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OpenStreetMap
Land Classification System
(OSM LCS)

An Approach to Improve
Global Land Cover and Land Use Mapping
in OpenStreetMap

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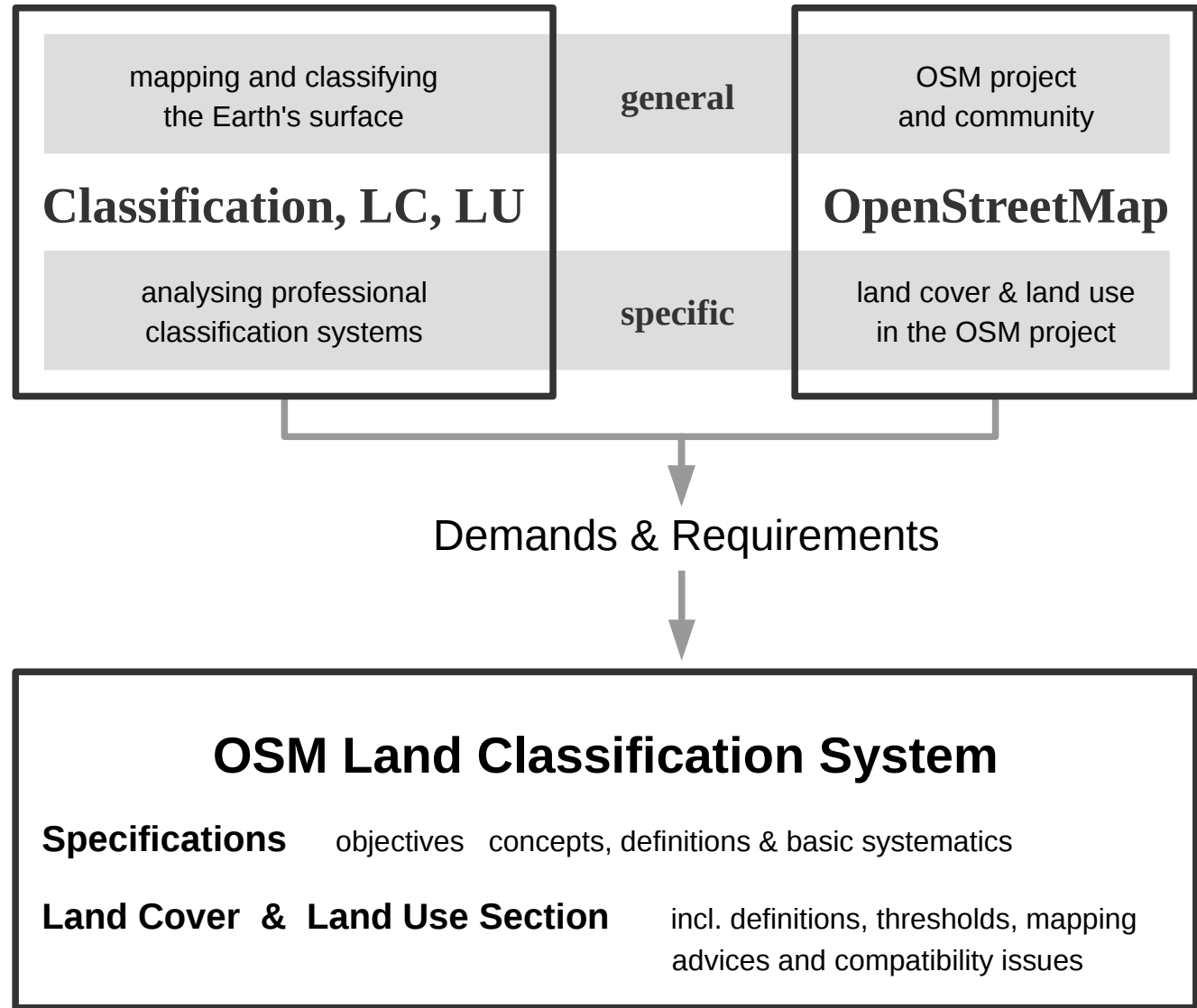Department for Civil Engineering and Geoinformation
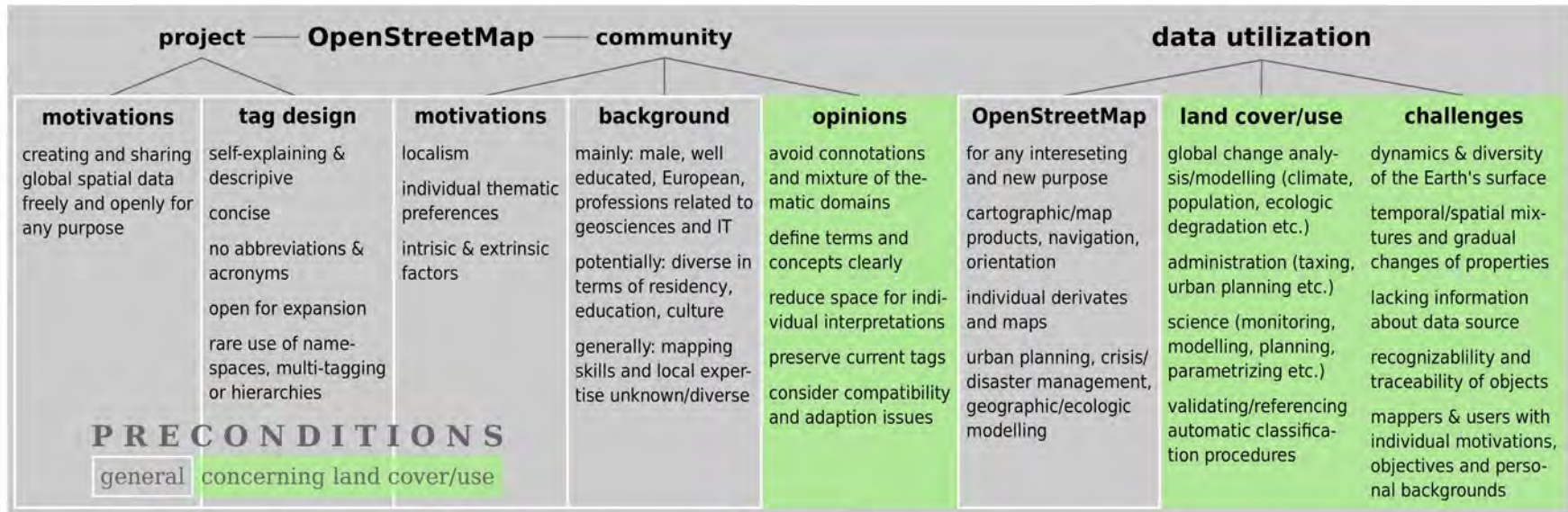
Synopsis

