TABLE 5.2 Indicators of social and ecological connectivity.

ID	Indicator and source*	Definition
A	**CONNECTIVITY**	
A.1	Social	
A.1.1	**Longitudinal**	
A.1.1.1a	Slow mobility routes - continuity	The presence and continuity of slow mobility routes along the river: [1] absent; [2] discontinuous; [3] continuous.
A.1.1.1b	Slow mobility routes - %	Percentage of waterside slow mobility routes out of the total length of riverbanks per corridor segment. Values: [1] below 50%; [2] medium 50-75%; [3] above 75%.
A.1.1.1c	Slow mobility routes - location	Location of riverside slow mobility routes: [1] absent; [2] on one bank or partial; [3] on both banks.
A.1.1.2a	Pedestrian network - continuity	The presence and continuity of riverside walkways: [1] absent; [2] discontinuous; [3] continuous.
A.1.1.2b	Pedestrian network - %	Percentage of walkways out of the total length of riverbanks per corridor segment. Values: [1] below 50%; [2] medium 50-75%; [3] above 75%.
A.1.1.2c	Pedestrian network - location	Location of walkways: [1] absent; [2] on one bank or partial; [3] on both banks.
A.1.1.3a	Major roads - continuity	The presence of major roads along the corridor in parallel with the river: [1] absent; [2] discontinuous; [3] continuous.
A.1.1.3b	Major roads - location	Location of major roads: [1] on both sides of the river; [2] on one side of the river or partially on both sides; or [3] detached from the river.
A.1.1.4a	Navigability – continuity (adapted from Kondolf & Pinto, 2016; Batista e Silva et al., 2004)	The possibility for navigation along the channel determined by obstacles in water: [1] not possible (e.g. presence of weirs); [2] reduced continuity (e.g. presence of sluices); and [3] navigable.
A.1.1.4b	Navigability – use (adapted from Kondolf & Pinto, 2016; Batista e Silva et al., 2004)	The section of the channel and the presence of obstacles to movement on water determine the suitability for: [1] cargo transport (regional scale), [2] passenger transport (city scale), or [3] recreational (corridor and river segment scale).
A.1.2	**Lateral**	
A.1.2.1a	Accessibility - network	Percentage of the total length of riverside segments classified into low, medium and high local integration (R500m), compared to local integration (R500m) of the road network of the whole city. Values: [1] low, when medium and high values of local integration are below city low values; [2] medium, when medium values are higher than city values, and high values are lower than city values; [3] high, when high values are higher than city values.
A.1.2.1b	Accessibility - residents	The percentage of the total inhabited area (the area of the corridor, excluding the river space) in the corridor which is accessible by pedestrians (500 m). A service area of 500 m is calculated from the river, i.e. from all riverside road and path intersections. Values: [1] below 50%; [2] between 50%-75%; [3] above 75%.
A.1.2.1c	Accessibility - visitors (public transport) (adapted from Batista e Silva et al., 2004, pp.63,66)	Accessibility of the river space by pedestrians from public transport stops (bus, tram, metro) per corridor and river segment. This indicator shows the percentage of the total river length accessible by public transport in a 500m distance. Values: [1] below 50%; [2] medium 50%-75%; [3] above 75%.
A.1.2.2a	Level of disruption - % (adapted from Batista e Silva et al., 2004, pp.63,67)	The percentage of riverbanks occupied by disruptive (road or rail) traffic per river corridor and river segment: [1] more than 75%; [2] between 50-75%; [3] less than 50%.
A.1.2.2b	Level of disruption - classified river length	The length of the river is divided and classified in [1] river sections disrupted on both banks, [2] disrupted on one bank or [3] undisrupted by car or rail traffic.
A.1.2.3a	Crossability - linear density of crossings (adapted from Batista e Silva et al., 2004, pp.63-4)	Linear density of pedestrian/bike bridges (number of crossings/km) (Batista e Silva et al., 2004; 2006; 2013) and change through time. This variable indicates to what extent the river is perceived as a barrier to transversal movement. The scale is determined based on the minimum plausible and maximum plausible number of pedestrian bridges per river segment. Batista e Silva et al. use a max. plausible value of 4 bridges/km. Values: [1] 0-1 bridge/km; [2] 2-3 bridges/km; [3] ≥4 bridges/km.
A.1.2.3b	Crossability – river width (adapted from Kondolf & Pinto, 2017, p.190)	Crossability is measured in function of the width of the river: [1] rarely bridged above 400m; [2] hard to bridge between 50-400m; or [3] easily bridged below 50m.
A.1.2.4	Transversal gradient of speeds of movement (based on Tjallingii, 2005; 2015)	Transversal disposition of speeds of movement: [1] fast lane along the river, slow lane outside the river space; [2] fast and slow lane along the river; [3] slow lane along the river, fast lane outside the river space.

