



Status quo report – Supplement

Nature-based solutions in the city of Hue

First results from the BMBF-funded GreenCityLabHuế project – Case study typology

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List of acronyms and abbreviations

GBI	green-blue infrastructure
HUB	Humboldt-Universität zu Berlin
HUSC	Faculty of Architecture of University of Sciences, Hue University

1 Introduction: Case study typology

The case study typology was developed in a co-creation and co-learning process, including feedback loops, between the Vietnamese partner HUSC and the German partner HUB. Two important documents on green-blue infrastructure (GBI), “A typology of urban green spaces, ecosystem services provisioning services and demands” by Cvejić et al. (2015) and “Reflections about blue ecosystem services in cities” by Haase (2015), form the basis for the typology and were complemented by few additional elements. All GBI elements were listed in a table and supplemented by a short description of the element as well as exemplary picture. Next, the Vietnamese partner was asked (i) to indicate elements that are also considered as GBI in the city of Hue, and illustrate them exemplary with images, (ii) to add elements that are considered as GBI in the city of Hue but are not listed, and (iii) to indicate opposing definitions of terms if applicable. Based on their experiences and the consultation with local architects and urban planners, the partner identified relevant, irrelevant and Hue-specific GBI elements. Subsequently, HUB reviewed the entries and made some minor adjustments to them (e.g. combining similar GBI examples in one category). In a further feedback loop, the case study typology was then completed.

The case study typology consists of 64 GBI elements grouped into ten categories:

- Green Infrastructure on building structures (8)
- Private, commercial, industrial and institutional GBI and GBI connected to grey infrastructure (12)
- Allotment and community gardens (2)
- Recreational parks and gardens (14)
- Agricultural GBI (5)
- Other GBI (3)
- Type of vegetation (6)
- Blue Infrastructure on building structure (1)
- Natural or semi-natural water bodies and hydrographic networks (6)
- Constructed wetlands/water bodies and built structures for water management (7)

In the following, the elements are briefly described and illustrated according to the group to which they belong.

2 Green Infrastructure on building structures

Table 1. Case study typology – Green Infrastructure on building structures.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Green Infrastructure on building structures						
Balcony green¹	Plants in balcony and terraces, planted mostly in pots.	Cvejić et al. 2015: 18.		Plants in pots or movable boxes. Some buildings have unmovable tanks/containers on their balconies for the plants.	Architects from HUSC and local architecture offices, 2019	
Ground based green wall²	Ground based climbing plants intended for ornamental (and sometimes food production) purpose.	Cvejić et al. 2015: 18.		In Vietnam in general, and in the city of Hue in particular, this form is not preferred in building design due to water absorption and penetration into the house during the (long and heavy) rainy seasons. Instead, they prefer plants separated from wall surfaces when decorating buildings with (vertical) greenery.	Architects from HUSC and local architecture offices, 2019	
Façade-bound green wall³	Plants growing in façade bound substrate, e.g. containers or textile-systems.	Cvejić et al. 2015: 18.		Plants that grow not only on facades but also on interior ornamental walls to bring nature into the interior.	Architects from HUSC and local architecture offices, 2019	
Green roof⁴	A vegetated roof.	Shafiq & Kim 2017: 242.		In Central Vietnam in general, and in the city of Hue in particular, green roofs are not preferred. During the rainy season the retained water can enter the house if waterproofing is lacking or limited. Instead, vegetables are planted in plastic/polystyrene boxes (separated from the roof) to feed the family with healthy, chemical-free vegetables.	Haakon et al. 2018	

¹ Image sources: Cvejić et al. 2015: 18 (left); Jessica Jache (right)

² Image sources: Herfurt and Melzer 2018: 12 (left); image provided by HUSC (right)

³ Image sources: Cvejić et al. 2015: 18 (left); image provided by HUSC (right)