Motivation

The availability of satellite images, accompanied by increasing computation power, led to a rising importance of automatic land cover and land use classification. The relations between both aspects are complex and conclusions in both directions are often incorrect. Collecting necessary reference data is very resource-intensive. OSM provides this data, but is characterized by credibility and compatibility issues.

Objectives

The thesis develops a conceptual basis and a draft of a new *OSM Land Classification System*. By considering the needs of mappers and data users, the system shall improve OSM data quality and compatibility (via *FAO LCCS* and *ISIC*). This shall leverage the potential of OSM to become an attractive data source for professional applications.

mapping and classifying
the Earth's surface

general

OSM project
and community

Classification, LC, LU

OpenStreetMap

analysing professional
classification systems

specific

land cover & land use
in the OSM project

Demands & Requirements

OSM Land Classification System

Specifications   objectives   concepts, definitions & basic systematics

Land Cover & Land Use Section   incl. definitions, thresholds, mapping
advices and compatibility issues

Demands & Requirements

project — **OpenStreetMap** — **community**   **data utilization**

motivations	**tag design**	**motivations**	**background**	**opinions**	**OpenStreetMap**	**land cover/use**	**challenges**
creating and sharing global spatial data freely and openly for any purpose	self-explaining & descripive concise no abbreviations & acronyms open for expansion rare use of name-spaces, multi-tagging or hierarchies	localism individual thematic preferences intrisic & extrinsic factors	mainly: male, well educated, European, professions related to geosciences and IT potentially: diverse in terms of residency, education, culture generally: mapping skills and local exper-tise unknown/diverse	avoid connotations and mixture of the-matic domains define terms and concepts clearly reduce space for indi-vidual interpretations preserve current tags consider compatibility and adaption issues	for any interesting and new purpose cartographic/map products, navigation, orientation individual derivates and maps urban planning, crisis/ disaster management, geographic/ecologic modelling	global change analy-sis/modelling (climate, population, ecologic degradation etc.) administration (taxing, urban planning etc.) science (monitoring, modelling, planning, parametrizing etc.) validating/referencing automatic classifica-tion procedures	dynamics & diversity of the Earth's surface temporal/spatial mix-tures and gradual changes of properties lacking information about data source recognizablility and traceability of objects mappers & users with individual motivations, objectives and perso-nal backgrounds

