

Build4People Project

Enhancing Quality of Life through Sustainable Urban Transformation in Cambodia

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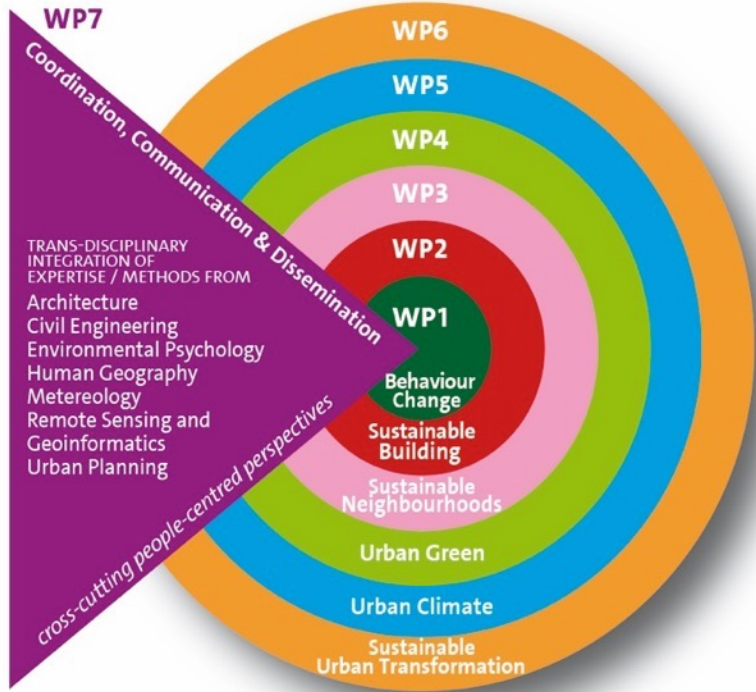
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Sustainable Development of Urban Regions



Resource Efficiency and Mitigation within the Build4People Project

Michael Waibel, Jan-Peter Mund, Dirk Schwede
with inputs from Lutz Katzschner and Rolf Messerschmidt



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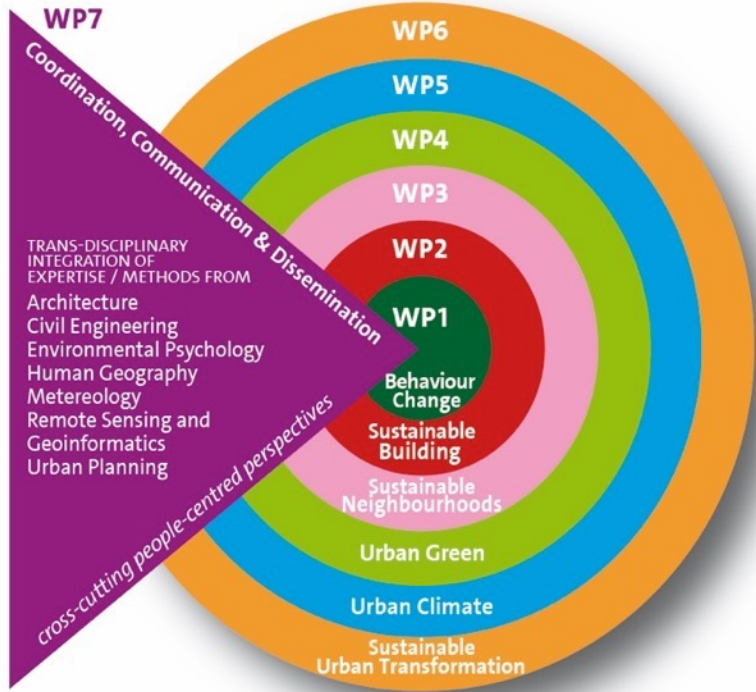
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SURE Sustainable Development
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ការសម្របសម្រួល, ការទំនាក់ទំនង និង ការផ្សព្វផ្សាយ



Work Packages កញ្ចប់ការងារ

WP1: Behaviour Change
ការផ្លាស់ប្តូរឥរិយាបថ



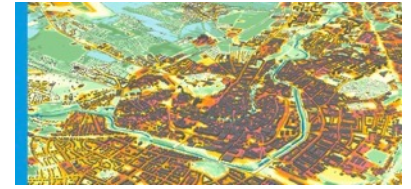
WP4: Urban Green
ទីក្រុងបៃតង



WP2: Sustainable Building
អគារដែលមាននិរន្តរភាព



WP5: Urban Climate
អាកាសធាតុទីក្រុង



WP3: Sust. Neighbourhoods
សហគមន៍ដែលមានចីរភាព



WP6: Sust. Urb. Transformation
ការផ្លាស់ប្តូរទីក្រុងដោយនិរន្តរភាព



➤ **The Build4People project follows a people-led, cross-cutting and transdisciplinary approach**

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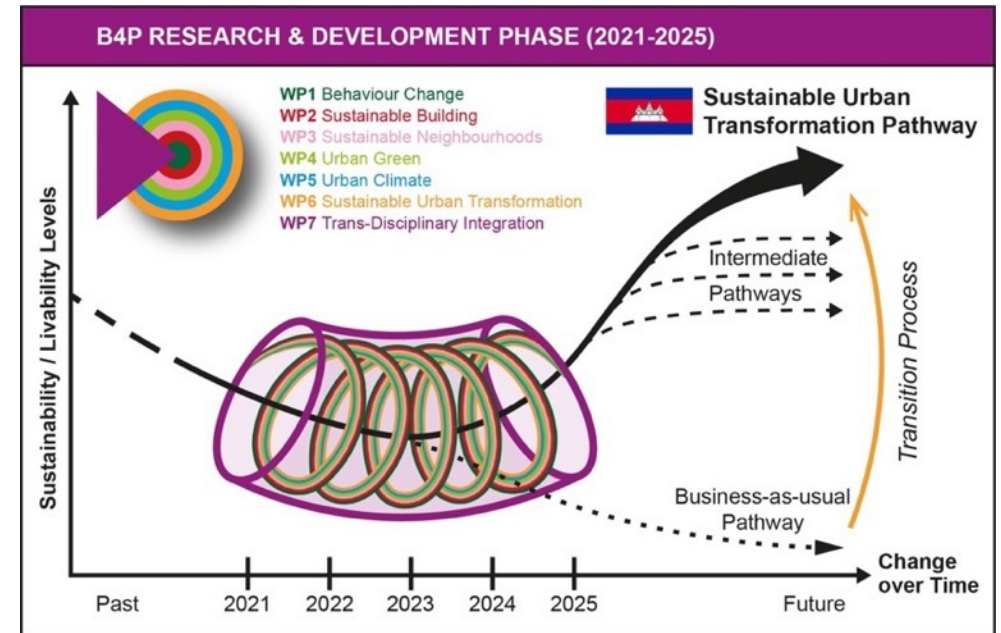
General Approach of BuildPeople Project

