Arbeitsgemeinschaft der Vermessungsverwaltungen
der Länder der Bundesrepublik Deutschland

Landuse & Landcover

future concept for the german cadastre

Dr. Christian Lucas

AMTLICHES DEUTSCHES VERMESSUNGSWESEN

GeoInfoDok

- **Structure of the German Cadaster Data Modell (AAA-Modell)**
  - the real estate cadaster Data, coming from the Automated Real Estate Book (ALB) and the Automated Real Estate Map (ALK) is combined to ALKIS® (Authoritative Real Estate Cadaster Information System)

  - ALKIS® together with the Authoritative Topographic-Cartographic Information System ATKIS® and the Authoritative Control Point Information System AFIS® is formulated in the AAA-model and described in the GeoInfoDok

GeoInfoDok

- **Main Objekt Type**

10000 Land parcels, Location, Points	20000 Owner
30000 Buildings	40000 Actual Use
50000 Structures, Facilities and other Information	60000 Relief
70000 Legal Specifications, Territorial Units, Catalogs	80000 User Profile

GeoInfoDok

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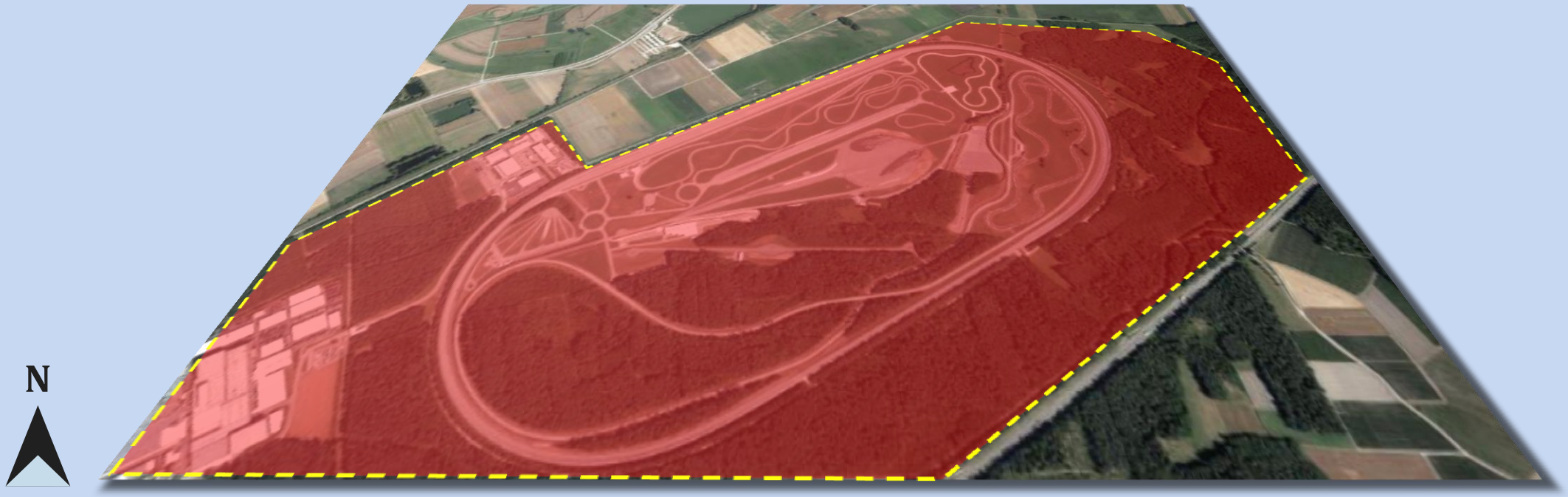
Definition

