientific knowledge will be developed, with significant effects on disciplinary as well as interdisciplinary publication strategies.

Role of capacity development

Throughout the RD phase, cross-cutting input will be given to capacity mobilisation (see Figures 2 & 3). Already previously, local actors have shown both a need for and an interest in this field. In general, capacity building takes place intrinsically through regular communication and joint activities together with the research, implementation and dissemination partners. As mentioned above, the Build4People processes such as the Ecocity Transition Lab, the Sustainable Building Arena or the Sustainable Building Incubator are intended to generate actionable knowledge for local stakeholders.

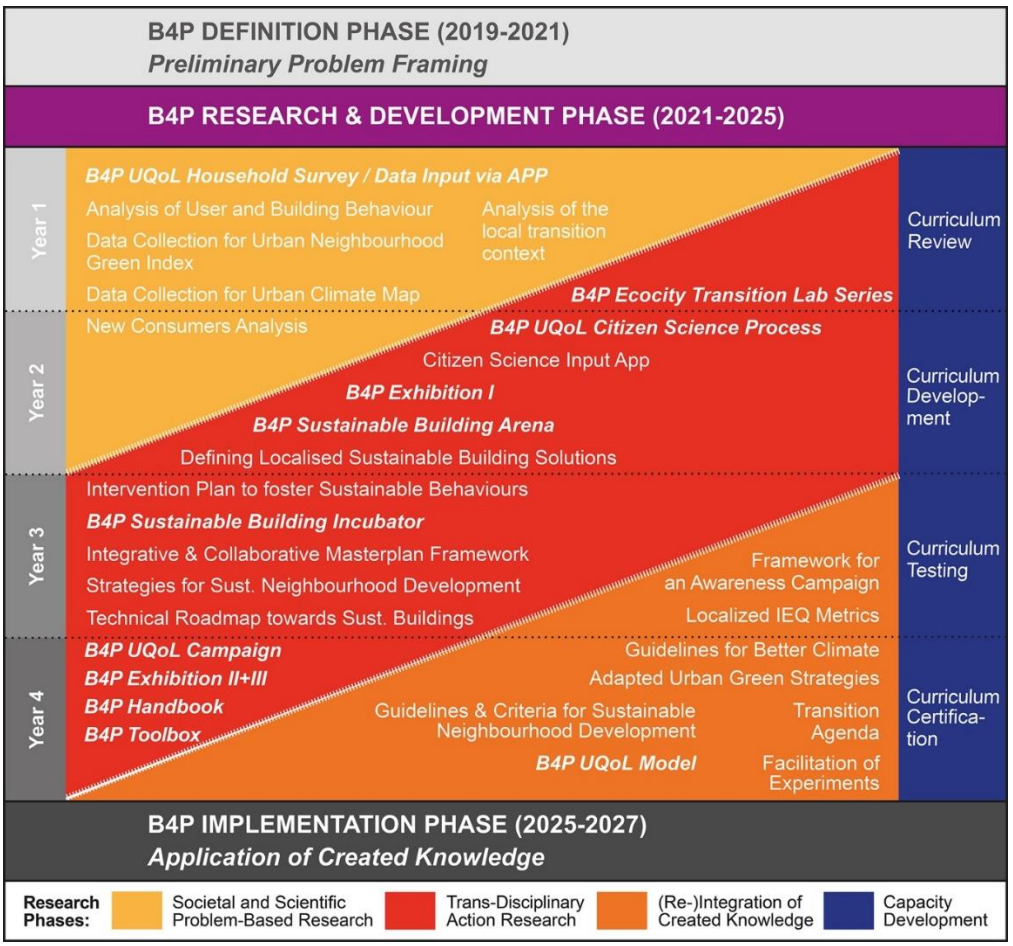
In particular, there have been requests to support the development of new master courses or to provide input to existing master courses at our

research partner institutions. We have decided to focus on the development of a new multi-disciplinary Master course on *"Sustainable Urban Transformation Planning"* (working title) at the School of Architecture and Urban Planning at Paññāsāstra University. In contrast to other local courses in this field, which are usually very much focused on questions of design, the idea is to incorporate the Build4People project's holistic and people-orientated approach into the curriculum. The new course will not be a mere imitation of a curriculum or textbooks from universities of the Global North but will feed into the refined research findings of the Build4People team. This is expected to provide locally actionable knowledge, tools and feasible solutions that are conducive to more sustainable urban development pathways in Cambodia.