Rationale of Research & Development Phase

“Sustainable Urban Transformation is not only a technological challenge but also a social, cultural, economic and political one”.
(Rohracher, 2001; Rink et al., 2018)

General Approach

- ✓ Systemic to support a transition process
 - ✓ People-led
 - ✓ Cross-cutting
 - ✓ Trans-disciplinary
 - ✓ Action research
 - ✓ Integrated urban development
- **The aim is support a more sustainable urban transformation pathway by means of interventions and action research**



Source: Own design.



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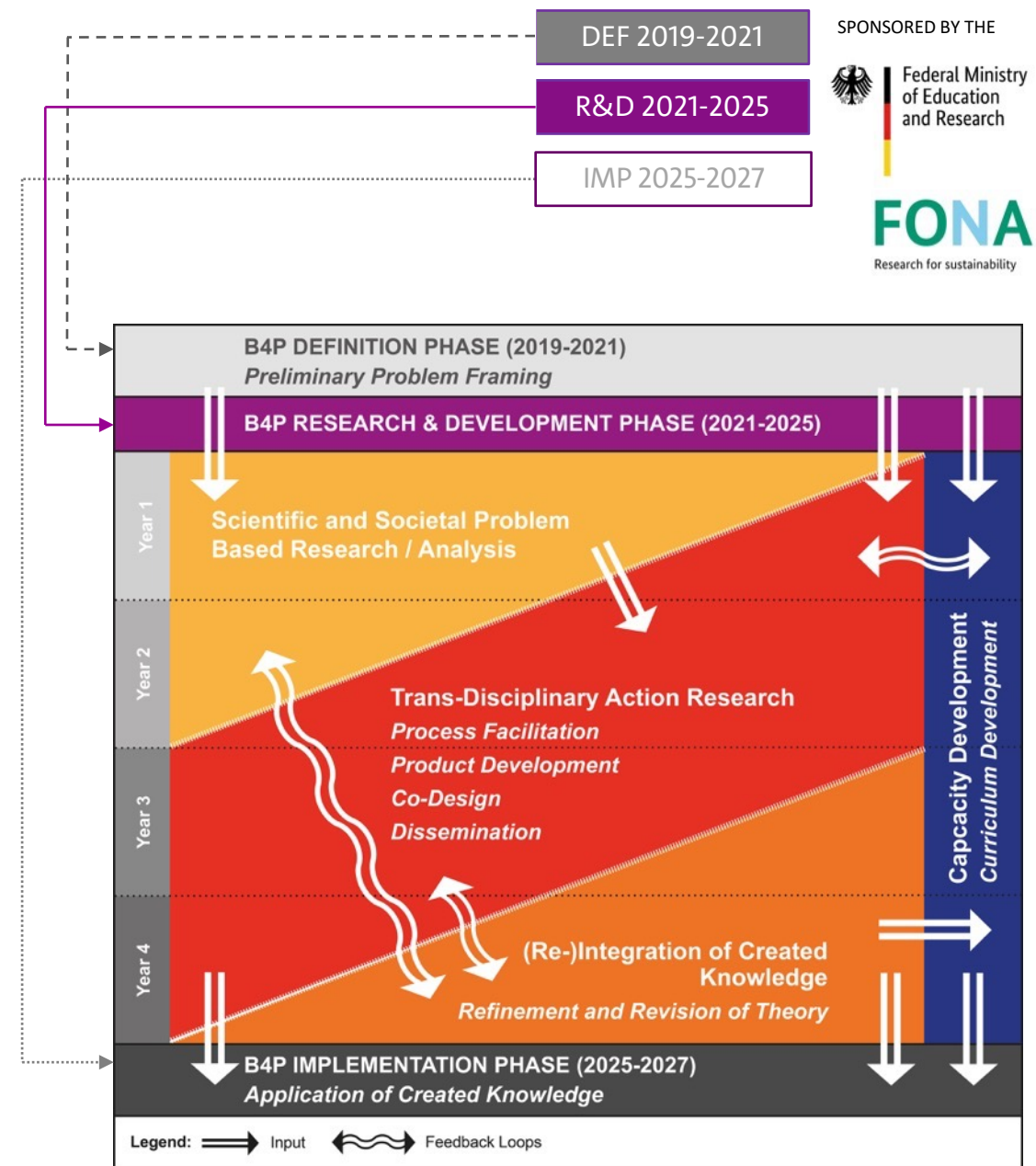
General Approach of BuildPeople Project

Build4People Research Design

The design of the B4P RD phase consists of three overlapping spheres based on renowned trans-disciplinary research approaches in sustainability science. (Lang et al., 2012; Noboa, 2019)

- 1) Analytical phase: Societal and scientific problem-based research,
- 2) Transdisciplinary action research, and
- 3) Concluding phase of reflection, refinement & re-integration of created knowledge.