- **Object Type „Actual Use“ - TN**

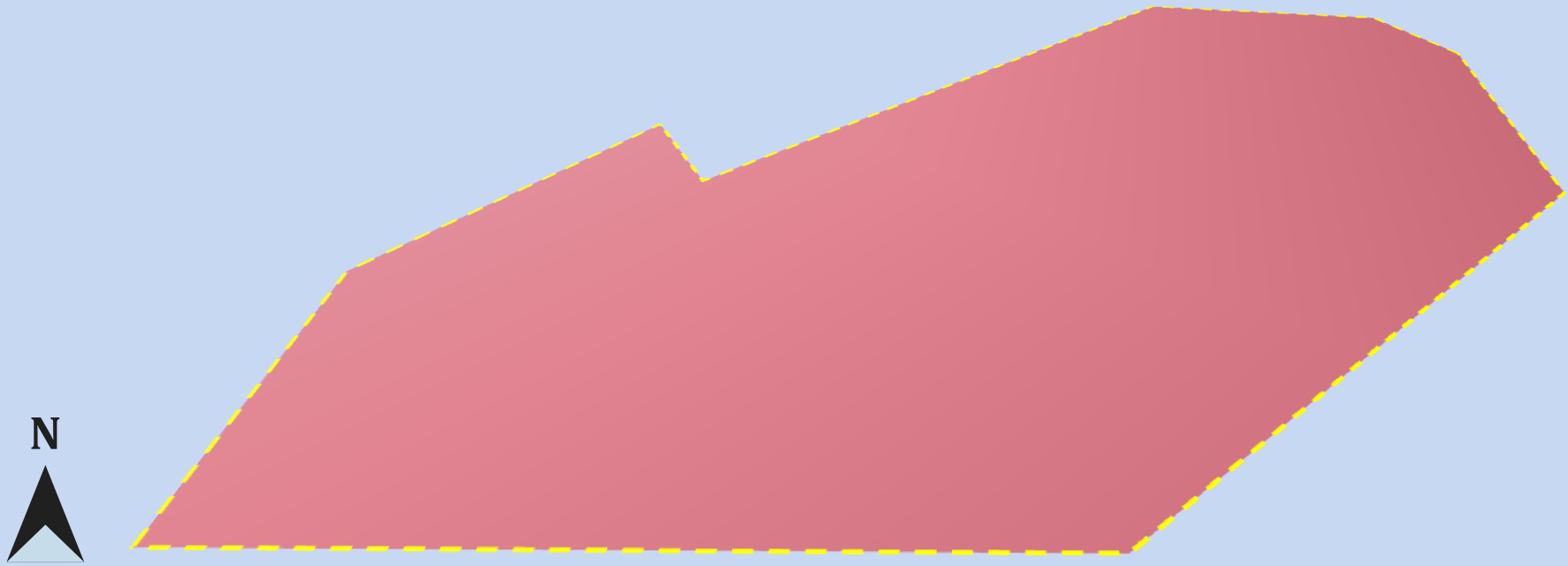
Definition

- **$TN_{v.1}$**
  - Industry and Commercial Services
  - Roads



Definition

- **Statistics / Land Use / Environmental Planning | Tax Administration**
  - Settlement and traffic areas | Building and Open space

