

**Appendix 1** Characteristics of landscape types within the study area

| Landscape division                                                                                  |                                 |                                                     | Description of landscape units                                                                                                                                                                                                                                                              | Symbol of landscape unit                                                                                                                                                                                                                              | Number of landscape unit | Landscape units' total area [ha] |
|-----------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------|
| Group (Level 1)                                                                                     | Type (Level 2)                  | Subtype (Level 3)                                   |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                       |                          |                                  |
| Natural landscapes                                                                                  | 1. Forests                      | 1.1. With dominance of boreal habitats              | The landscape background is formed by dense forests (with an area > 100 hectares) in low- to medium-moisture boreal habitats                                                                                                                                                                | A1–A7                                                                                                                                                                                                                                                 | 7                        | 9827.2                           |
|                                                                                                     | 2. Surface waters               | 2. 1. Water courses                                 | The landscape background includes natural sections of riverbeds of considerable spatial scale together with islands, sandbanks, and silt nanos as well as areas inundated by snowmelt and flood waters                                                                                      | B2                                                                                                                                                                                                                                                    | 1                        | 368.5                            |
|                                                                                                     |                                 | 2. 2. Water bodies                                  | The landscape background consists of lakes or groupings of lakes of significant spatial scale (with an area > 100 hectares) along with islands and peninsulas                                                                                                                               | B3                                                                                                                                                                                                                                                    | 1                        | 856.3                            |
|                                                                                                     | 3. Wetlands                     | 3. 1. With dominance of rushes and sedges           | The landscape background is formed by plant communities with a predominance of rushes and sedges with the participation of peat bogs and depressions of land permanently or periodically filled with water                                                                                  | B1                                                                                                                                                                                                                                                    | 1                        | 121.2                            |
|                                                                                                     |                                 | 3. 2. With dominance of extensively used grasslands | The landscape background is formed by riparian areas associated with the valleys of large and medium-sized rivers, which are dominated by communities of extensively used meadows with the participation of peatlands and depressions of land permanently or periodically filled with water | B4, B5                                                                                                                                                                                                                                                | 2                        | 783.9                            |
|                                                                                                     | Natural and cultural landscapes | 4. Rural                                            | 4.1. With a predominance of mosaically distributed agricultural land forming small fields                                                                                                                                                                                                   | The landscape background is agricultural land either used (arable land, meadows and pastures) or unused (fallow and fallow land), which is dominated by mosaically arranged parcels of near-rectangular shape and small area (typically < 3 hectares) | C1–C6, C8, C10, C12      | 9                                |
| 4.2. With a predominance of mosaically distributed agricultural land, forming fields of medium size |                                 |                                                     | The landscape background is agricultural land either used (arable land, meadows and pastures) or unused (fallow and fallow land) which is dominated by mosaically arranged parcels of near-rectangular shape and medium size (typically from 3 to 30 ha)                                    | C11                                                                                                                                                                                                                                                   | 1                        | 352.2                            |
| 4.3. With predominantly built-up areas with a rural character                                       |                                 |                                                     | The landscape background is a compact village-like development with a well-preserved habitat layout surrounded by land in agricultural use                                                                                                                                                  | C7, C9                                                                                                                                                                                                                                                | 2                        | 97.6                             |
| Cultural landscapes                                                                                 | 5. Urban                        | 5.1. Villages with the preserved historical layout  | The landscape background is a compact, large-scale development with urban characteristics associated with the presence of a market and concentric layout of streets and the presence of historic architectural buildings                                                                    | D3                                                                                                                                                                                                                                                    | 1                        | 376.2                            |
|                                                                                                     | 6. Suburban                     | 6.1. Compact localities with residential functions  | The landscape background is intensive and compact development, mostly nonagricultural in nature with a dominant residential function and home gardens                                                                                                                                       | D1, D2                                                                                                                                                                                                                                                | 2                        | 168.9                            |