The Build4People team will complement these activities by critically reviewing existing course units and co-designing new course units in the context of the existing Master Course in Global Change (MICC) and a Master Course currently under development in the field of Geography at the Royal University of Phnom Penh. Also, at the Royal University of Agriculture, the topic of *"urban green"* will be integrated into the curricula at the faculty of Land Management and Land Administration. Further aims during the RD phase include efforts to organise joint summer schools, online work design studios or similar activities and to intensify the international exchange of faculty members. The joint curriculum development is regarded as another key transdisciplinary instrument to integrate expertise and empirical research results from all Work Packages of the Build4People Project.

Finally, the Build4People team strongly believes that contributing input to formats such as master courses will secure a lasting impact – even after the Build4People project funding ceases. The following figure 3 summarises the most important envisaged outcomes of the Build4People project along with the three research spheres.

Figure 3. Outcomes of the Build4People Project



Source: Own design

Achieving successful cooperation within the Build4People project

With so many disciplines involved, transdisciplinary integration can only be achieved by implementing a research design that brings together all work packages closely together in empirical or societal data collection, in transformation processes such as the Build4People Ecocity Transition Lab, through joint capacity-building activities and the joint development of dissemination products.

Experience shows that transdisciplinary integration requires a great deal of time-consuming communication within the research team, but also between academia, policy-makers and the general public. Obviously, it also requires mutual respect on the part of the members from different disciplines. During the RD phase, all this will be facilitated through regular online meetings, workshops and rounds of monitoring, self-reflection, evaluation and learning. The key responsibility for managing the essential transdisciplinary integration will lie in the hands of the consortium lead at Hamburg University. Table 1a in Appendix 1 provides an overview of the Build4People project's cooperation structures.

Conclusion and outlook

The Build4People project is an ambitious implementation-oriented research project consisting of multiple disciplines and involving stakeholders from the spheres of state, economy and civil society (see Figure 1a, Appendix 1). In the context of the upcoming RD phase, sustainable urban transformation will be encountered by a systemic and cross-cutting approach. Build4People's innovative outcomes (see Figure 3) are based on an intricate three-phase research design including an analytical phase, action

research with stakeholders and a final phase of review and refinement of theory (see Figure 2). This is to ensure high-value scientific output as well as real implementation.

In this approach, comprehensive transdisciplinary research and added value can best be achieved through the design of joint activities and products (see Figure 1). The transdisciplinary research process will be connected to (a) national-level policymaking processes through Build4People project's membership in the inter-ministerial sector Technical Working Groups on Green Buildings and Sustainable Cities, (b) transnational initiatives through a regional technical roadmap as a localized part of UNEP's global road-mapping activities, and (c) the local start-up scene through a sustainable building incubator.

The Build4People project results will be further disseminated through tangible knowledge products such as a toolbox, a handbook or several exhibitions reaching out to different target groups via locally established multipliers.

All of these factors combined are intended to support the transformative shift of Phnom Penh's urban development pathway towards higher sustainability and liveability levels. A lasting impact beyond the Build4People project funding period itself is also be achieved through capacity-building activities with a focus on curriculum development support among Build4People's research partners at local universities. This is also regarded as an opportunity to feed in the refined research findings and serves as another transdisciplinary instrument to compile and connect results from all work packages.

To ensure application and mainstreaming with maximum outreach, we generally do not regard the finalisation of research outcomes as the end of our efforts, but as a starting point for intensive dissemination and intervention campaigns through multi-stakeholder coalitions. In this context, the long-term funding perspective of four years, even with a subsequent two-year implementation phase, is another strategic advantage of the Build4People project. In general, it can be concluded that research projects such as Build4People can only work out solutions for sustainable urban development together with urban society. By actively communicating and cooperating with multiple stakeholders, their concerns and competencies can be integrated into the research process. At the same time, the understanding of the areas of concern on the part of society and the motivation to implement sustainability measures can be increased. Based on a common understanding of the problem, innovative approaches can not only be developed but also tested by using scientifically monitored, real urban district developments. Among others, this is applied by means of the Build4People Ecocity Transition Lab as a transformation platform and as a tool of integrated urban development. Ultimately, however, the success of the project will require a great deal of inward and outward-orientated communication in combination with mutual recognition of the competencies of each scientific discipline involved, and of the local cultural specificities in particular.

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Methodology, all authors;

Writing—review and editing, Waibel, M., Mund, J.-P.;

Visualization, Waibel, M. (all figures), Jayaweera, R. (figure 1 & 2);

All authors have read and agreed to the published version of the manuscript.