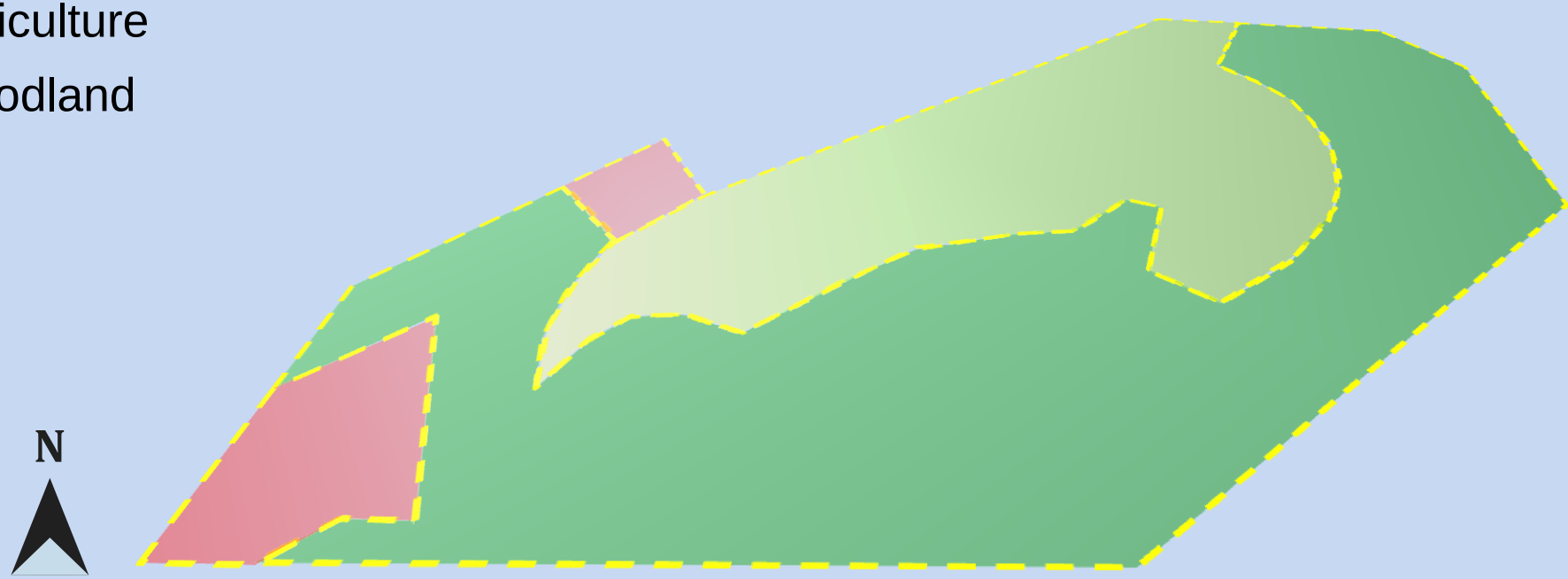


Definition

- **$TN_{v.2}$**
  - Industrial and Commercial Services
  - Vegetation Less Areas
  - Grassland
  - Forest
  - Roads

Definition

- **Statistics / Land Use / Environmental Planning | Tax Administration**
  - Settlement and traffic areas | Building and Open Space
  - Vegetation Less Areas
  - Agriculture
  - Woodland

