

Build4People Project

Work Package #4: Urban Green Research Approach

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RATIONALE & BACKGROUND

Urban green spaces (UGS) offer multifaceted benefits for urban residents and the city itself. UGS belong to our global ecosystems supplying ecosystem services, such as biodiversity and climate regulations (Marques 2019), not only to the inhabitants of a city. Recently scholars more often draw parallels between UGS and general human well-being and people's health - physically, socially and mentally (Huang et al. (2017). Taking this into consideration, it is believed that UGS contributes to improving the quality of life in cities. Today it's a thriving challenge in sustainable urban planning to actively maintain and develop green infrastructure (GI), especially in fast growing cities like Phnom Penh (PP).

The Phnom Penh Sustainable City Plan 2018-2030 acknowledges the importance of UGS and includes in section 5.2 the task to double the size of UGS in PP to a minimum of 2.2m² per person in 2030 (GGGI 2019).

OBJECTIVES

The objective of this research is to develop, test and apply four different products about UGS in PP.

1. Typology of urban green space
2. Map of urban green space in 2019
3. Index maps of city properties
4. Time Series Change since 2000

A step-by-step approach will be elaborated to create a land cover classification for PP. Different image classification systems will be tested to extract physical features of land cover types mainly UGS. As input data for the classification will be used PlanetScope and Rapideye image products.

New data products like Sentinel-2 will be utilized to calculate three different indices named "Urban Green Space Index" (UGSI); "Urban Green Neighborhood Index" (UGNI) and "Urban Surface Roughness Index (USRI)".

EXAMPLE FOR AN URBAN GREEN SPACE TYPOLOGY



SOURCE: DAVID COLE (IN: <https://www.realestate.com.kh/news/three-ideas-for-improving-phnom-penh-public-space/>)