⁴ Image source: image provided by HUSC (right)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Extensive green roof⁵	Roof vegetation on thin substrate with little or no irrigation and management. Vegetation established either artificially by seeding or planting or naturally: mosses, succulents, few herbs and grasses.	Cvejić et al. 2015: 19.		Not relevant in the context of the city of Hue.		
Intensive green roof⁶	Roof vegetation on thick substrate with irrigation and management. Vegetation established either artificially by seeding or planting or naturally: perennials, grasses, small trees, rooftop farming.	Cvejić et al. 2015: 19.		Not relevant in the context of the city of Hue.		
Atrium⁷	Green area surrounded/enclosed in a building planted mostly with ornamental plants.	Cvejić et al. 2015: 19.		Green space enclosed in a building usually without roofing.	Architects from HUSC and local architecture offices, 2019	
Vegetated pergola⁸	A pergola serving as climbing support for vegetation			Not very common in the city of Hue. Existing pergolas are made of iron frames along which the vegetation climbs. Usually used in restaurants, eco-resorts or tourism buildings.	Field survey of the Hue Faculty of Architecture (HFA) team in December 2019	

⁵ Image source: Cvejić et al. 2015: 19 (left)

⁶ Image source: Herfurt and Melzer 2018: 9 (left)

⁷ Image sources: Cvejić et al. 2015: 19 (left); image provided by HUSC (right)

⁸ Image sources: Bezirksamt Charlottenburg-Wilmersdorf (2018) (left); <https://www.flickr.com/photos/ricepot/8213845384/in/photostream/> (right)

3 Private, commercial, industrial and institutional GBI and GBI connected to grey infrastructure

Table 2. Case study typology – Private, commercial, industrial and institutional GBI and GBI connected to grey infrastructure.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Private, commercial, industrial and institutional GBI and GBI connected to grey infrastructure						
Tree alley and street tree ⁹	Trees planted along roads and paths either solitary or in rows.	Cvejić et al. 2015: 20.		In the city of Hue, numerous trees are planted along the streets and paths. Tree species are carefully selected to be resilient to strong winds and storms.	Field survey of the HFA team in December 2019	
	in Berlin predominantly laid out in unsealed tree pits or road verges	European Commission 2013: 9.				
Street green and green verge ¹⁰	Non-tree, mostly shrubby or grassy verges along roads or other built or natural element.	Cvejić et al. 2015: 20.		Street green usually occurs in the form of grass/lawn, accompanied by smaller trees as decorative elements. Usually combined with small public parks that serve the community and recreation of Hue's residents.	Field survey of the HFA team in December 2019	
Hedge ¹¹	Artificial type of vegetation consisting of densely grown woody plants.	Reif and Achtziger 2014		In Vietnam in general, and in the city of Hue in particular, hedges are traditionally used as boundary/fencing along village roads or paths. However, this traditional way of dividing land is gradually being replaced by brick/iron fences (lower safety level compared to iron/brick fences).	Hung 2019	
	Typically, in use as private property boundary/fence along roads or paths.					
Railroad bank ¹²	Green space along railroads.	Cvejić et al. 2015: 20.		Green spaces along railroads are more common in rural areas (most railroad banks are covered by vegetation), in the city of Hue only few parts of the railroads are covered by green space.	Field survey of the HFA team in December 2019	
Grassed tram tracks/green tracks ¹³	Greened (tram) tracks	Schreiter and Kappis (n.d.).		Not relevant in the context of the city of Hue.		

⁹ Image sources: Bezirksamt Charlottenburg-Wilmersdorf 2008 (left); image provided by HUSC (right)

¹⁰ Image sources: Cvejić et al. 2015: 20 (left); image provided by HUSC (right)

¹¹ Image sources: BerlinOnline Stadtportal 2017 (left); image provided by HUSC (right)

¹² Image sources: Cvejić et al. 2015: 20 (left); image provided by HUSC (right)