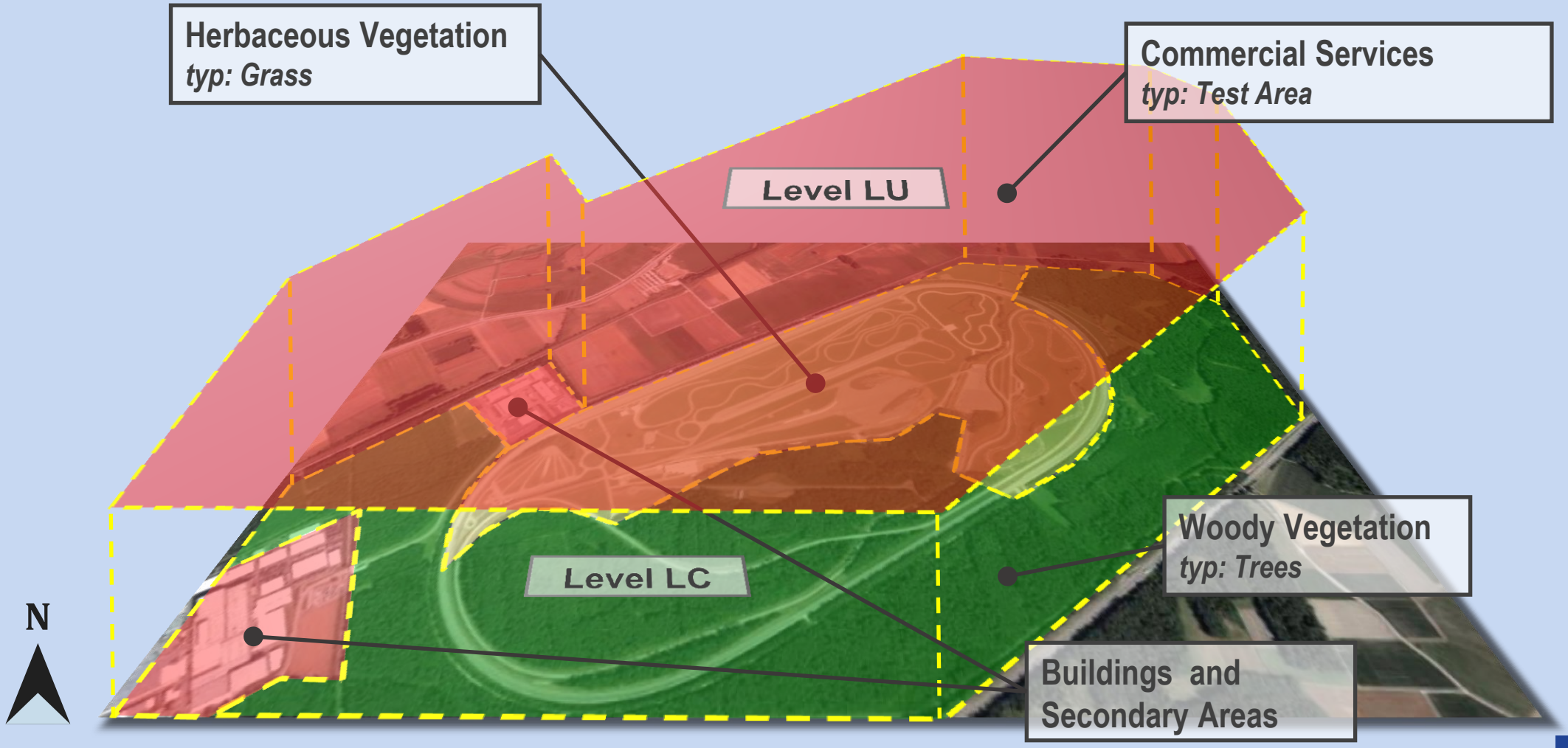


Definition

- **LU/LC ?**

Definition

- **LU/LC**



Semantic analysis of the TN

- **existing nomenclatures and classification concepts**
  - CORINE Land Cover
  - Hierarchical INSPIRE Land Use Classification System (HILUCS)
  - EIONET Action Group on Land Monitoring in Europe (EAGLE)
  - Land Use / Cover Area Frame Survey (LUCAS)
  - Landcovermodell for Germany (LBM-DE)
  - DeCOVER
  - Open Street Map LandUse / LanCover
  - …

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  - …

Semantic analysis of the TN

- **exemple LBM-DE**
  - Land Cover: 36
  - Land Use: 15

A	Gebäude (Versiegelung > 80%)	B111
	Gebäude (Versiegelung 50% - 80%)	B112
	Gebäude (Versiegelung 30% - 50%)	B113
	Industrielle Anlagen	B121
	Versiegelte gebäudelose Flächen	B122
	Unversiegelte gebäudelose Flächen	B133
B	Ackerland	B211
	Weinbau	B221
	Obst- und Beerenobst	B222
	Hopfen	B224
C	homogenes Grünland	B231
	inhomogenes Grünland	B321
	Salzwiesen (Küste)	B421
D	Mischflächen (regelmäßige Struktur)	B242
	Grasland mit Bäumen (<50%)	B233
	Zwergsträucher (Heide)	B322
	Büsche, Sträucher, junge Bäume	B324

E	Laubbäume	B311
	Nadelbäume	B312
	Nadel- und Laubbäume	B313
F	Spärliche Vegetation	B333
	Sandflächen	B331
	Fels, feste natürliche Oberfläche, Ton	B332
	Brandfläche	B334
	Schnee (permanent) und Eis	B335
	Lockergestein	B336
G	Sumpf	B411
	Moor	B412
	Sumpf mit Büschen/Bäumen < 50%	B413
	Moor mit Büschen/Bäumen < 50%	B414
H	Watt	B423
	Wasserlauf	B511
	Wasserfläche	B512
	Lagune	B521
	Mündungstrichter	B522
	Offenes Meer	B523