**Appendix 2** Indicators used to characterize biophysical landscape features (abbreviations explained in Table 1)

| Indicator code and name                                                                      |                                        | Indicator description                                                                                              | Measurement unit                                                   | Database         |
|----------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------|
| <b>A. Indicators of the potential of CES characteristics of a specific type of ecosystem</b> |                                        |                                                                                                                    |                                                                    |                  |
| Forest                                                                                       |                                        |                                                                                                                    |                                                                    |                  |
| 1.                                                                                           | Forest habitat type                    | Proportion of stand in low- or medium-moisture habitats in the unit area                                           | % of landscape area                                                | LA, BDL, LMN     |
| 2.                                                                                           | Type of stand                          | The share of two- or multispecies stands in the area of the unit                                                   | % of landscape area                                                | BDL, LMN         |
| 3.                                                                                           | Age of the stand                       | The share of mature stands (over 60 years old) in the area of the unit                                             | % of landscape area                                                | BDL, LMN         |
| 4.                                                                                           | Story structure of the stand           | The share of two- or three-story stands in the unit area                                                           | % of landscape area                                                | BDL, LMN         |
| 5.                                                                                           | Protective function of the forest      | The share of forest stand with protective functions in the area of the unit                                        | % of landscape area                                                | LA, BDL, LMN     |
| Water courses                                                                                |                                        |                                                                                                                    |                                                                    |                  |
| 6.                                                                                           | Nature of the river                    | Occurrence of permanent watercourses of natural character                                                          | % of objects in the unit                                           | LA, MHP, BDOT10k |
| 7.                                                                                           | Width of the riverbed                  | Occurrence of watercourses with a significant spatial scale (width of the river channel > 15 m)                    | % of objects in the unit                                           | MHP, BDOT10k     |
| 8.                                                                                           | Variability of the river shoreline     | The presence of a varied coastline devoid of technical fortifications                                              | % of shoreline length                                              | MHP, BDOT10k     |
| 9.                                                                                           | Tree cover on the river banks          | Occurrence of trees and shrubs in contact with the river banks                                                     | % of shoreline length                                              | MSP, BDOT10k     |
| Water bodies                                                                                 |                                        |                                                                                                                    |                                                                    |                  |
| 10.                                                                                          | Lake area                              | Occurrence of lakes of significant spatial scale (lake area > 50 ha)                                               | % of objects in the unit                                           | LA, MHP, BDOT10k |
| 11.                                                                                          | Average depth of the lake              | Occurrence of lakes of considerable depth (> 3 m)                                                                  | % of objects in the unit                                           | MHP, BDOT10k     |
| 12.                                                                                          | Shape of the lake basin                | Occurrence of elongated lakes (elongation index value from 3 to 7)                                                 | % of objects in the unit                                           | MHP, BDOT10k     |
| 13.                                                                                          | Diversity of the lake shoreline        | Occurrence of a varied coastline with numerous bays and peninsulas (value of shoreline development index > 2 m/ha) | % of objects in the unit                                           | MHP, BDOT10k     |
| 14.                                                                                          | Forestation of the lake shore          | Occurrence of trees and shrubs in contact with the lake shoreline                                                  | % of shoreline length                                              | MSP, BDOT10k     |
| Wetlands                                                                                     |                                        |                                                                                                                    |                                                                    |                  |
| 15.                                                                                          | Meadows and pastures                   | The share of extensively used meadows and pastures in the area of the unit                                         | % of landscape area                                                | LA, BDOT10k      |
| 16.                                                                                          | Local marshes, bogs, sedges and rushes | The surface density of local marshes, bogs, sedges and rushes in the landscape                                     | Number of objects per unit area of landscape (km/km <sup>2</sup> ) | LA, BDOT10k      |
| 17.                                                                                          | Local watercourse system               | The density of local watercourses in the landscape unit                                                            | Length of objects per unit area of landscape (km/km <sup>2</sup> ) | LA, BDOT10k      |
| 18.                                                                                          | Small-scale and unitary tree plantings | The density of canopies characteristic of wetland habitats on the landscape surface                                | Number of objects per unit area of landscape (km/km <sup>2</sup> ) | LA, BDOT10k      |