¹³ Image source: Schreiter and Kappis 2013: 1 (left)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Riverbank green ¹⁴	Green space sideways the rivers, streams and canals, usually with foot or bike paths.	Cvejić et al. 2015: 21.		Similar meaning in the city of Hue.		
Permeable pavement ¹⁵	Pavements made of water-permeable building materials or infiltration by joints.	Berliner Wasserbetriebe et al. 2018.		Not very common in the city of Hue. Permeable pavement is mainly combined with a permeable strip covered by grass in order to allow water to infiltrate. The footpath next to this strip is not permeable.	Field survey of the HFA team in December 2019	
Bioswale ¹⁶	Vegetated and gently sloped pit for filtering surface runoff.	Cvejić et al. 2015: 19.		Similar meaning in the city of Hue, often combined with flowers or ornamental gardens in new residential or urban areas.	Field survey of the HFA team in December 2019	
Green playground, school ground ¹⁷	Green areas intended for playing or outdoor learning.	Cvejić et al. 2015: 21.		Similar meaning in the city of Hue.	Nguyen 2017	
				The small park is located in manor crown city and is used by its residents. The park consists of trees, grass and equipment for the playground.	Manor crown in Hue, Field survey of the HFA team in December 2019	
Rain garden ¹⁸	Rain gardens are vegetated, or landscaped depressions designed with an engineered soil layer that promotes infiltration of stormwater runoff.	Brears 2018: 135.		Not relevant in the context of the city of Hue.		
	Usefully sited nearby impervious areas.	Brears 2018.				

¹⁴ Image sources: Cvejić et al. 2015: 21 (left); Nguyen 2017 (right)

¹⁵ Image sources: Timm 2019: 6 (left); image provided by HUSC (right)

¹⁶ Image sources: Cvejić et al. 2015: 19 (left); image provided by HUSC (right)

¹⁷ Image sources: Cvejić et al. 2015: 21 (left); Nguyen 2017, Nguyen Ngoc Tung (right from top to bottom)

¹⁸ Image source: Haase 2015: 5 (left)

6 Private, commercial, industrial and institutional GBI and GBI connected to grey infrastructure

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
House garden ¹⁹	Areas in immediate vicinity of private houses cultivated mainly for ornamental purposes and/or noncommercial food production.	Cvejić et al. 2015: 20.		Private areas cultivated primarily for ornamental purposes and/or non-commercial food production can be mainly found in Hue's traditional garden houses. But also, in some new houses or villas that have been built recently, as their owners prefer this type of area. There are no policies that regulate how much area of a residential area must be greened or unsealed.	Field survey of the HFA team in December 2019	
Garden café ²⁰				In the city of Hue there are many cafés with a garden-like character. The small gardens within the cafés consist of small trees, flowers, statues and other materials and invite people to come, drink and enjoy the garden.	From a garden cafe at Pham Van Dong St., Hue; Field survey of the HFA team in December 2019	

¹⁹ Image sources: Cvejić et al. 2015: 20 (left); provided by HUSC (right)

²⁰ Image source: Nguyen Ngoc Tung (right)

4 Allotment and community gardens

Table 3. Case study typology – Allotment and community gardens.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Allotment and community gardens						
Allotment garden (UK)/community garden (US) ²¹	A leased garden in urban surrounding which serves the user for non-commercial gardening use, in particular for the extraction of horticultural products for his own use and for recreation.	Senatsverwaltung für Umwelt, Verkehr und Klimaschutz 2019.		Small trees and flowerpots are arranged by the owner as recreation and living space of the family.	Cac Huong Cu garden house in, Kim Long, Hue; Field survey of the HFA team in December 2019	
	Typically situated in allotment-garden area (In Berlin around 70.000 allotment gardens in around 870 allotment-garden areas)	Senatsverwaltung für Umwelt, Verkehr und Klimaschutz 2019.		Open space surrounded by houses. Each house uses part of the open space to grow vegetables, trees and fruit.	Trieu Quang Phuc community in Hue; Field survey of the HFA team in December 2019	
Urban gardening/ community garden ²²	Community-managed garden in an urban context with a focus on social, intercultural and ecological topics	Abgeordnetenhaus von Berlin 2017.		Not relevant in the context of the city of Hue.		
	Areas, collectively gardened by a community for food and recreation.	Cvejić et al. 2015: 24.				
	In Berlin: legal recognition and political support of urban gardening since 2018-12	Senatskanzlei Berlin 2018.				