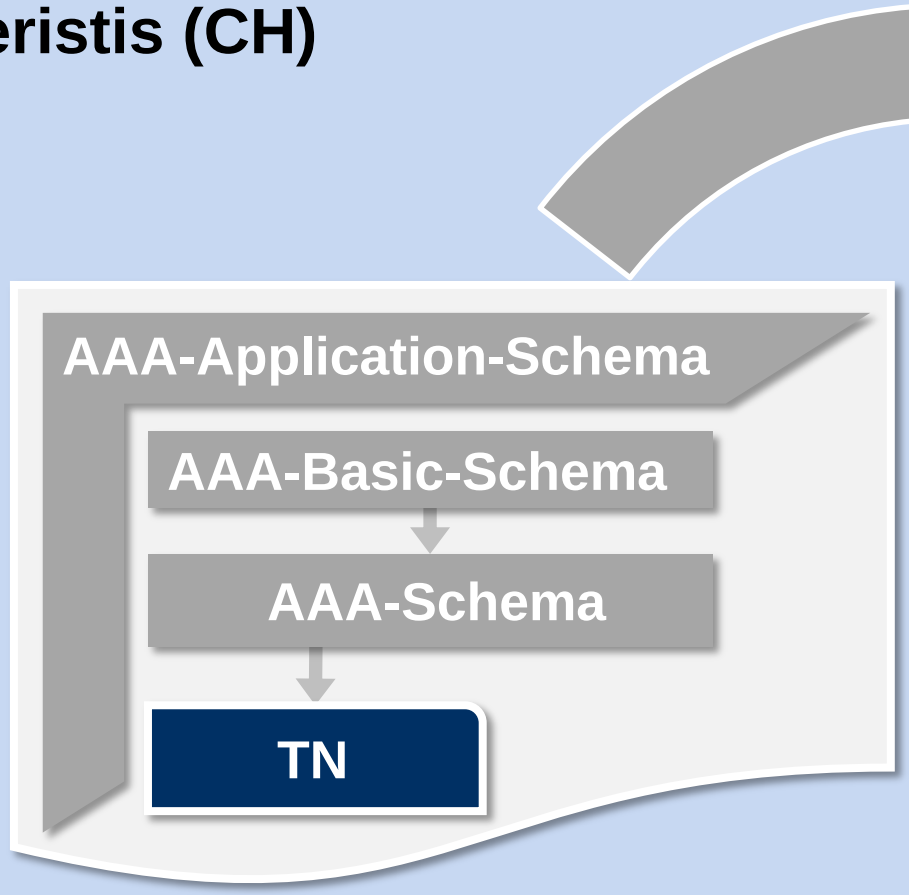
Semantic analysis of the TN

- **exemple LBM-DE**
  - Landcover: 36
  - Landuse: 15

			Wohnen	Produktion	Öffentlichkeit	Hafen	Abbauflächen	Deponien	Lager	Straßen- und Bahnverkehr	Flugverkehr	Sport und Freizeit	städt. Grünfläche	Landwirtschaft (intensiv)	extensive Nutzung	Brache	Forstwirtschaft	im Bau	Keine Nutzung erkennbar, nicht relevant
			N112	N120	N121	N123	N131	N132	N134	N122	N124	N142	N141	N211	N214	N215	N311	N133	N999
A	Gebäude (Versiegelung > 80%)	B111	111		111	123	121	121		122	124							111	
	Gebäude (Versiegelung 50% - 80%)	B112	112		112	123	121	121		122	124	142		211				112	
	Gebäude (Versiegelung 30% - 50%)	B113	112		112	123	131	132		122	124	142		211				112	
	Industrielle Anlagen	B121		121	121	123	121	121		122	124	142		211				121	
	Versiegelte gebäudelose Flächen	B122		121	121	123	131	132	121	122	124	142						133	
	Unversiegelte gebäudelose Flächen	B133		121	121	123	131	132	121	122	124	142						133	
B	Ackerland	B211												211					
	Weinbau	B221												221	221				
	Obst- und Beerenobst	B222												222	222				
	Hopfen	B224												222					

Semantic analysis of the TN

- **Semantic decomposition of the TN into the components LC / LU and characteristis (CH)**



Komponents LC/LU/CH					
OT	2	2	1	0	3
OT	2	2	2	1	1
OT	1	1	0	0	1

Semantic analysis of the TN

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Semantic analysis of the TN

- **Semantic decomposition of the TN into the components LC / LU and characteristis (CH)**

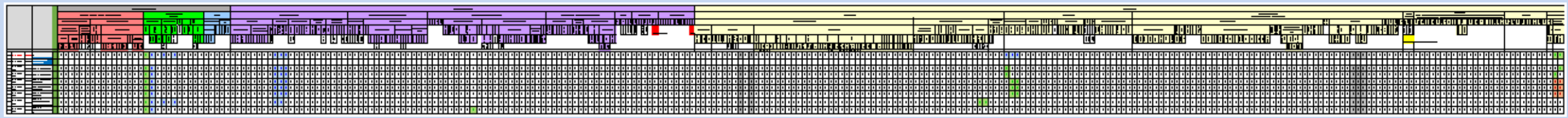
- **EAGLE - European approach to describe landscape**

- **Komonents of the Eagle Matrix**
  - Landcover components (32)
  - Landuse components (88)
  - Charakteristik (212)