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Biography

The corresponding author Michael Waibel has been working as a senior researcher, lecturer and project leader at the Department of Human Geography of the University of Hamburg, since 2007. From 1996-2007 he was a research associate at the Department of Human Geography of the University of Göttingen. He holds a PhD in Human Geography and an M.Sc. in economic geography, geography and national economy with key competencies in urbanism, sustainability sciences, housing, urban governance, urban lifestyles and green growth approaches. He has about 25 years of international experience in academic work, consultancy work and capacity development in Southeast Asia as well as in East Asia. In 2001 he published his Ph.D.-thesis about the urban development of Hanoi / Vietnam. He has benefited from well over 100 study trips to the Asian region.

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Appendix

Figure 1a. A comprehensive overview of Build4People consortium

German Partners	Magdeburg University (OvGU)	Stuttgart University (USTG)	Eble Messerschmidt Partner (EMP) *(SME)*	Eberswalde University for Sustainable Development (HNEE)	Institute for Climate and Energy Concepts (INKEK) *(SME)*	Hamburg University (UHH)
Cambodian Partners	Royal University of Phnom Penh (RUPP)	Institute of Technology of Cambodia (ITC)	Paññāsāstra University of Cambodia (PuC)	Royal University of Agriculture (RUA)	Royal University of Phnom Penh (RUPP)	Royal University of Phnom Penh (RUPP)
Work Package (WP)	WP#1: Behaviour Change	WP#2: Sustainable Building	WP#3: Sustainable Neighbourhoods	WP#4: Urban Green	WP#5: Urban Climate	WP#6: Sustainable Urban Transformation
Focus	*environmental psychology* *conceptualization / modelling of UQoL* *user behaviour* *intervention strategies and awareness campaigning* *participatory and inclusive approaches* *gender dimension of sustainable living and UQoL*	*sustainable, energy efficient and climate adapted building* *comfort assessment* *IEQ measurement* *design & simulation parameter studies (LCA, LCC)* *development of assessment standards* *building physics*	*strategies, guidelines and criteria for sustainable neighbourhood development* *assessment and certification standards (in cooperation with DGNB)* *conceptualization of B4P toolbox* *main facilitation of ECTL* *exhibition curation and design*	*urban and neighbourhood level* *geo-spatial analysis of urban green infrastructure* *calculation of green urban neighbourhood index* *UQoL Citizen Science Input APP* *statistical data modelling* *project data management within Nextcloud*	*urban and neighbourhood level* *urban heat island* *human thermal comfort* *ventilation streams* *resilience against climate change* *urban climate modelling,* *urban-rural climate linkages,* *regional climate map*	*transition studies and urban governance* *socio-technopolitical system and urban development regime analysis* *socio-institutional and socio-political context* *transition management* *strategic niche management* *transition pathways* *facilitation of experiments*
Responsible Persons	Dr. Anke Blöbaum / Prof. Dr. Ellen Matthies /	Dr. Dirk Schwede	Rolf Messerschmidt	Prof. Dr. Jan-Peter Mund	Prof. Dr. Lutz Katzschner / Sebastian Kupski	Dr. Michael Waibel
Consortium Leader (UHH)	**WP#7: Coordination, Communication & Dissemination** *Overall project management, trans-disciplinary integration within Build4People Project, conference organisation, logistics support to Build4People processes, dissemination and event organisation, advocacy, impact management, PR work, social media strategy, coordination of joint master course development as key part of Build4People capacity mobilisation activities, liaison with the implementation and dissemination partners as well as to the corporate sector, industrial fair participation*					
Responsible Persons	Dr. Michael Waibel Dr. Susanne Bodach (local project assistance)					
Project Management Partner	➢ Cambodian Institute of Urban Studies (CIUS)					
Key Implementation Partner	➢ Phnom Penh Capital Administration (PPCA)					
Capacity Mobilisation Partners (Curriculum Development)	➢ Paññāsāstra University of Cambodia (PUC) ➢ Royal University of Phnom Penh (RUPP) ➢ Royal University of Agriculture (RUA)					
Corporate Cambodian Research Partners	➢ Urban Living Solutions, Phnom Penh ➢ Green Infrastructure Solutions, Phnom Penh					
Dissemination Partners	➢ European Chamber of Commerce of Cambodia (EuroCham), Phnom Penh ➢ Centre for Khmer Studies (CKS) ➢ META House, Phnom Penh ➢ Industrial Fair Cambodia Architect & Décor, Phnom Penh					
Scientific Advisory Board	• Dr. Stephan Anders, DGNB • Dr. Eduardo Noboa, WorldFuture Council • Mélanie Mossard, Impact Hub PP • Bradley Abbott, GGGI, Phnom Penh • Andéol Cadin, Chairperson of Green Business Committee of European Chamber of Commerce Cambodia • Michel Cassagnes, Chairperson of Real Estate & Construction Committee of European Chamber of Commerce Cambodia					

Source: Own design