²¹ Image sources: BerlinOnline Stadtportal 2015 (left from top to bottom); Nguyen Ngoc Tung (right from top to bottom)

²² Image source: Debus 2012 (left)

5 Recreational parks and gardens

Table 4. Case study typology – Recreational parks and gardens.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Recreational parks and gardens						
Botanical garden ²³	Educational and ornamental areas planted with large diversity of plant species.	Cvejić et al. 2015: 22.		Not relevant in the context of the city of Hue.		
Zoological garden ²⁴	Areas with animals kept in cages and enclosures often combined with planted trees, ornamental beds and cultivated grass.	Cvejić et al. 2015: 22.		Not relevant in the context of the city of Hue.		
Neighbourhood green space ²⁵	Semi-public green spaces, vegetated by grass, trees and shrubs in multi-story residential areas.	Cvejić et al. 2015: 22.		Alley along the village covered by grass, trees and brushes.	Thanh Tien village in Hue; Field survey of the HFA team in December 2019	
Green inner courtyard ²⁶	A greened inner courtyard.			Similar meaning in the city of Hue.		
Large urban park ²⁷	Larger green area within a city intended for recreational use by urban population, can include different features such as trees, grassy areas, playgrounds, water bodies, ornamental beds, etc.	Cvejić et al. 2015: 21.		Larger green spaces that Hue residents usually use for recreation, relaxation, photography and as a venue for some Hue festival events.	Park along Huong river, Hue; Field survey of the HFA team in December 2019	

²³ Image source: BerlinOnline Stadtportal 2019a (left)

²⁴ Image source: Cvejić et al. 2015: 22 (left)

²⁵ Image sources: Cvejić et al. 2015: 22 (left); Nguyen Ngoc Tung (right)

²⁶ Image source: Bezirksamt Neukölln von Berlin 2015: 4 (left)

²⁷ Image sources: Andreas Steinhoff (left); Nguyen Ngoc Tung (right)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Small to medium urban park/public garden ²⁸	Small to medium green area within a city intended for recreational use by urban population, can include different features such as trees, grassy areas, playgrounds, water bodies, ornamental beds, etc.	According to Cvejić et al. 2015: 21.		The public garden (e.g. public garden near the Huong River and next to the Hue Diem Phung Thi Museum) includes different elements such as trees and statues and is used by locals and tourists for sightseeing and recreation.	Open space in Diem Phung Thi museum in Hue; Field survey of the HFA team in December 2019	
Feng shui garden/garden house ²⁹				Traditional garden houses (Feng Shui gardens) are one of the integral elements of Hue culture. Normally they are designed according to Feng Shui principles: Binh Phong (screen), Be Can (small basin) as a bright courtyard to protect against evil winds. Other elements to embellish the garden can include small flowers and bonsai.	Traditional garden house in Kim Long, Hue; Field survey of the HFA team in December 2019	
Green-blue garden ³⁰				Can be found in lakes, canals, ponds connected to royal buildings of the Hue Citadel.	Hung 2019	
Historical park/garden ³¹	Similar to large urban parks, but with distinct management due to heritage status.	Cvejić et al. 2015: 21.		Green area located between the imperial city and the citadel intended for recreational use. Used by the local population for various activities such as playing with children, kite flying, sports and learning. Also used as a venue for Hue City events and associated ceremonies.	Open space in front of the Imperial city, Hue; Field survey of the HFA team in December 2019	
Pocket park ³²	Small park-like areas around and between buildings vegetated by ornamental trees and grass, publicly accessible.	Cvejić et al. 2015: 22.		Small gardens between buildings that are used to divide streets and create an open landscape (e.g. Manor Crown City).	Manor crown city in Hue; Field survey of the HFA team in December 2019	

²⁸ Image sources: Friedrichshainer Wochenmarktgesellschaft 2014 (left); Nguyen Ngoc Tung (right)

²⁹ Image source: Nguyen Ngoc Tung (right)

³⁰ Image source: Hung 2019 (right)

³¹ Image sources: Bezirksamt Treptow-Köpenick 2019 (left); Nguyen Ngoc Tung (right)