Komponents LC/LU/CH					
OT	2	2	1	0	3
OT	2	2	2	1	1
OT	1	1	0	0	1

Semantic analysis of the TN

- **Komponents of the Eagle-Matrix: example Forest**



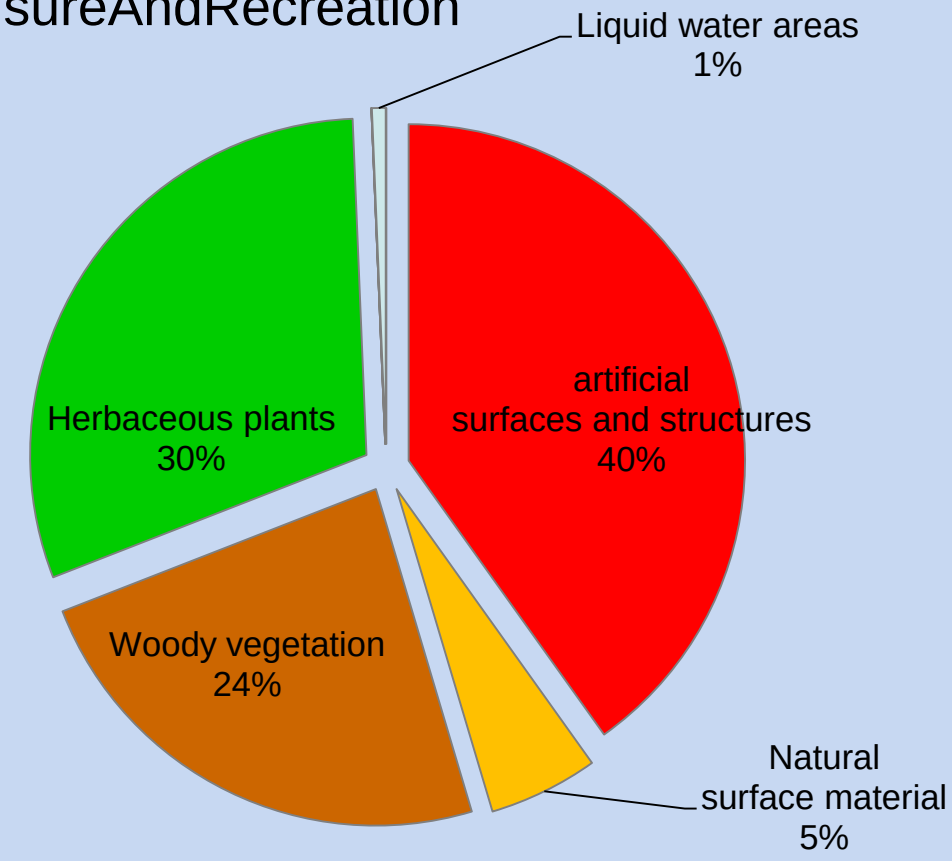
Nomenclature LU/LC

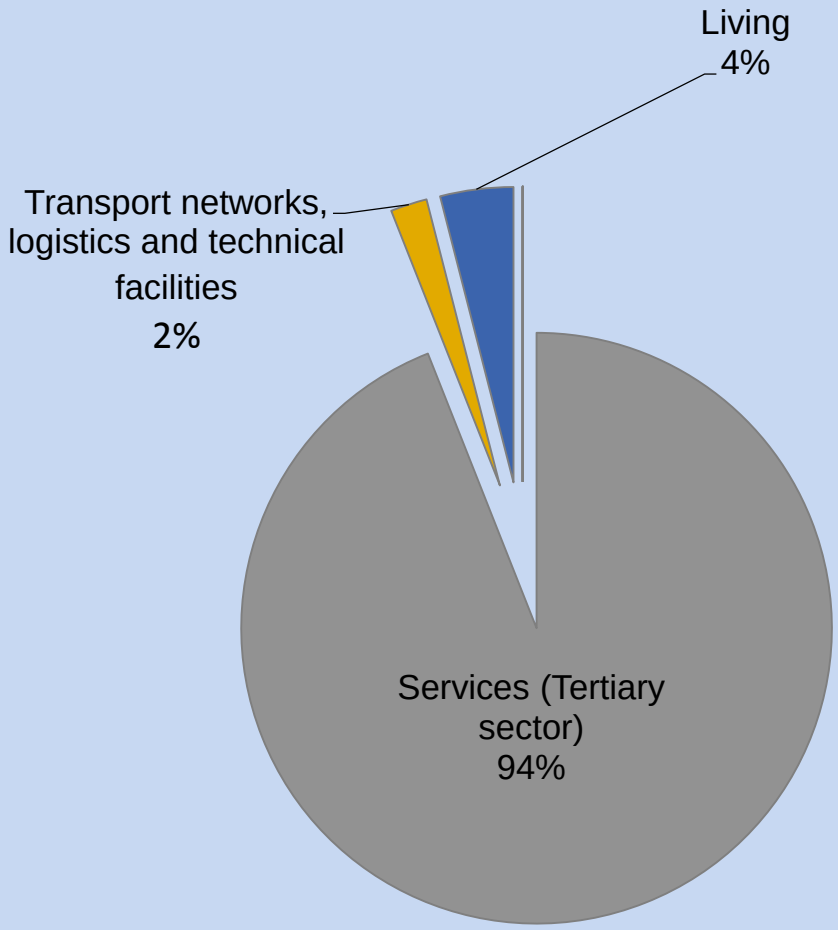
- **example Forest**

			Land Cover Components (LCC)						Land Use / Function (LUA)				Characteristics (CH)							
			BIOTISCHE Oberflächen / VEGETATION						Primary Production Sector			Services (Tertiary sector)	Land Management			Spatial Patterns			Physical Characteristics	
			Woody Vegetation			Herbaceous Vegetation			Forestry			Services (Tertiary	Forestry Management			Spatial Distribution Patterns			Vegetation Characteri	
			trees	Bushes, Shrubs		Graminaceous (grass-like)		non-graminace	short rotation	intermediate /	continuous cover	Religious Services	Forest History Type			homogenous	mixed	mosaic	Leaf Form	