➤ **State of the art approach based upon an intricate three-phase research design**



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



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General Approach of BuildPeople Project

Build4People Research Design

- ✓ 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 actionable knowledge for local stakeholders and a basis for evidence-based decision-making.
- **Comprehensive transdisciplinary research and added value can best be achieved through the design of *joint* activities and products**

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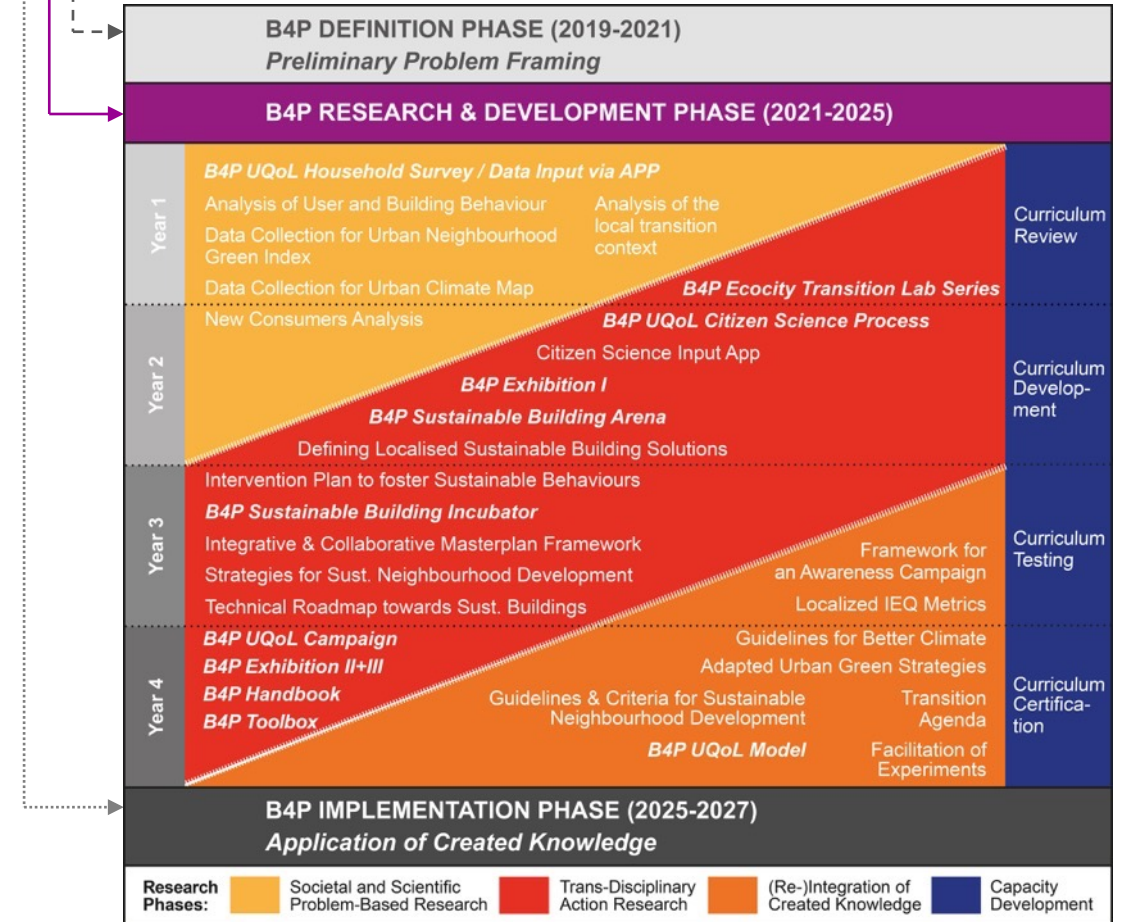
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Source: Own design.



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Main challenges to achieving efficiency in the use of resources and a reduction in CO2 emissions

- Long tradition of vernacular architecture <-> modern practices
- Vivid economic activities
- Modern consumer society -> more resource-intensive life-styles
- Electricity consumption per capita has sharply risen
- Car boom, particularly of SUV- and Jeep types
- Spatially isolated residential enclaves, mostly in the suburbs
- Doubling of the urban population expected by 2030 according to EuroCham
- 50% of the buildings with long-lasting sustainability impacts that will be standing in Cambodia in 2050 have not been built yet
- **Unique window of opportunity to tackle sustainable buildings and sustainable urbanization**



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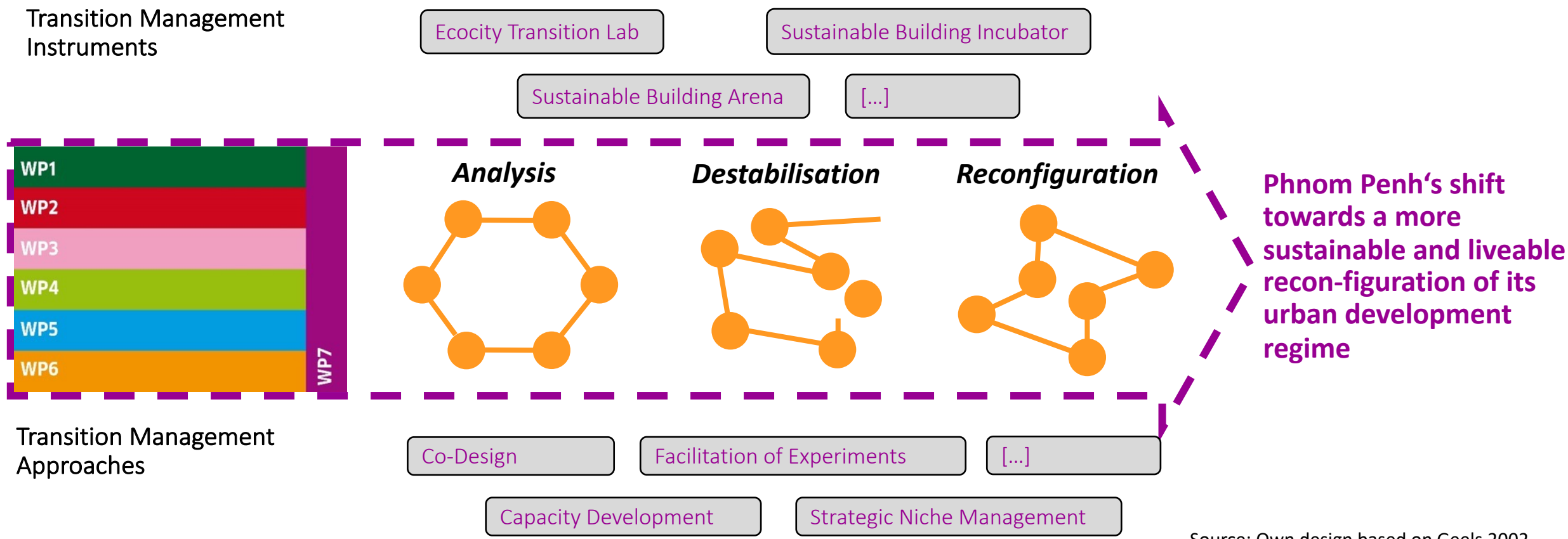