³² Image sources: Cvejić et al. 2015: 22 (left); Nguyen Ngoc Tung (right)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Institutional green space ³³	Green spaces surrounding public and private institutions and corporation buildings.	Cvejić et al. 2015: 23.		Open spaces surrounding administrative buildings in the city of Hue, e.g. the Ministry of Investment and Planning, the Ministry of Justice and the Ministry of Finance, can include different features such as ponds, grassy areas, shrubs and trees.	Ton Duc Thang St. And Nguyen Van Huyen St. in Hue; Field survey of the HFA team in December 2019	
Green sport facility ³⁴	Intensively cultivated and fertilized grass turf tolerant to frequent trampling for sport activities (e.g., golf courses, football fields).	Cvejić et al. 2015: 23.		The ground is covered by natural grass. Normally used for football and other sports.	Center for Sport and culture in Hue; Field survey of the HFA team in December 2019	
Camping area ³⁵	Green areas reserved for camping.	Cvejić et al. 2015: 23.		Not relevant in the context of the city of Hue.		
Cemetery and churchyard ³⁶	Burial ground often with covered by lawns, trees and other ornamental plants. In Berlin: varying type and size, consideration of ecological significance as green space in Berlin's urban planning	Cvejić et al. 2015: 23. Senatsverwaltung für Stadtentwicklung und Umwelt 2014.		Not relevant in the context of the city of Hue.		

³³ Image sources: Cvejić et al. 2015: 23 (left); Nguyen Ngoc Tung (right)

³⁴ Image sources: Cvejić et al. 2015: 23 (left); Nguyen Ngoc Tung (right)

³⁵ Image source: Cvejić et al. 2015: 23 (left)

³⁶ Image source: Bezirksamt Charlottenburg-Wilmersdorf 2013 (left)

6 Agricultural GBI

Table 5. Case study typology – Agricultural GBI.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Agricultural GBI						
Arable land ³⁷	Regularly ploughed arable land for crop production.	Cvejić et al. 2015: 24.		Arable land for crop production existed in agricultural villages in the north of the city of Hue (mainly in Huong So ward) and along the walls of the Hue Citadel.	Field survey of the HFA team in December 2019	
Urban grassland ³⁸	Type of habitat located in urban area and which is due to regular mowing dominated by grass species.	Klaus 2013: 665.		Not relevant in the context of the city of Hue.		
	Can be managed with low or high intensity (see urban meadow, lawn) Pastures or meadows.	Cvejić et al. 2015: 24.				
Horticulture ³⁹	Land devoted to growing vegetables, flowers, berries, etc.	Cvejić et al. 2015: 25.		Mainly found in the gardens of traditional houses, temples, pagodas and churches. In recent years, it is also used for division strips of city roads and streets to improve the streetscape and the overall urban landscape.	Field survey of the HFA team in December 2019	
Small farms/agricultural gardens ⁴⁰				Found in gardens of farmers living in Thuong Thanh -Eo Bau – The surrounding Walls of Hue Citadel.	Field survey of the HFA team in December 2019	
				Found in the surroundings of relics and heritage buildings of the city of Hue.	Field survey of the HFA team in December 2019	

³⁷ Image sources: Cvejić et al. 2015: 24 (left); image provided by HUSC (right)

³⁸ Image source: Cvejić et al. 2015: 24 (left)

³⁹ Image sources: Cvejić et al. 2015: 25 (left); image provided by HUSC (right)

⁴⁰ Image sources: <http://dhkhonggiangduong.com/>, image provided by HUSC, image provided by HUSC, Nguyen Ngoc Tung (right from top to bottom)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
				Agricultural gardens planted in urban areas as part of urban agriculture.	Field survey of the HFA team in December 2019 (Kim Long ward)	
				Small farm along the historic wall - Currently, many residents live along the wall of the citadel (heritage site) and use the land there to grow vegetables for sale and for their own use.	Back of the wall of the citadel of Hue; Field survey of the HFA team in December 2019	
Orchard ⁴¹	Fruit and nut trees, mixed agricultural and fruit or biofuel production.	Cvejić et al. 2015: 25.		Mostly found in Thuy Bieu and Thuy Xuan wards of the city of Hue, where inhabitants have large orchard or farmlands to grow local fruit and earn money.	Nguyen 2017	

⁴¹ Image sources: Cvejić et al. 2015: 25 (left); Nguyen 2017 (right)