| Rural                                                                 |                                                                    |                                                                                                                                              |                                                                    |                      |
|-----------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------|
| 19.                                                                   | The size and layout of the farmland                                | The share of small or medium-sized fields with a ribbon or mosaic arrangement in the area of the unit                                        | % of landscape area                                                | LA, EGIB             |
| 20.                                                                   | Facilities related to the specificity and tradition of cultivation | Occurrence of crops related to historical features of the landscape                                                                          | Number of objects                                                  | LA, LDP, BDOT10k     |
| 21.                                                                   | Mid-field plantings                                                | The density of linear tree canopy in the landscape unit                                                                                      | Length of objects per unit area of landscape (km/km <sup>2</sup> ) | LA, BDOT10k          |
| 22.                                                                   | Historic systems of composed greenery with a rural character       | Occurrence of historical greenery systems integrated with village buildings                                                                  | number of objects                                                  | LA, BDOT10k          |
| Urban and suburban                                                    |                                                                    |                                                                                                                                              |                                                                    |                      |
| 23.                                                                   | Landscaped greenery complexes                                      | Share of developed green areas in the area of the unit                                                                                       | % of landscape area                                                | LA, BDOT10k          |
| 24.                                                                   | Other urban green areas                                            | Share of undeveloped green areas in the area of the unit                                                                                     | % of landscape area                                                | LA, BDOT10k          |
| 25.                                                                   | Local water reservoirs                                             | Occurrence of water reservoirs integrated with green areas                                                                                   | Number of objects                                                  | LA, MHP, BDOT10k     |
| 26.                                                                   | Historic greenery systems with an urban character                  | Occurrence of historical greenery systems integrated with urban development                                                                  | Number of objects                                                  | BDOT10k              |
| B. Indicators of the potential of CES specific to all landscape types |                                                                    |                                                                                                                                              |                                                                    |                      |
| 27.                                                                   | The nature of the relief                                           | The share of morphometrically diverse areas (with slopes of > 3° and relative heights of 10-25 m) in the area of the unit                    | % of landscape area                                                | LA, DTM              |
| 28.                                                                   | High-ranking nature and landscape conservation areas               | The share of naturally and culturally valuable areas of supra-local importance in the area of the unit                                       | % of landscape area                                                | LA, NPA, CRNC        |
| 29.                                                                   | Local forms of nature conservation                                 | The density of local forms of nature conservation on the landscape surface                                                                   | Number of objects per unit area of landscape (km/km <sup>2</sup> ) | LA, NPA, CRNC        |
| 30.                                                                   | Natura 2000 areas                                                  | Occurrence of natural habitat types protected within the Natura 2000 network                                                                 | Number of objects                                                  | LA, NPA, CRNC        |
| 31.                                                                   | Other valuable natural sites                                       | Occurrence of geological or geomorphological objects of supra-local importance (geoheritage)                                                 | Number of objects                                                  | LA, CRGP, GMW        |
| 32.                                                                   | Archaeological sites integrated into the landscape                 | Occurrence of archaeological objects integrated into the relief of the area                                                                  | Number of objects                                                  | LA, AM, RHM          |
| 33.                                                                   | Other cultural sites of high importance                            | The presence of cultural objects of supra-local importance, whose character and functions relate to the historical features of the landscape | Number of objects                                                  | LA, IM, RHM, LDP     |
| 34.                                                                   | Facilities of scientific and educational importance                | Occurrence of facilities conducting scientific or educational activities on natural and cultural values of the landscape                     | Number of objects                                                  | LA                   |
| 35.                                                                   | Intangible values of the landscape                                 | Occurrence of intangible landscape values fixed in collective memory and confirmed in source studies                                         | Number of objects                                                  | LA, IM, RHM, LDP     |
| 36.                                                                   | Objects of spiritual or symbolic significance                      | Occurrence of objects of ethnographic and folklore value related to nature worship, beliefs and legends                                      | Number of objects                                                  | LA, IM, AM, RHM, LDP |

|                                                                      |                                           |                                                                                                                                       |                                                                    |                   |
|----------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------|
| 37.                                                                  | Dominant features and landscape interiors | The density of natural or cultural objects that stand out visually and contrast with the background of the landscape surface          | Number of objects per unit area of landscape (km/km <sup>2</sup> ) | DEM, BDOT10k, GMW |
| 38.                                                                  | Viewpoints and panoramas                  | Occurrence of natural or cultural objects elevated topographically in the terrain, which allows observing extensive and distant views | Number of objects                                                  | DTM, BDOT10k, LDP |
| <b>C. Indicators affecting the reduction of the potential of CES</b> |                                           |                                                                                                                                       |                                                                    |                   |
| 39.                                                                  | Anthropogenic barriers in the landscape   | Density of anthropogenic barriers in the landscape unit in the form of paved roads, railroads and high-voltage power lines            | Length of objects per unit area of landscape (km/km <sup>2</sup> ) | LA, BDOT10k, MSP  |
| 40.                                                                  | Nuisance objects in the landscape         | Occurrence of objects with a negative impact on environmental elements of guiding importance for the landscape unit                   | Number of objects                                                  | GH, MSP           |
| 41.                                                                  | Vulnerability of the landscape            | Share of vulnerable areas due to environmental elements of guiding importance for the landscape unit                                  | % of landscape area                                                | MSP, MHP          |
| 42.                                                                  | Degree of landscape degradation           | Share of areas that exceed quality standards of environmental elements of guiding importance for the landscape unit                   | % of landscape area                                                | DTM, SW, MSP, MHP |