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Methods and action-oriented approaches to climate protection and adaptation from WP6



Source: Own design based on Geels 2002.

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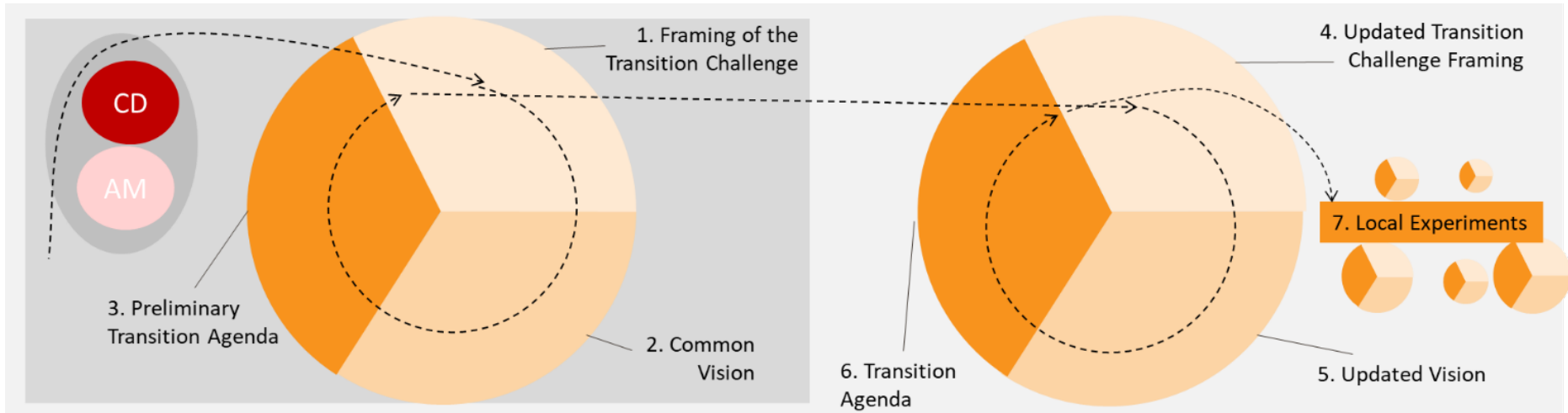
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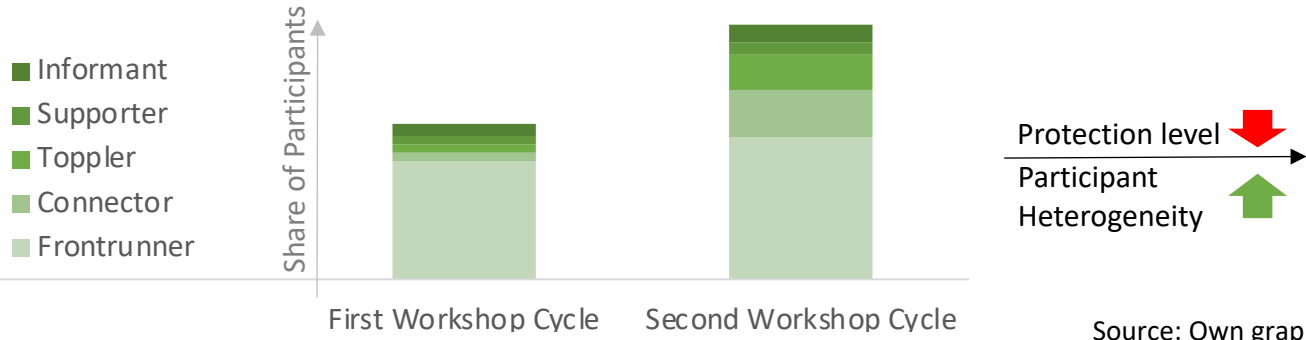
Methods and action-oriented approaches to climate protection and adaptation from WP6



SBA Phases and Actors



Impressions from 1st Build4People SBA in March 2022, Phnom Penh



Source: Own graph.