7 Other GBI

Table 6. Case study typology – Other GBI.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Other GBI						
Brownfield/fallow land ⁴²	Currently unused or un-cultivated land on which vegetation can develop undisturbed.	Senatsverwaltung für Stadtentwicklung und Umwelt 2016.		Exists in the form of 'hanging' planning areas whose planning has been approved on paper but not yet put in practice. The people living here are not allowed to do anything (e.g. reconstruction of housing, land improvement) due to such 'hanging' planning.	Field survey of the HFA team in December 2019	
	Distinction is made between vegetation-free brownfields and those with vegetation.	Senatsverwaltung für Stadtentwicklung und Umwelt 2016.				
Informal green space ⁴³	'Informal green space' (IGS) as an explicitly socio-ecological entity, rather than solely cultural or biological. IGS consists of any urban space with a history of strong anthropogenic disturbance that is covered at least partly with non-remnant, spontaneous vegetation.	Rupprecht and Byrne 2014: 598.		Commonly seen in the peri-urban areas of Hue City where rural-urban transition and urbanization occurs strongly while lack of following administrative regulations to regulate and control. Such informal green spaces are in high danger of disappearance/remove due to lack of management.	Field survey of the HFA team in December 2019	
Garden relics ⁴⁴				Found in the surrounding areas outside the monuments or heritage buildings (lack of care and management).	Field survey of the HFA team in December 2019	
				Found in the areas within the monuments or heritage buildings (carefully maintained and managed).	Field survey of the HFA team in December 2019	

⁴² Image sources: anstiftung 2020 (left); image provided by HUSC (right)

⁴³ Image sources: Rupprecht and Byrne 2014: 600 (left); image provided by HUSC (right)

⁴⁴ Image sources: <http://hueworldheritage.org.vn/TTBTDTCDH.aspx?TieuDeID=35&TinTuclD=43&l=vn> (right top), <http://hueworldheritage.org.vn/TTBTDTCDH.aspx?TieuDeID=35&TinTuclD=12&l=vn> (right bottom)

8 Type of vegetation

Table 7. Case study typology – Type of vegetation.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Type of vegetation						
Shrubland ⁴⁵	Natural or secondary shrubland, e.g., heath, macchia, etc.	Cvejić et al. 2015: 26.				
Urban shrub vegetation ⁴⁶				<i>Cây chuối ngọc</i> (<i>Duranta repens</i>), small leaf plants to create borders, carpet planting (streets, schools).	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
				<i>Cây ắc ó</i> (<i>Acanthus integrifolius</i>), beautiful canopy, easy to shape, used for fences, decorative borders.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
				<i>Cây bạch trạng</i> (<i>Cordia latifolia</i>), 0.3 – 0.5 m, widely used, white leafy grown as fences, use in walkways, in parks.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
				<i>Cây cẩm tú mai</i> (False Heather), green, year-round flower, tiny purple flower.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	

⁴⁵ Image source: Cvejić et al. 2015: 26 (left)

⁴⁶ Image sources: vuoncayhoabinh.com (n.d.), cayvaha.net (n.d.), cayxanhSadec.com (n.d.), caycanhsanvuon.vn (n.d.), caycanhnoithat.net (n.d.), nguoihanoi.com.vn 2019 (right from top to bottom)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
				<i>Cây cúc mặt trời</i> , daisies, colourful, grown in streets, parks and gardens.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
				<i>Cây hoa dâm bụt</i> (Hibiscus), grown in streets, parks and gardens, fences.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
Urban meadow ⁴⁷	Urban grasslands with high biodiversity value.	Bretzel et al. 2016.		<i>Cây cỏ lá gừng</i> (<i>Axonopus Compressus</i>) greening industrial parks, streets and urban flower sinks, 4-5 months of care.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
				<i>Cây cỏ lá tre</i> , long life, high 40-100cm, leaves are soft, staggered, look like bamboo leaves.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
Lawn/ Turfgrass ⁴⁸	Highly managed grasslands serving traditional lawn, weed-free aesthetics.	Larson et al. 2016.		<i>Cây cỏ lan chi</i> (<i>Chlorophytum bichetii</i>), grass grows into bushes, fast growth rate và partial under shade, should be able to be planted in places under large trees.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
				<i>Cây cỏ lạc</i> (<i>Arachis pintoi</i>), grass stalks, forming a thick carpet 12 – 17 mm, yellow flower, grow well in sunny environments but also in the shade.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	