**Appendix 3** Matrix of specific indicator importance for assessing the potential supply of cultural ecosystem services (CES), developed by the authors

| Indicator code and name                                                              |                     | The characteristics of ecosystems that affect:                                      |                                                       |                                                                 |                                                               |                                                                   |                                                                                      |                                                                                                              |                                                 |                                                                                               |
|--------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------|
|                                                                                      |                     | Regeneration of the body and improvement of health (including bioclimatic features) | Interactions of a leisure nature (active and passive) | Zoning of the tourist function, shaping enclaves for recreation | Interakcje o charakterze naukowym, szkoleniowym i edukacyjnym | Cognitive interactions based on natural heritage and biodiversity | Interactions of a cognitive nature based on cultural heritage and cultural diversity | Interactions related to the perception of physiognomic features, providing inspiration for artistic activity | Interactions of a religious or spiritual nature | Opportunities to use the potential of CES due to protective rigor and environmental condition |
| A. Indicators of the potential of CES characteristic of a specific type of ecosystem |                     |                                                                                     |                                                       |                                                                 |                                                               |                                                                   |                                                                                      |                                                                                                              |                                                 |                                                                                               |
| Forest                                                                               |                     |                                                                                     |                                                       |                                                                 |                                                               |                                                                   |                                                                                      |                                                                                                              |                                                 |                                                                                               |
| 1.                                                                                   | Forest habitat type | ●●●                                                                                 | ●●●                                                   | ●●●                                                             | ●●                                                            | ●●                                                                | ●                                                                                    | ●●                                                                                                           | ●●                                              | ●                                                                                             |
| 2.                                                                                   | Type of stand       | ●●●                                                                                 | ●●                                                    | ●●●                                                             | ●●                                                            | ●●                                                                | ●                                                                                    | ●●●                                                                                                          | ●                                               | ●                                                                                             |