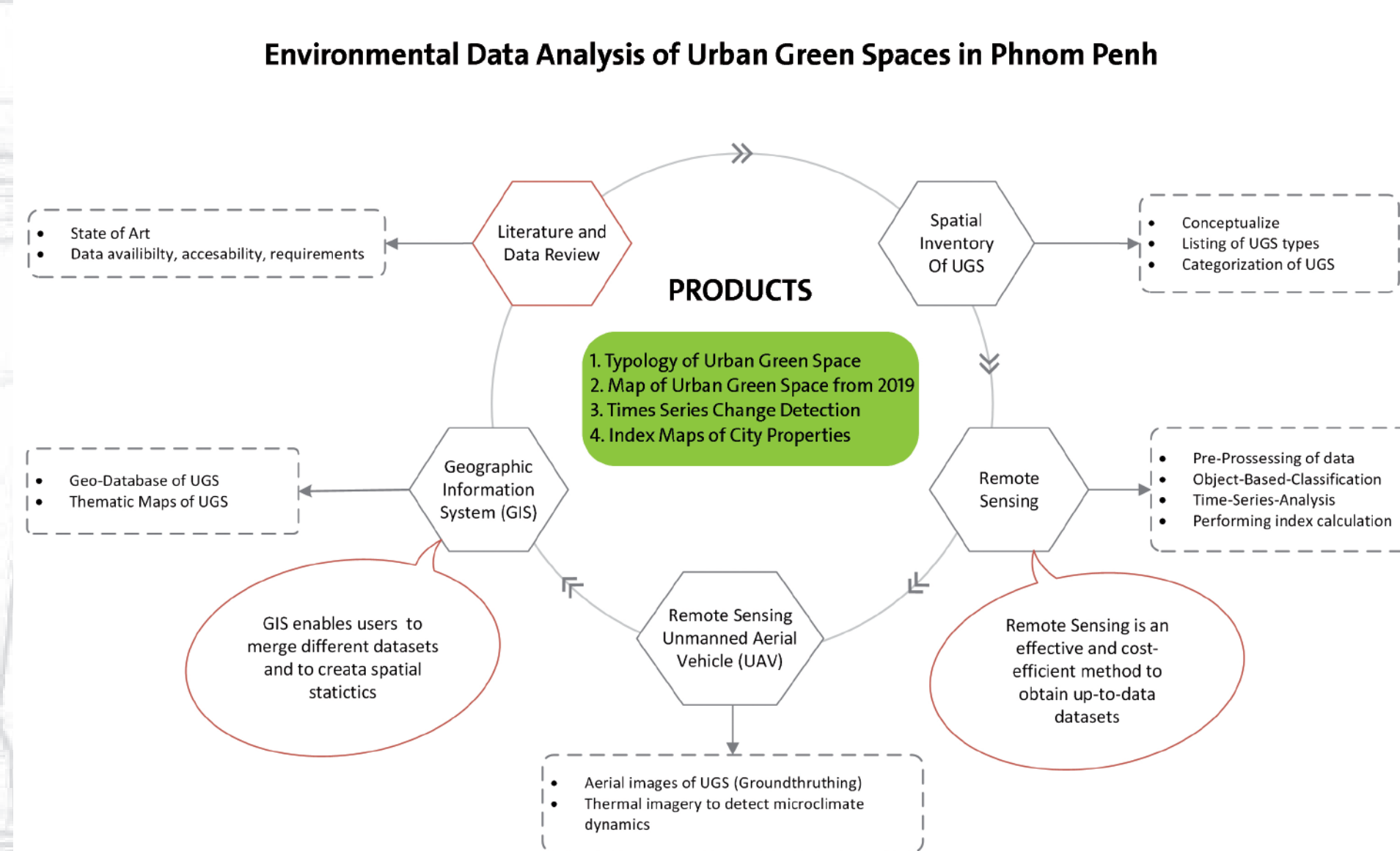
THEORETICAL FRAMEWORK

The main focus of this research is to explore and collect information on the spatial distribution and configuration of UGS. This will be achieved by performing different RS techniques.

1. the identification and mapping of physical features of UGS in PP and its surrounding areas (Taubenböck 2010)
2. the investigation of different urban properties performing different index models (Gupta et al. 2012; Jhaldiyal et al. 2016)
3. comparing the past and present with human impact change applying a time series of remote sensing data (Kuenzer et al. 2015)

Analyzing the spectral properties of plants and other landscape features allows to generate a broad but up-to-date land cover type classification. The evaluation of such classifications enables to efficiently obtain and describe important characteristics (location, vegetation structure, patch connectivity and size etc.) on global and local level.

ENVIRONMENTAL DATA ANALYSIS OF UGS IN PP



SOURCE: ILLUSTRATION OF DIFFERENT DISCIPLINES AND METHODS CONNECTED TO CONDUCT AN ENVIRONMENTAL DATA ANALYSIS (OWN DESIGN BY AMELIE MCKENNA, 2019)

OUTLOOK

- Expected results should serve to improve the scientific knowledge and academic understanding of WP 4 research topics and research questions among all project partners and other stakeholders groups in Phnom Penh
- Spatial-temporal mapping products can be integrated into measures for ecological sustainable and environmentally friendly urban planning or serve as addition information for specific spatial regulation and management measures
- The results will help to highlight the interaction between the human and physical environment of Phnom Penh
- [...]

IDEAL MODEL OF URBAN GREEN SPACE (UGS)



SOURCE: DAVID COLE (IN: <https://www.realestate.com.kh/news/three-ideas-for-improving-phnom-penh-public-space/>)

RESEARCH QUESTIONS

- What types of UGS exists in Phnom Penh and how they can be categorized?
- What is the spatial distribution, density and topology of UGS in Phnom Penh in 2019?
- How did UGS develop over time in Phnom Penh at city and district level (Sangkat)?
- How many different types of UGS can we identify using remote sensing classification algorithms?
- Which classification system performs best in extracting information on UGS in urban environments?
- What are the advantages / disadvantage using images taken by Unmanned Aerial Vehicle (UAV) to support or verify above mentioned land cover classifications in urban areas?
- What can we learn about the urban environment when calculating different indices?

MILESTONES OF THE DEFINITION PHASE

- Typology and classification of UGS
- Understanding the spatial structure of UGS
- Knowledge on change of UGS over time
- Testing different metrics e.g.
 - "Urban Green Space Index",
 - "Urban Green Neighbourhood Index",
 - "Urban Surface Roughness Index".
- Presenting geospatial research products to the end-user and stakeholders
- Implementation of a citizen-science approach to UGS on the local level in the context of the "Green School Demonstration project"
- Development of a data management environment to assure easy and flexible data access and storage for day-to-day operations

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List of references cited within this poster /
Further reading

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