⁴⁷ Image sources: BerlinOnline Stadtportal 2016 (left); plantworld2.blogspot.com 2014, caycanhtrinhthap.com (n.d.) (right from top to bottom)

⁴⁸ Image sources: BerlinOnline Stadtportal 2019b (left); phuongrosa.com 2019, hoadepviet.com (n.d. a), vingarden.vn (n.d.) (right from top to bottom)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
				<i>Cỏ xuyên chi</i> (<i>Wedelia trilobata</i>) grass stalks, forming a thick carpet; dark green leaf; yellow flowers; grows best on fertile, moist, well-drained soil, but can also grow on nutrient-poor soil; adapted to tropical climate; like sunshine, very fast growth rate.	National Technical Regulation on Construction Planning (QCVN 01: 2019/BXD)	
Urban forest ⁴⁹	Natural or planted areas of dense tree vegetation.	Cvejić et al. 2015: 25.		Occurs in hilly areas, mainly in the southwest of the city.	Field survey of the HFA team in December 2019	
Urban trees ⁵⁰				<i>Bàng Đài Loan</i> (Madagascar almond), Small tree trunks, high 10-20 m, Straight shape, beautiful foliage, small leaves, falling with less polluting (schools, parks, streets, urban areas, industrial areas ...), prefer light, suitable in nutrient-rich soils, well drained.	Field survey of the HFA team in December 2019; SalalaGreen	
				<i>Cây Giáng Hương</i> (<i>Pterocarpus macrocarpus</i> Kurz) , high 20-30m, ưa đất thoát nước, grows on many types of soil such as gray soil, bazan, stand with dry soil conditions, suitable for climatic regions which divided in rainy and dry seasons.	Field survey of the HFA team in December 2019; SalalaGreen	
				<i>Cây Long Não</i> (<i>Cinnamomum camphora</i>) high from 20-30m, Small, and yellow flowers grow in clusters of leaves. Flowering season from April 3-4, prefer light, like warm and humid climate, prefer to grow on roads because of their ability to absorb heavy metal ions to clean the environment.	Field survey of the HFA team in December 2019; SalalaGreen	
				Green trees in religious buildings (pagodas, churches) - Trees in these buildings also carry spiritual functions or religious beliefs.	Hung 2019	

⁴⁹ Image sources: Cvejić et al. 2015: 25 (left); Nguyen Vu Minh (right)

⁵⁰ Image sources: hoadepviet.com (n.d. b), thietkesanvuonviet.com (n.d.), GardenSoft 2020, Hung 2009 (right from top to bottom)

9 Blue infrastructure on building structure

Table 8. Case study typology – Blue infrastructure on building structure.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Blue infrastructure on building structure						
Blue roofs ⁵¹	Non-vegetated storage roofs, that “have a flow restriction device around the drain that holds water back until the storm event has passed.	Brears 2018: 48.		Small garden with ponds or water tanks on top floor		
				Water tank for usage on the roof top		

⁵¹ Image sources: Hazen and Sawyer 2020 (left); Nguyen Vu Minh (right from top to bottom)

10 Natural or semi-natural water bodies and hydrographic networks

Table 9. Case study typology – Natural or semi-natural water bodies and hydrographic networks.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Natural or semi-natural water bodies and hydrographic networks						
Coast ⁵²	Outline of a coast, nexus between ocean/sea and urban land.	Haase 2015: 79.		Not relevant in the context of the city of Hue.		
Rivers/ Creeks ⁵³	Water courses within a city/urban land including riparian areas/ stripes and water front areas, riverbanks.	Haase 2015: 79.		The city of Hue has a diverse river system consisting of both natural and artificial rivers and canals. Green spaces, vegetation and waterfronts have been newly built (in new urban areas) or renovated (in traditional/old urban areas).	Field survey of the HFA team in December 2019	
Estuary ⁵⁴	Downstream part of the river, subject to tidal effects with mixing of freshwater and seawater.	Cvejić et al. 2015: 28.		Not relevant in the context of the city of Hue.		
Peat bog ⁵⁵	Areas of high ground water level, organic soils and natural vegetation in a city.	Haase 2015: 79.		Not relevant in the context of the city of Hue.		
Lakes ⁵⁶	Water body within a city/urban land.	Haase 2015: 79.		In the city of Hue there are many lakes, both in the new and the old urban areas (citadel).	Field survey of the HFA team in December 2019	