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TABLE 5.2 Indicators of social and ecological connectivity.

ID	Indicator and source*	Definition
A.1.3	**Vertical**	
A.1.3.1a	Contact with water – points (based on Kondolf & Pinto, 2016)	The percentage of river banks where physical contact with water (e.g. stairs, beaches) is possible. Values: [1] below 50%; [2] medium 50-75%; [3] above 75%.
A.1.3.1b	Contact with water – typology (adapted from Batista e Silva et al., 2006, p.11)	Points or areas of contact classified as: [1] punctual; [2] linear and short (<50m); [3] linear and long (>50m).
A.1.3.2	Contact with water – constructions (based on Kondolf & Pinto, 2016)	The presence of buildings or structures providing public amenities in relation with water: [1] absent; [2] facilities in the proximity of water; [3] facilities providing interaction with water.
A.1.3.3	Contact with water – swimming (based on Kondolf & Pinto, 2016)	The presence of swimming facilities in a river segment: [1] absent; [2] isolated swimming facilities; [3] swimming possible in the river.
A.2	**Ecological**	
A.2.1	**Longitudinal**	
A.2.1.1a	Landscape connectivity – existing (based on Anderson et al., 2009; Zetterberg et al., 2010)	Number of connected components in the corridor formed by vegetated patches in the corridor. Values: [1] disconnected; [2] fragments; [3] connected.
A.2.1.1b	Landscape connectivity – potential (based on Anderson & Bodin, 2009; Zetterberg et al., 2010)	Number of connected components in the corridor formed by existing (vegetated) and potential (non-vegetated open spaces) ecological patches in the corridor. Values: [1] disconnected; [2] fragments; [3] connected.
A.2.1.2a	Stepping stone redundancy – existing (based on Dramstad et al., 1996, Anderson & Bodin, 2009; Zetterberg et al., 2010)	Betweenness (stepping stones) values of the patches in the network of vegetated open spaces classified as [1] low, [2] medium, and [3] high.
A.2.1.2b	Stepping stone redundancy – potential (based on Dramstad et al., 1996, Anderson & Bodin, 2009; Zetterberg et al., 2010)	Betweenness (stepping stones) values of the patches in the network of existing (vegetated) and potential (non-vegetated) open spaces classified as [1] low, [2] medium, and [3] high.
A.2.1.3	Continuity of riverside vegetation	The vegetation between points of discontinuity (road crossings, walls, etc.) is classified as: [1] absent; [2] intermittent; or [3] continuous.
A2.2	**Lateral**	
A.2.2.1	Presence of transversal corridors	The percentage of vegetation on transversal roads, from the river to the URC edge are mapped and classified into: [1] absent, vegetated road segments ≤33%; [2] intermittent, >33% and ≤66%; or [3] continuous, >66%.
A.2.2.2	Connectivity of the impervious area (adapted from Alberti et al., 2007)	
A.2.2.3	Sinuosity (adapted from Batista e Silva et al., 2004; based on Manning, 1997)	Sinuosity can be determined by dividing channel length with down-valley length. Values: [1] almost straight between 1,00-1,05; [2] sinuous between 1,05-1,50, and [3] meandering above 1,50.
A.2.3	**Vertical**	
A.2.3.1	Presence of ecotones (based on May, 2006)	Percentage of the total length of ecotones out of the total length of river edges. Values: [1] low for values below 25%; [2] medium for values greater than 25% but lower than 50%; and [3] high for values higher than 50%.
A.2.3.2	Surface and groundwater interaction (based on Pringle, 2003)	The interaction between surface- and groundwater, i.e. vertical hydrologic connectivity, is classified according to the permeability of the riverbed: [1] no connectivity (concrete channel); [2] partial connectivity (partially channelized or sealed riverbed); [3] total connectivity (natural river bed).
A.2.3.3	Open water surface	The total area of water uncovered by bridges. Values: [1] <50% uncovered; [2] uncovered between 50%-75%; [3] uncovered above 75%.

** Indicators for which a source is not specified were proposed in this thesis.*

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TABLE 5.3 Indicators of social and ecological spatial capacity.