|                                                                              |                                                                    |     |     |     |     |     |     |     |     |     |
|------------------------------------------------------------------------------|--------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 3.                                                                           | Age of the stand                                                   | ••  | ••• | ••• | ••  | ••  | •   | ••• | ••  | •   |
| 4.                                                                           | Story structure of the stand                                       | ••• | ••• | ••  | •   | ••  | •   | ••  | •   | •   |
| 5.                                                                           | Protective function of the forest                                  | ••  | ••  | ••• | ••• | ••• | ••  | ••  | ••  | ••• |
| Water courses                                                                |                                                                    |     |     |     |     |     |     |     |     |     |
| 6.                                                                           | Nature of the river                                                | ••  | ••  | ••• | •   | ••  | •   | ••• | ••  | •   |
| 7.                                                                           | Width of the riverbed                                              | ••• | ••• | ••• | •   | ••  | •   | ••• | ••  | •   |
| 8.                                                                           | Variability of the river shoreline                                 | •   | ••  | ••• | •   | ••  | •   | ••  | •   | •   |
| 9.                                                                           | Tree cover on the river banks                                      | ••  | ••  | ••  | •   | ••  | •   | ••• | •   | •   |
| Water bodies                                                                 |                                                                    |     |     |     |     |     |     |     |     |     |
| 10.                                                                          | Lake area                                                          | ••• | ••• | ••• | •   | ••  | •   | ••• | ••  | •   |
| 11.                                                                          | Average depth of the lake                                          | •   | ••• | ••• | •   | ••  | •   | •   | •   | •   |
| 12.                                                                          | Shape of the lake basin                                            | ••• | ••• | ••• | •   | ••  | •   | ••• | •   | •   |
| 13.                                                                          | Diversity of the lake shoreline                                    | •   | ••  | ••• | •   | ••  | •   | ••  | •   | •   |
| 14.                                                                          | Forestation of the lake shore                                      | ••  | ••  | ••  | •   | ••  | •   | ••• | •   | •   |
| Wetlands                                                                     |                                                                    |     |     |     |     |     |     |     |     |     |
| 15.                                                                          | Meadows and pastures                                               | ••• | ••• | ••• | •   | ••  | ••  | ••  | •   | •   |
| 16.                                                                          | Local marshes, bogs, sedges and rushes                             | •   | ••  | ••• | •   | ••  | •   | ••• | ••  | •   |
| 17.                                                                          | Local watercourse system                                           | ••  | ••• | ••• | •   | ••  | •   | ••  | •   | •   |
| 18.                                                                          | Small-scale and unitary tree plantings                             | ••  | ••  | ••  | •   | ••  | •   | ••• | •   | •   |
| Rural                                                                        |                                                                    |     |     |     |     |     |     |     |     |     |
| 19.                                                                          | The size and layout of the farmland                                | •   | ••• | ••• | •   | ••  | ••  | ••• | •   | •   |
| 20.                                                                          | Facilities related to the specificity and tradition of cultivation | •   | ••• | ••• | ••  | •   | ••• | ••  | ••  | •   |
| 21.                                                                          | Mid-field plantings                                                | ••  | ••  | ••  | •   | ••  | ••  | ••• | •   | •   |
| 22.                                                                          | Historic systems of composed greenery with a rural character       | ••  | ••  | ••  | ••  | ••• | ••• | ••  | ••  | ••  |
| Urban and suburban                                                           |                                                                    |     |     |     |     |     |     |     |     |     |
| 23.                                                                          | Landscaped greenery complexes                                      | ••• | ••• | ••• | •   | ••  | ••  | ••• | •   | •   |
| 24.                                                                          | Other urban green areas                                            | ••• | ••• | ••• | •   | ••  | •   | ••• | •   | •   |
| 25.                                                                          | Local water reservoirs                                             | ••  | ••  | ••  | •   | ••  | •   | ••  | •   | •   |
| 26.                                                                          | Historic greenery systems with an urban character                  | ••  | ••  | ••  | ••  | ••• | ••• | ••  | ••  | ••  |
| <b>B. Indicators of the potential of CES specific to all landscape types</b> |                                                                    |     |     |     |     |     |     |     |     |     |
| 27.                                                                          | The nature of the relief                                           | ••• | ••• | ••• | •   | ••  | •   | ••• | •   | •   |
| 28.                                                                          | High-ranking nature and landscape conservation areas               | ••  | ••• | ••• | ••• | ••• | ••• | ••• | ••  | ••• |
| 29.                                                                          | Local forms of nature conservation                                 | •   | ••  | ••  | ••  | ••• | ••  | ••  | ••  | ••  |
| 30.                                                                          | Natura 2000 areas                                                  | ••  | ••  | ••  | ••  | ••• | •   | ••  | •   | ••• |
| 31.                                                                          | Other valuable natural sites                                       | •   | ••  | ••  | ••• | ••• | •   | ••  | ••  | ••  |
| 32.                                                                          | Archaeological sites integrated into the landscape                 | •   | •   | •   | ••  | •   | ••• | •   | ••• | ••  |

|     |                                                     |   |    |    |     |     |     |     |     |    |
|-----|-----------------------------------------------------|---|----|----|-----|-----|-----|-----|-----|----|
| 33. | Other cultural sites of high importance             | • | •  | •  | ••• | •   | ••• | ••  | ••• | •• |
| 34. | Facilities of scientific and educational importance | • | •  | •  | ••• | ••• | ••• | •   | •   | •  |
| 35. | Intangible values of the landscape                  | • | •  | •  | ••  | •   | ••• | •   | ••• | •  |
| 36. | Objects of spiritual or symbolic significance       | • | •• | •• | •   | •   | ••• | •   | ••• | •  |
| 37. | Dominant features and landscape interiors           | • | •• | •• | ••  | ••  | ••  | ••• | ••  | •  |
| 38. | Viewpoints and panoramas                            | • | •• | •• | ••  | •   | •   | ••• | ••  | •  |

**C. Indicators affecting the reduction of the potential of CES**

|     |                                         |     |     |     |    |    |    |     |   |     |
|-----|-----------------------------------------|-----|-----|-----|----|----|----|-----|---|-----|
| 39. | Anthropogenic barriers in the landscape | ••  | ••  | ••  | •• | •• | •• | ••• | • | ••• |
| 40. | Nuisance objects in the landscape       | ••• | ••• | ••• | •• | •• | •• | ••• | • | ••• |
| 41. | Vulnerability of the landscape          | •   | ••  | ••  | •• | •• | •  | •   | • | ••• |
| 42. | Degree of landscape degradation         | ••• | ••• | ••• | •• | •• | •  | ••  | • | ••• |

Explanations: significance of the indicator for assessing the CES potential: ••• - large •• - medium • - small or unimportant