⁵² Image source: Haase 2015: 79 (left)⁵³ Image source: Haase 2015: 79 (left)⁵⁴ Image source: Cvejić et al. 2015: 28 (left)⁵⁵ Image source: Haase 2015: 79 (left)⁵⁶ Image source: Haase 2015: 79 (left)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Wetlands ⁵⁷	Areas of high ground water level and natural vegetation in a city.	Haase 2015: 79.		Not very common in city of Hue. Instead, they exist in form of green parks and public spaces that combine community and social activities.	Field survey of the HFA team in December 2019	

⁵⁷ Image source: Haase 2015: 79 (left)

11 Constructed wetlands/water bodies and built structures for water management

Table 10. Case study typology – Constructed wetlands/water bodies and built structures for water management.

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Constructed wetlands/water bodies and built structures for water management						
River embankment ⁵⁸	Nexus between river and urban land, constructed and surfaced.	Haase 2015: 80.		Concrete river embankment in combination with vegetation/grass cover (so-called green "grey" infrastructure)	Field survey of the HFA team in December 2019	
Pond ⁵⁹	Body of standing water, either natural or man-made, that is usually smaller than a lake. They may arise naturally in floodplains as part of a river system, or as an isolated depression.	Haase 2015: 80.		In Vietnam, lakes and ponds (locally called <i>ao hồ</i>) are often used differently by stakeholders and people. In the city of Hue, lakes/ponds are commonly seen in the Hue citadel and its surroundings because of the water system and waterway network, which is one of the most important valuable features of this UNESCO heritage.	Field survey of the HFA team in December 2019	
Channel/ Canal ⁶⁰	Artificial water course within a city or urban land, mostly linked to a river network, built/constructed and partially embanked.	Haase 2015: 80.		The city of Hue has a diverse river system consisting of both natural and artificial rivers and canals. Green spaces, vegetation and waterfronts have been newly built (in new urban areas) or renovated (in traditional/old urban areas).	Field survey of the HFA team in December 2019	
	Artificial non-saline water courses with man-made substrate.	Cvejić et al. 2015: 28.				The canal covering the citadel was formerly used as a defensive canal. Currently, there are projects trying to identify the potential of the canal for tourism. The canal is also used by the locals to plant vegetation.

⁵⁸ Image sources: Haase 2015: 80 (left); image provided by HUSC (right)

⁵⁹ Image sources: Haase 2015: 80 (left); image provided by HUSC (right)

⁶⁰ Image sources: Cvejić et al. 2015: 28 (left); songvang.net (n.d.), WorldWildBrice.net 2016, Nguyen Ngoc Tung (right from top to bottom)

Term	Description (Europe)	Source	Example (Europe)	Description (Vietnam)	Source	Example (Vietnam)
Fountain ⁶¹	Artificial water supply within a city or urban land, constructed and designed.	Haase 2015: 80.		Not relevant in the context of the city of Hue.		
Postmining lake ⁶²	Artificial water body within a city or urban land following an opencast mining activity with groundwater linkage and mostly open lakeshores.	Haase 2015: 81.		Not relevant in the context of the city of Hue.		
Retention basin ⁶³	Artificial water body within a city or urban land with groundwater linkage and mostly open lakeshores.	Haase 2015: 81.		Can be mainly found in the Hue citadel in the form of artificial canals, lakes and ponds connected to natural river systems flowing through the city of Hue (e.g. Huong River, Bach Dang River)	Field survey of the HFA team in December 2019	
Pipe system ⁶⁴	Land drainage form principally used to alleviate waterlogging in streets, open spaces and gardens.	Haase 2015: 81.		Not relevant in the context of the city of Hue.		

⁶¹ Haase 2015: 80 (left)

⁶² Haase 2015: 81 (left)

⁶³ Haase 2015: 81 (left); image provided by HUSC (right)

⁶⁴ Haase 2015: 81 (left)

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