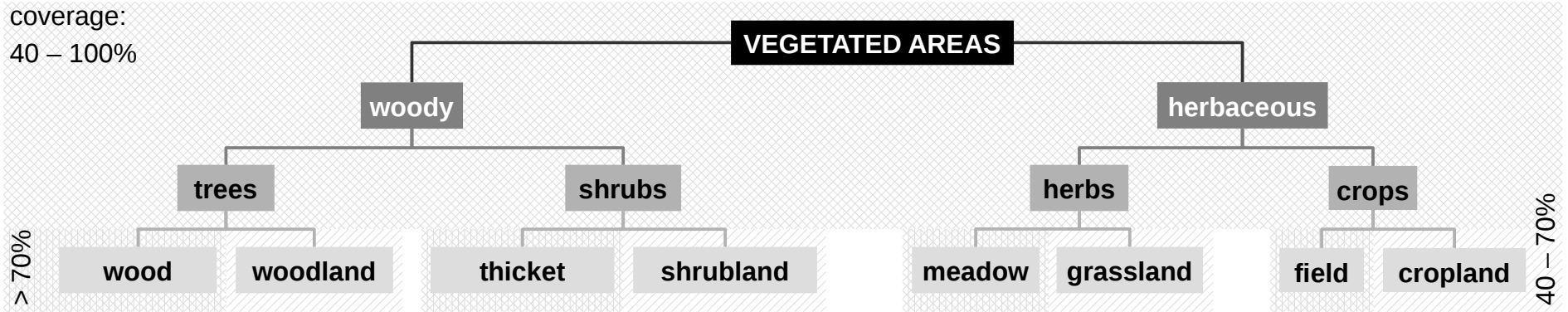**PRECONDITIONS**

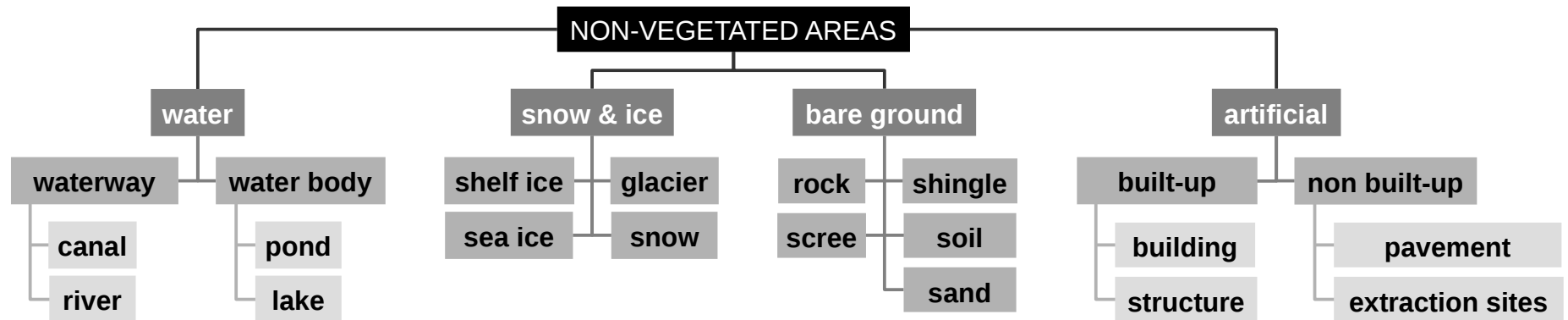general   concerning land cover/use

GENERAL DEMANDS

REQUIREMENTS + supportive O neutral − obstructive	focus on observation	transparency	usability & acceptance	objectivity	high data quality	compatibility	tackle diversity	globality
provide guidelines & explanations	+	+	+	+	+	+	+	+
use simple basic concepts	+	+	+	+	+	+	+	+
provide classes for different detail levels	+	O	+	+	+	+	+	+
provide comprehensible criteria	+	+	+	+	+	+	O	+
provide precise definitions	+	+	+	+	+	+	O	+
avoid regional limitations	+	O	+	+	+	+	O	+
use consistent thematic domains	O	+	+	+	+	+	O	+
provide user-friendly thresholds	+	+	+	+	−	−	−	+
store info about source data	O	+	O	+	+	+	O	O
assure expandability	−	−	+	O	O	−	+	+
preserve current tags	O	−	+	−	O	O	O	O
provide concise, descriptive, simple tags	−	−	+	O	−	O	O	O

Classifying Land Cover (draft)

Land Cover Classification System

coverage:
40 − 100%

VEGETATED AREAS

> 70%

40 − 70%

woody

herbaceous

trees

shrubs

herbs

crops

wood **woodland**

thicket **shrubland**

meadow **grassland**

field **cropland**

[bold] … land cover class expressed by a tag (e.g. `landcover=trees`)

NON-VEGETATED AREAS

water

snow & ice

bare ground

artificial

waterway **water body**

shelf ice **glacier**

rock **shingle**

built-up **non built-up**

sea ice **snow**

scree **soil**

building **pavement**

sand

canal **pond**

structure **extraction sites**

river **lake**

Classifying Land Use (draft)

Land Use Classification System

PRIMARY SECTOR

- **farming**
  - **crop farming**
  - **animal farming**
  - **mixed farming**
- **orchardry**
- plant propagation
- **forestry**
- **aquaculture**
- resource extraction

SECONDARY SECTOR

- **energy production**
- **industry & manufacturing**

MISCELLANEOUS

- **abandoned areas**
- **construction sites**

[bold] … land use class expressed by a tag (e.g. `landuse=forestry`)

TERTIARY SECTOR

- transportation
  - **railway transportation**
  - **road transportation**
  - **water transportation**
  - **air transportation**
- **commerce & business**
  - **retail & wholesale**
  - **services**
  - **hospitality businesses**
- community services
  - **health care**
  - education