ID	Indicator and source*	Definition
B	**SPATIAL CAPACITY**	
B.1	**Social**	
B.1.1	**Spatial diversity**	
B.1.1.1a	Diversity of land uses – richness (adapted from Prastacos et al., 2017)	Patch richness density (PRD), representing the number of different land use classes per 100 hectares within the study area, is used as a measure of land use diversity. Values: [1] PRD < 0,25; [2] 0,25 ≤ PRD < 0,75; [3] PRD ≥ 0,75.
B.1.1.1b	Diversity of land uses – dominance (based on O'Neill et al., 1988)	Dominance represents the relative abundance of a land use class. Values (normalised): [1] ≤0,33; [2] >0,33 and ≤0,66; [3] >0,66.
B.1.1.1c	Diversity of land uses – dominant activities in riverfront (adapted from Batista e Silva et al., 2004, pp.59-61)	Percentage of different types of activities such as dwelling, services, commerce, and industries in the river space. Values: [1] not urbanised or predominantly non-urban; [2] partially urban with low diversity of urban activities; [3] predominantly urban with diversity of urban activities.
B.1.2	**Spatial quality**	
B.1.2.1a	Visual permeability - % visible river space	Percentage of visible open space within the river space. Values: [1] low visibility, when lower than 25%, [2] medium visibility between 25% and 75%, and [3] high visibility above 75%.
B.1.2.1b	Visual permeability – linear density of visual intersections (adapted from Batista e Silva et al., 2004, pp.48-49)	The visibility of the river space from the surrounding urban fabric is measured by the linear density of visual intersections between transversal visual axes and the river. Values: [1] 0-3 intersections/km; [2] 4-6 intersections/km; [3] 7-10 intersections/km. The maximum plausible and the corresponding categories may differ depending on specific URC or corridor segment conditions.
B.1.2.1c	Visual permeability - average length of transversal visual axes (adapted from Batista e Silva et al., 2004, pp.48-49)	Average length of visual axes with the river in a corridor segment, i.e. length of visual axes per number of visual axes intersecting the river. The maximum plausible (M) is determined for each corridor segment. Values: [1] ≤M/3; [2] >M/3 and ≤2M/3; [3] >2M/3.
B.1.2.1d	Visual permeability - no. of belvederes (adapted from Batista e Silva et al., 2004, pp.48-49)	Number of belvederes (no. of belvederes/area of river corridor (km2). The maximum plausible number of belvederes (M) is determined in a site analysis. Values: [1] ≤M/3; [2] >M/3 and ≤2M/3; [3] >2M/3.
B.1.2.2	Density of landmarks	Number of landmarks per area of river corridor. Maximum/target (M) is determined by a landscape analysis. Values: [1] ≤M/3; [2] >M/3 and ≤2M/3; [3] >2M/3.
B.1.2.3	Built space quality (adapted from Batista e Silva et al., 2004, pp.51-53)	Built space quality according to local building quality classification: [1] good quality; [2] medium quality; [3] bad quality.
B.1.2.4	Public utility of riverfront (adapted from Batista e Silva et al., 2004, p.53)	Predominance of attractive riverside public space (incl. green space). Values are given by the predominance of: [1] private space, public space not designated for pedestrian use (streets and parking); [2] unattractive public space; [3] attractive public space.
B.1.2.5	Cultural heritage (CH) - public interest of present CH values (adapted from Batista e Silva et al., 2004, pp.56-57)	"The amount of classified CH units in the river corridor with officially recognized public interest." (Batista e Silva et al., 2004, p.57) Maximum/target (M) is determined by a site analysis. Values: [1] ≤M/3; [2] >M/3 and ≤2M/3; [3] >2M/3.
B.1.2.6	Pollution (adapted from Batista e Silva et al., 2004, p.69)	Pollution classified according to local measurements of water quality: [1] poor; [2] fair; [3] good.
B.1.2.7	Attractiveness of existing activities (adapted from Batista e Silva et al., 2004, p.62)	The attractiveness of areas in a riverfront "is influenced by their distinctiveness, which makes them different from other common places in the city playing a different or specific role in the daily life of the city." Values: [1] low; [2] medium; [3] high.

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TABLE 5.3 Indicators of social and ecological spatial capacity.