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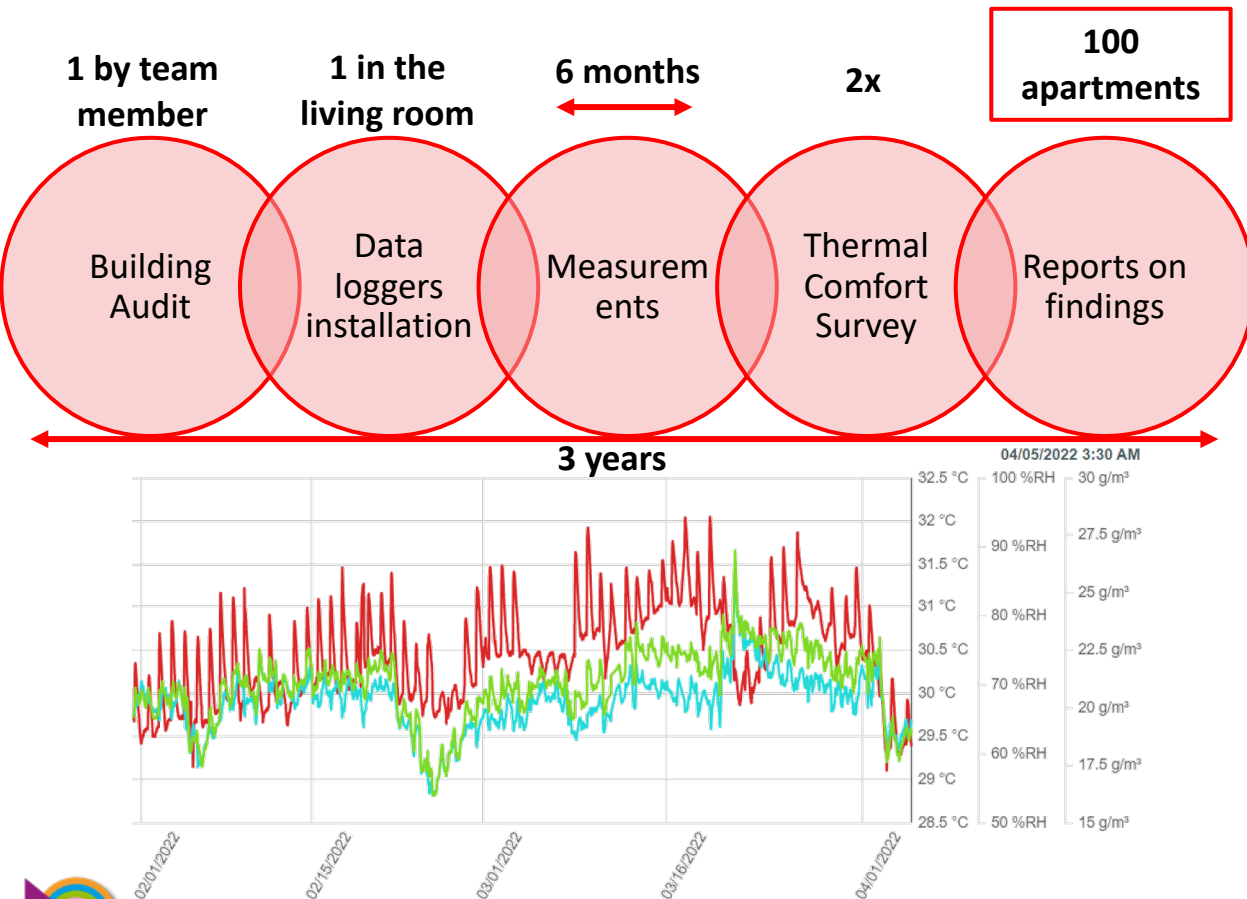


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Methods and action-oriented approaches to climate protection and adaptation from WP2

Building audits and basic measurements

- A series of surveys and studies are conducted in Phnom Penh within the Build4People project in order to answer how can indoor environmental quality be evaluated, measured and enhanced, both on the user and building level in the specific context of Phnom Penh.
- Comprehensive indoor environmental data and occupant behaviour information are collected, analyzed and used as a basis for subsequent simulation studies .
- The whole survey campaign consists of 4 main parts: household survey, building audit and long-term monitoring, and thermal comfort survey.
- The collected data are analyzed, processed and prepared for following research and development of climate-adapted buildings in Phnom Penh



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Methods and action-oriented approaches to climate protection and adaptation from WP2

Technical Roadmap towards Sustainable Building in Phnom Penh

- Developed and adapted to the expected economic, social and technological development of the country.
- The effects of climate change and the development of the urban microclimate are also considered.
- The relevant aspects of the building sector are outlined in cooperation with WP6, individual fields of technology are dealt with in detail.
- The technology fields (e.g. comfort cooling technology, material use, integrated renewable energy) are identified using our building audit and thermal comfort studies, the SBA results, literature review of green building rating schemes in the area, expert interviews and an online environmental challenges survey.

Objective:
Steps for a Building-Governance-Roadmap 2050
→ UQoL from the viewpoint of the building design



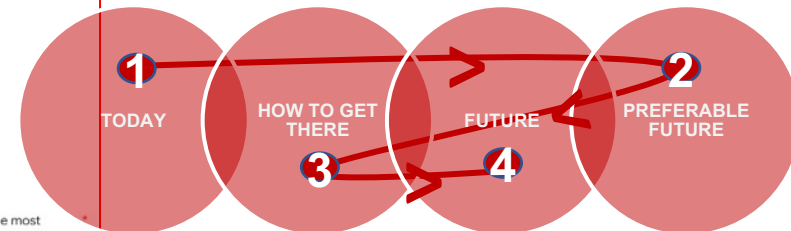
Green building rating systems in ASEAN Source: Mapping of Green Building Codes and Building Energy (2018)

5/3/22, 9:57 AM Environmental Challenges Survey

Life-Cycle of buildings All of the questions in this section are open and you can write as much as you wish.

When answering the following questions we would like you to think about the built environment and the life-cycle of buildings in Cambodia in general. Please take a look at the picture below in case you are not fully familiar with a buildings life cycle.

12. For answering this question think about your answer regarding the most important environmental challenges in Cambodia with impact in your direct surroundings. How do these challenges relate to the built environment and to a building's life-cycle?