  - **public services**
  - **religion**
  - **military**
- **sport & recreation**
- **dwelling & housing**

Remarks

Major Improvements

The new system emphasizes observation rather than interpretation. Objects are described by basic aspects without carrying connotations in respect of land use, ecology, climate etc.

The separation of land cover and land use represents their complex relationship. Varying land cover types within an area of homogeneous land use can be expressed – and vice versa.

Classes, definitions and thresholds are aligned to *FAO LCCS* and *ISIC* in order to improve external compatibility.

Major Limitations

Despite the efforts, full objectivity in classifying land objects can not be reached. Cultural or educational factors will have a remaining influence on the classification process.

The interdependency of class names and OSM tags are a problematic issue. Tags are concise and self-explanatory, but class names might be complex and consist of several words.

The *FAO LCCS* integrates land use and hydrology in its eight main categories. Here, the strict separation of these information in the OSM LCS causes compatibility issues.

Unsettled Issues

The new system is still a draft. For many classes, details have not been formulated yet. A systematic transfer and integration of recent OSM classes is an important step towards completeness.

Further adjustments can be expected as a consequence of test mappings; none have been conducted so far.

Important for the system to develop is the discussion within the OSM community: An official proposal is the conventional starting point but still has to be written.

Conclusion

For now, it can't be predicted whether the new system will meet the expectations formulated by the initial motivations and objectives, especially because of lacking practical experience. Anyway, the comprehensive analysis of preconditions on the sides of professional users and OSM contributors have resulted in a systematic compilation of general demands and practical requirements. It can serve as a conceptional guideline for improving the OSM tagging scheme – particularly for land cover and land use information, but also in general. Compromising compatibility and usability will stay the most difficult task.