ID	Indicator and source*	Definition
B.1.3	**Spatial composition**	
B.1.3.1	Intensity of construction (adapted from Batista e Silva et al., 2004, pp.55-56)	Gross floor area of construction per net surface of the river front. The maximum plausible intensity of construction (M) is determined in a site analysis. Values: [1] ≤M/3; [2] >M/3 and ≤2M/3; [3] >2M/3.
B.1.3.2a	Waterfront constitutedness - composition	Waterfront constitutedness is indicated by the percentage of the total length of built fronts projected on the river edges out of the total length of the river edges, corrected with a coefficient of fragmentation (standard deviation from maximum potential constitutedness). Values are standardized and classified as: [1] value ≤ 50%; [2] 50% < value ≤ 75%; [3] value > 75%.
B.1.3.2b	Waterfront constitutedness - configuration	Waterfront constitutedness is indicated by the perimeter-area ratio of the river space in a corridor segment. Values are determined according to the standard deviation from maximum possible constitutedness as: [1] fragmented; [2] partially constituted; [3] constituted.
B.1.3.3	Coverage - % parking spaces	Parking space coverage is indicated by the percentage of the total area of parking spaces out of the total area of open spaces in the corridor segment and it is classified as: [1] low, below 10%; [2] medium, between 10%-20%; [3] high, above 20%. The maximum plausible and the corresponding categories may differ depending on specific URC or corridor segment conditions.
B.2	**Ecological**	
B.2.1	**Spatial Diversity**	
B.2.1.1	Biodiversity	Species-rich areas in the corridor are mapped and classified as follows: [1] low, when no such area is present, [2] medium, when they are present in the proximity of the river, or [3] high, when species-rich areas are in direct contact with the river, i.e. they constitute part of the riparian space.
B.2.1.2	Storm water storage diversity	Different types of storm water storage solutions, classified as: [1] absent or neglected, grey infrastructure accommodating mainly drainage; [2] storage through grey infrastructure and pervious surfaces; [3] storage through pervious surfaces and a variety of green and blue infrastructure solutions, in addition to grey infrastructure.
B.2.1.3	Presence of different types of vegetation species (adapted from Batista e Silva et al., 2004, p.42)	Riparian vegetation classified as: [1] absent or herbaceous vegetation; [2] scarce trees in one or both margins; [3] well developed and continuous riparian vegetation in both margins.
B.2.1.4	Shannon diversity index (SHDI) (based on Alberti et al., 2007)	"The number of land cover classes in the landscape, [calculated as the] minus the sum, across all patch types, of the proportional abundance of each patch type multiplied by that proportion." (Alberti et al., 2007, p. 352). Values (normalised): [1] ≤0,33; [2] >0,33 and ≤0,66; [3] >0,66.
B.2.2	**Spatial quality**	
B.2.2.1	Flood vulnerability - % (adapted from Batista e Silva et al., 2004, pp.45-46)	Percentage of the total area of the corridor within the area of a 100-year flood. Values: [1] low; [2] medium; [3] high. As stated by Batista e Silva et al. (2004), adequate risk cartography is required for the assessment; values for the three classes are determined accordingly.
B.2.2.2	Bank erosion or landslide risk - % (adapted from Batista e Silva et al., 2004, p.46)	Percentage of the total length of river banks with potential erosion or landslides. Values: [1] low; [2] medium; [3] high. As stated by Batista e Silva et al. (2004), adequate risk cartography is required for the assessment; values for the three classes are determined accordingly.
B.2.2.3	Respect of natural dynamics (adapted from Batista e Silva et al., 2004, p.34)	Degree of disturbance of the river channel classified as: [1] highly disturbed (very artificial, channelized, concrete bed and banks), [2] moderately disturbed (artificial, channelized or concrete bed or banks), or [3] undisturbed (close to natural conditions).
B.2.3	**Spatial composition**	
B.2.3.1a	Coverage - % open space	The percentage of the total area of open spaces in a corridor segment out of the total area of the corridor segment. Open spaces are all unbuilt spaces, excluding the area occupied by road infrastructure and water. Values: [1] below 50%; [2] medium 50-75%; [3] above 75%.
B.2.3.1b	Coverage - % green space (based on Davis & Uffer, 2013)	Green space coverage is indicated by the percentage of the total area of green spaces out of the total area of the corridor segment and it is classified as: [1] low, below 20%; [2] medium, between 20%-40%; [3] high, above 40%.
B.2.3.1c	Coverage - % total impervious area (based on Alberti et al., 2007)	Percent total impervious area (%TIA) is classified as: [1] high imperviousness, below 20%; [2] medium imperviousness, between 20%-40%; [3] low imperviousness, above 40%. The maximum plausible and the corresponding categories are determined according to specific URC or corridor segment conditions.
B.2.3.2	Width of riparian vegetation (adapted from Batista e Silva et al., 2004, pp.42-43)	The riparian vegetation is classified as: [1] absent or narrow, value between 0-12m; [2] medium, value between 12-20m; [3] large, value >20m.

** Indicators for which a source is not specified were proposed in this thesis.*