Methodology of future scenario analysis, Source: Kosow Hannah; Gassner Robert (2018)



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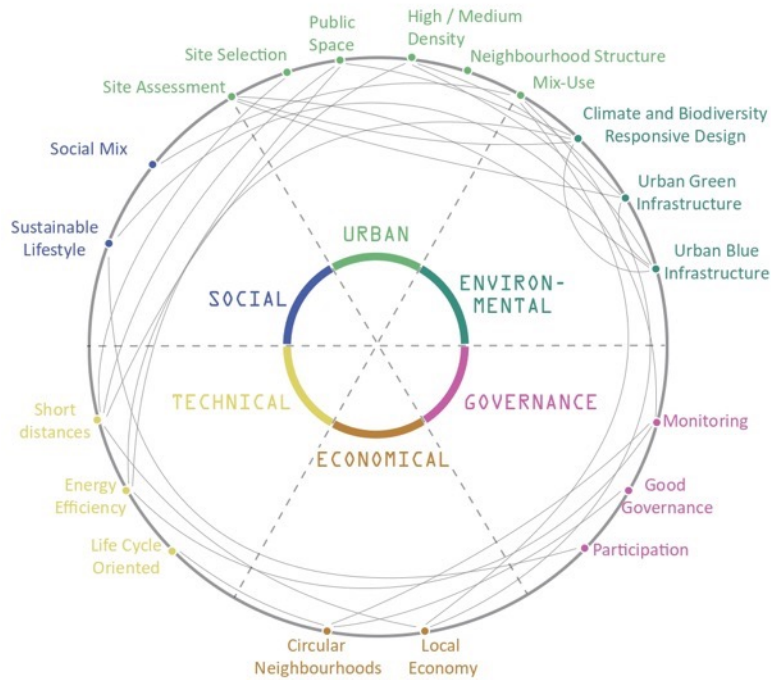
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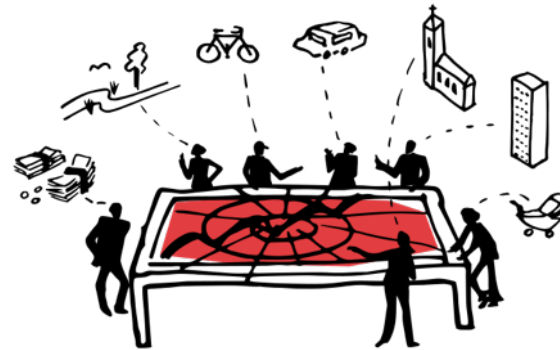
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Methods and action-oriented approaches to climate protection and adaptation from WP3

➤ Sustainability Strategies



Ecocity Transition Lab Approach



Transdisciplinary Integration



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Methods and action-oriented approaches to climate protection and adaptation from WP3

➤ Build4People Ecocity Transition Lab led by WP3



Urban Climate Concept



Green Infrastructure Concept



Blue Infrastructure Concept



Mobility Concept

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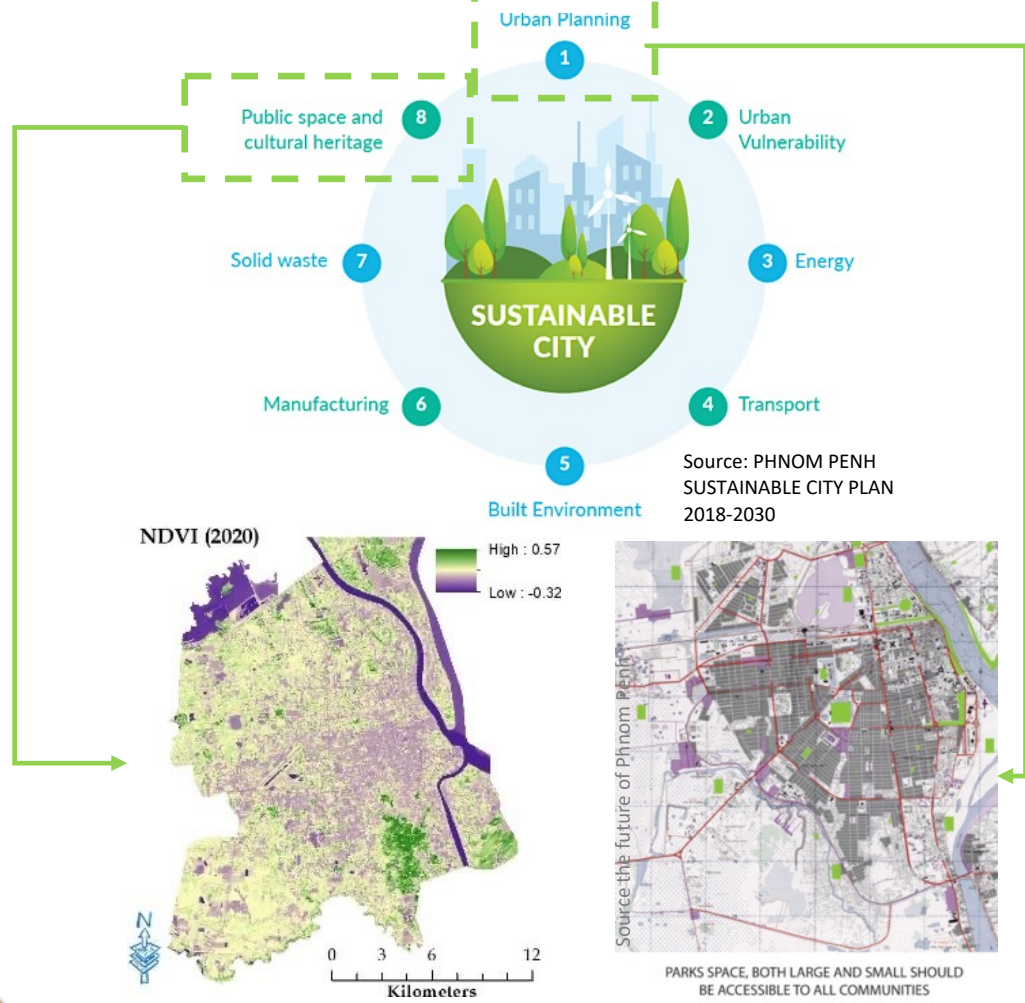