				regular bushes	dwarf shrubs	regular graminac	reeds, bamboos					cemetery	endemic/ primary	re-forestatio	af-forestatio				coniferous / needle	broad leaved
AX_Forest			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AX_Forest	vegetation feature		2	1	0	0	0	0	1	1	1	0		0	0	1	1	1	1	1
AX_Forest	vegetation feature	1100: hardwood (broad)	2	1	0	0	0	0	1	1	1	0	0	0	0	2	0	0	0	2
AX_Forest	vegetation feature	1200: softwood (needle)	2	1	0	0	0	0	1	1	1	0	0	0	0	2	0	0	2	0
AX_Forest	vegetation feature	1300: Hard- and Softwood	2	1	0	0	0	0	1	1	1	0	0	0	0	0	2	2	3	3
AX_Forest	vegetation feature	1310: Deciduous forest with softwood	2	1	0	0	0	0	1	1	1	0	0	0	0	0	2	2	3	3
AX_Forest	vegetation feature	1320: Coniferous forest with hardwood	2	1	0	0	0	0	1	1	1	0	0	0	0	0	2	2	3	3
AX_Forest	state		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AX_Forest	state	Forest regeneration area, new planting area	2	1	0	1	0	1	1	1	0	0	0	2	2	0	0	0	0	0
AX_Forest	state	Forest funeral surface	2	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0