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Build4People Work Package 4: Urban Green Infrastructures



- Urban forests provide ecosystem services to urban residents and makes a contribution to the quality of city life. In Phnom Penh the well-being of communities is at risk due to environmental degradation and a lack of high-quality public spaces for socializing and recreation.
- Open vegetated spaces especially at urban fringes are frequently replaced in Phnom Penh by build-up areas due to unprecedented urban growth
- A study on the vegetation and land surface temperature in Phnom Penh (2021) shows decrease in vegetative areas over the last few years 2016-2020



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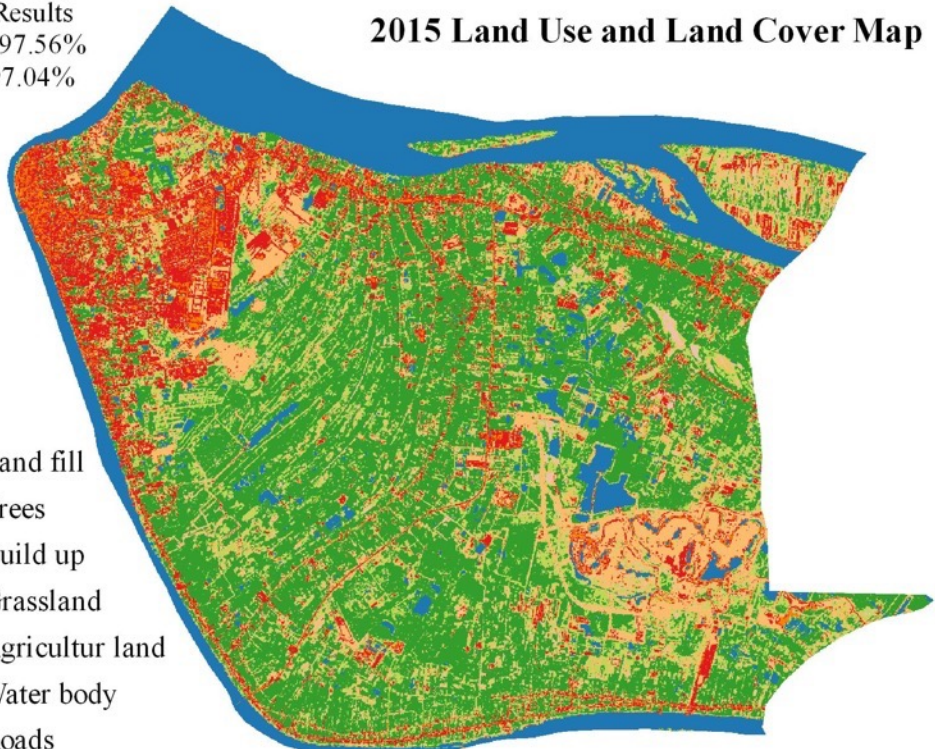
Build4People Work Package 4: Urban Green Infrastructures

- Build4People Work package 4 (WP4) research is investigating the role and function of urban green (infrastructure) in Phnom Penh's sustainable urban planning in a time series analysis. Peri-urban green and open spaces a shrinking.

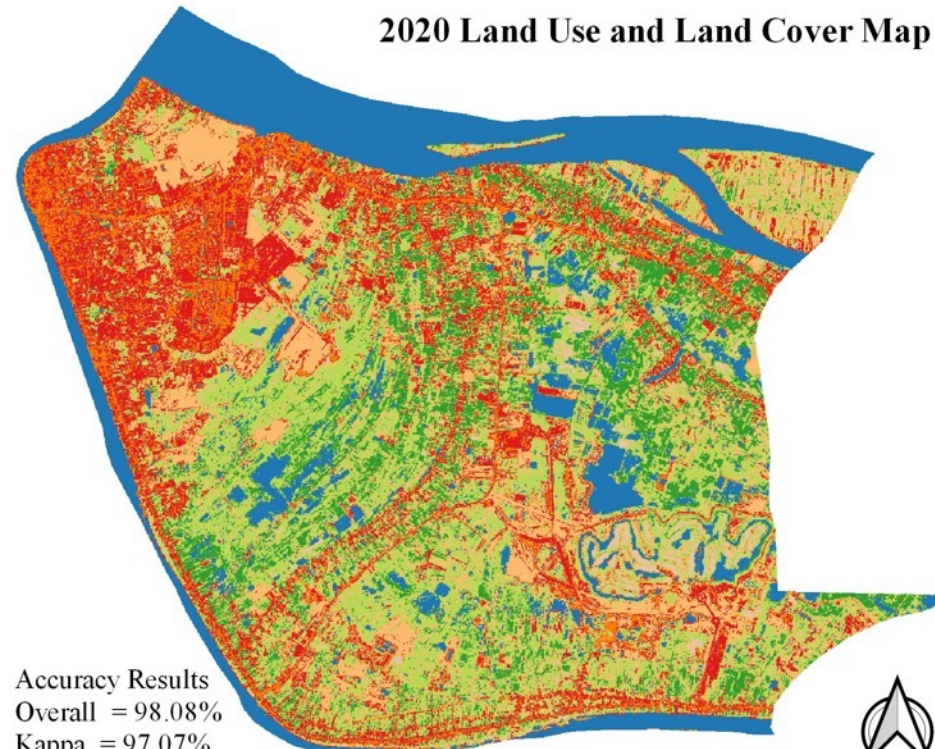
Accuracy Results
Overall = 97.56%
Kappa = 97.04%

2015 Land Use and Land Cover Map

- 1 Land fill
- 2 Trees
- 3 Build up
- 4 Grassland
- 5 Agricultur land
- 6 Water body
- 7 Roads



2020 Land Use and Land Cover Map



Accuracy Results
Overall = 98.08%
Kappa = 97.07%



Source: Sanara, H. ; Mohiuddin, G. Mund, J.-P. RUA & HNEE

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Methods and action-oriented approaches to climate protection and adaptation from WP#5

Urban Climate Map Development

- Urban climate maps as planning tool to understand urban heat island (UHI) effect
- CBD of Phnom Penh with high, dense buildings reduces ventilation which causes UHI
- UHI intensity differs between the areas:
 - Boeung Keng Kang has a maximum UHI intensity of 14.3°C and a minimum UHI intensity of 5.3°C
 - Pou Senchey is considered the least-developed area with a maximum UHI intensity of 12.6°C and a minimum UHI intensity of 4°C
- Wind plays important role to decrease UHI effect and increase human thermal comfort



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Methods and action-oriented approaches to climate protection and adaptation from WP#5

Wind directions and wind characteristics in the investigated area (data from fixed weather stations)

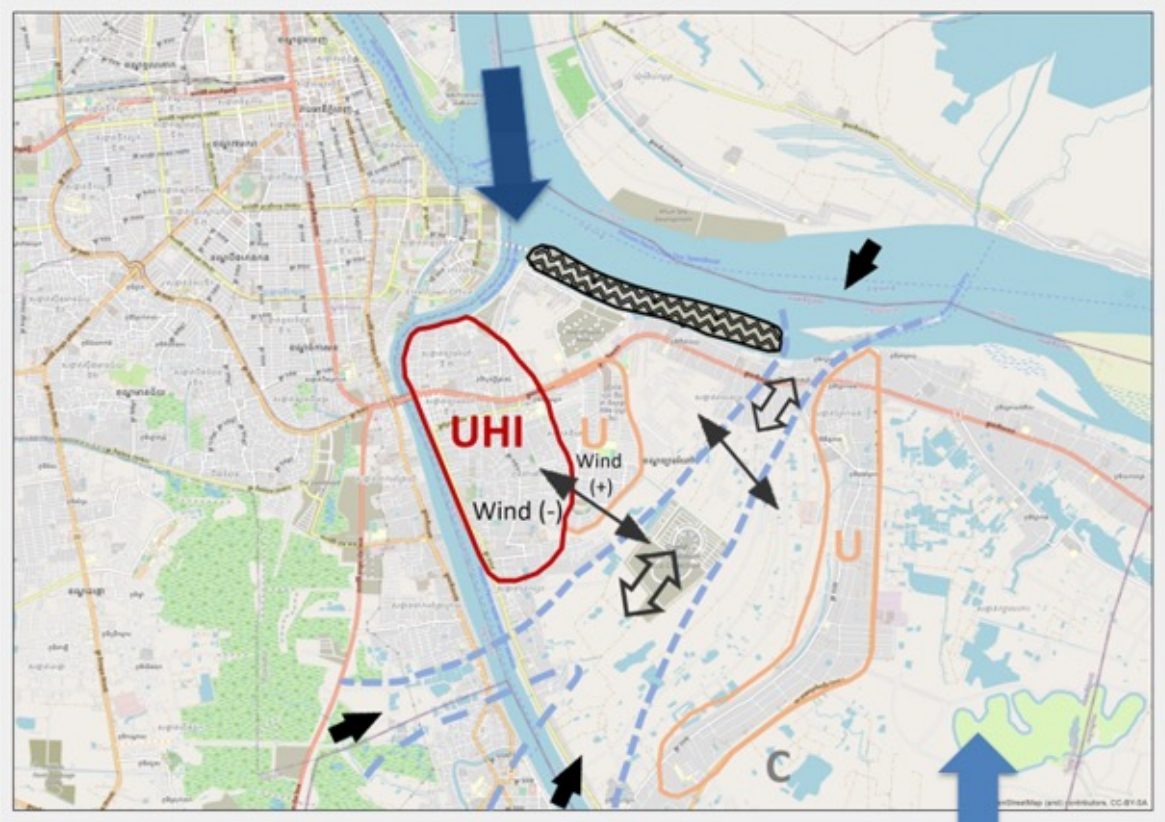


Incoming winds (main wind direction)

Weaker incoming winds (predominate winds)

Thermal induced pattern

Local incoming ventilation patterns



Ventilation patterns and urban heat island effect

Build4People Project

Enhancing Quality of Life through Sustainable Urban Transformation in Cambodia

គម្រោងសាងសង់សម្រាប់ប្រជាជន
ការលើកកម្ពស់ គុណភាពជីវិត របស់
អ្នកទីក្រុង ដោយ ការ បម្លែង នៅជា
ក្រុង មានចីរភាពនៅកម្ពុជា

DEF 2019-2021

R&D 2021-2025

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Conclusions

- The entry points for Build4People's mitigation efforts are the promotion of sustainable buildings and climate responsive neighbourhood design.
- Sustainable urban transformation will be encountered by a systemic and cross-cutting approach.
- Supporting the shift from technocratic top-down decision-making based on designing master plans to a planning culture more integrated, people-led and understood as a process and dialogue.
- Transdisciplinary integration is achieved by embedding the different scientific disciplines and stakeholders into joint formats (e.g. ecocity transition labs) and joint tangible products (toolbox).
- Key mitigation approaches involve blue-green infrastructures, passive design solutions for buildings, avoidance of burned bricks, or the integration of ventilation corridors to reduce urban heat islands.
- To maximize impacts, Build4People's approach will be actively communicated, disseminated and made visible.
- **Successful inter- and transdisciplinary research is a matter of intensive time-consumptive exchange and of personal dedication of all parties involved!**



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More info:
<https://build4people.org>



Thanks so much for your attention!

អរគុណសម្រាប់ការយកចិត្តទុកដាក់!

WORK IN PROGRESS!



Impression from B4P Ecocity Transition Lab in March 2022, Phnom Penh




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