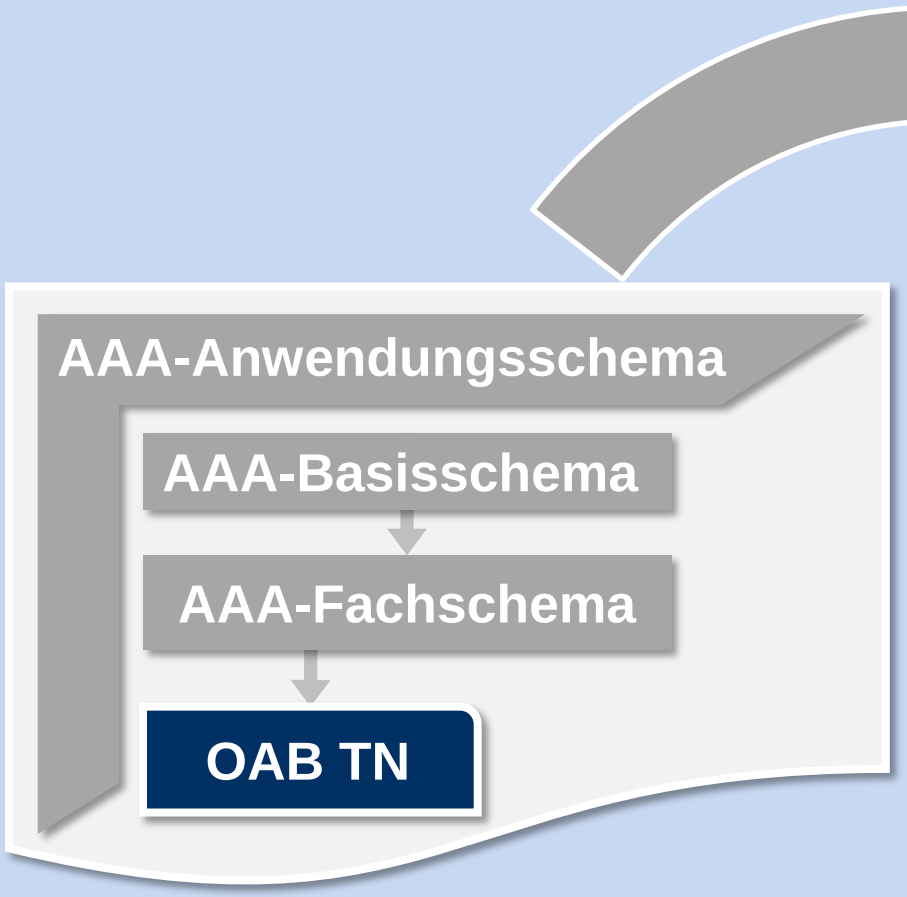
Semantikanalyse der TN

- **Frequency of valuable components LC / LU**
  - AX_SportsLeisureAndRecreation





Nomenclature LU/LC



Komponenten LB/LN/CH					
OA	2	2	1	0	3
OA	2	2	2	1	1
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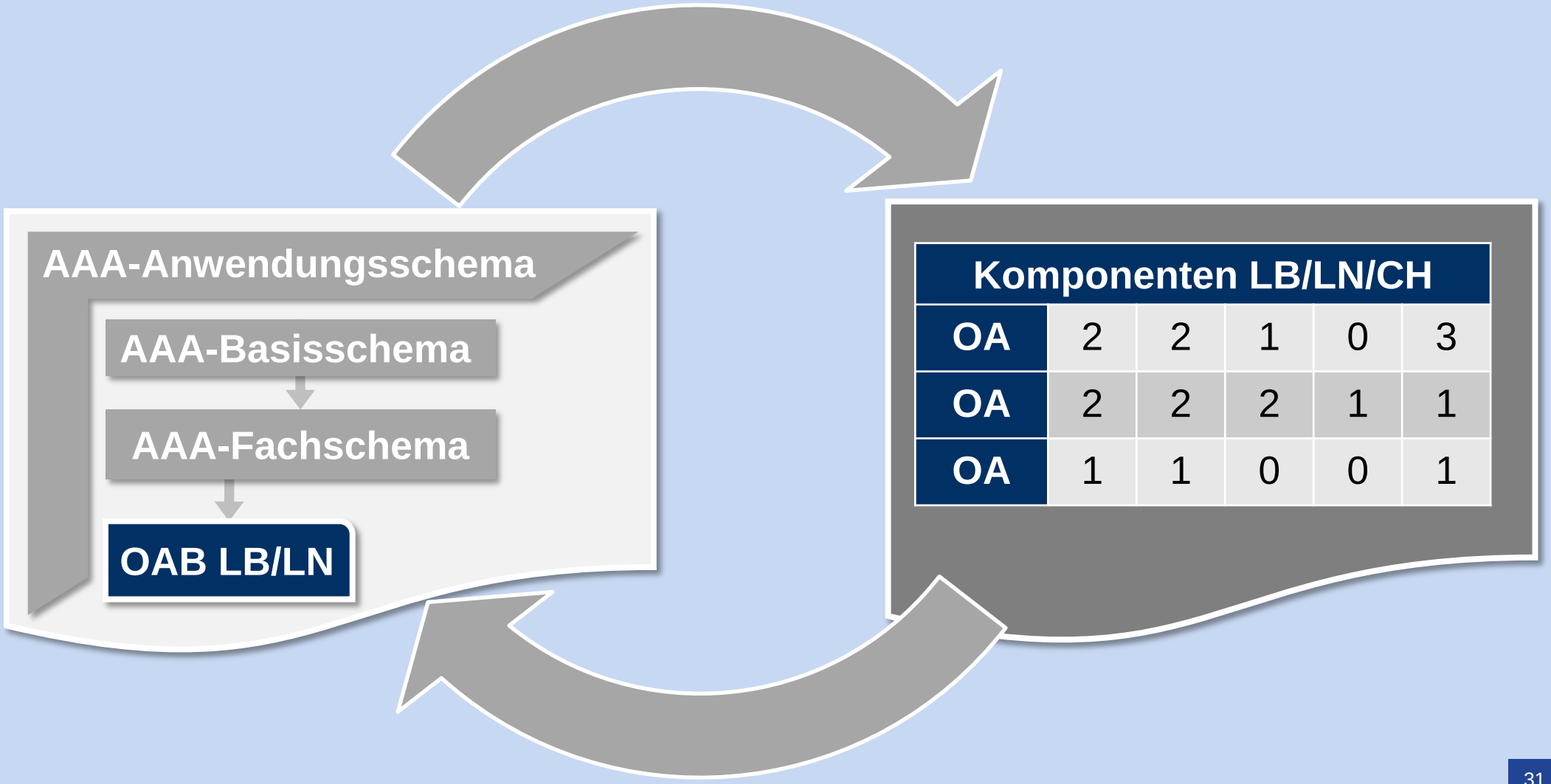
Nomenclature LU/LC



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AX_Forest	state	Forest regeneration area, new planting area	2	1	0	1	0	1	1	1	0	0	0	2	2	0	0	0	0	0
AX_Forest	state	Forest funeral surface	2	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0

Nomenclature LU/LC

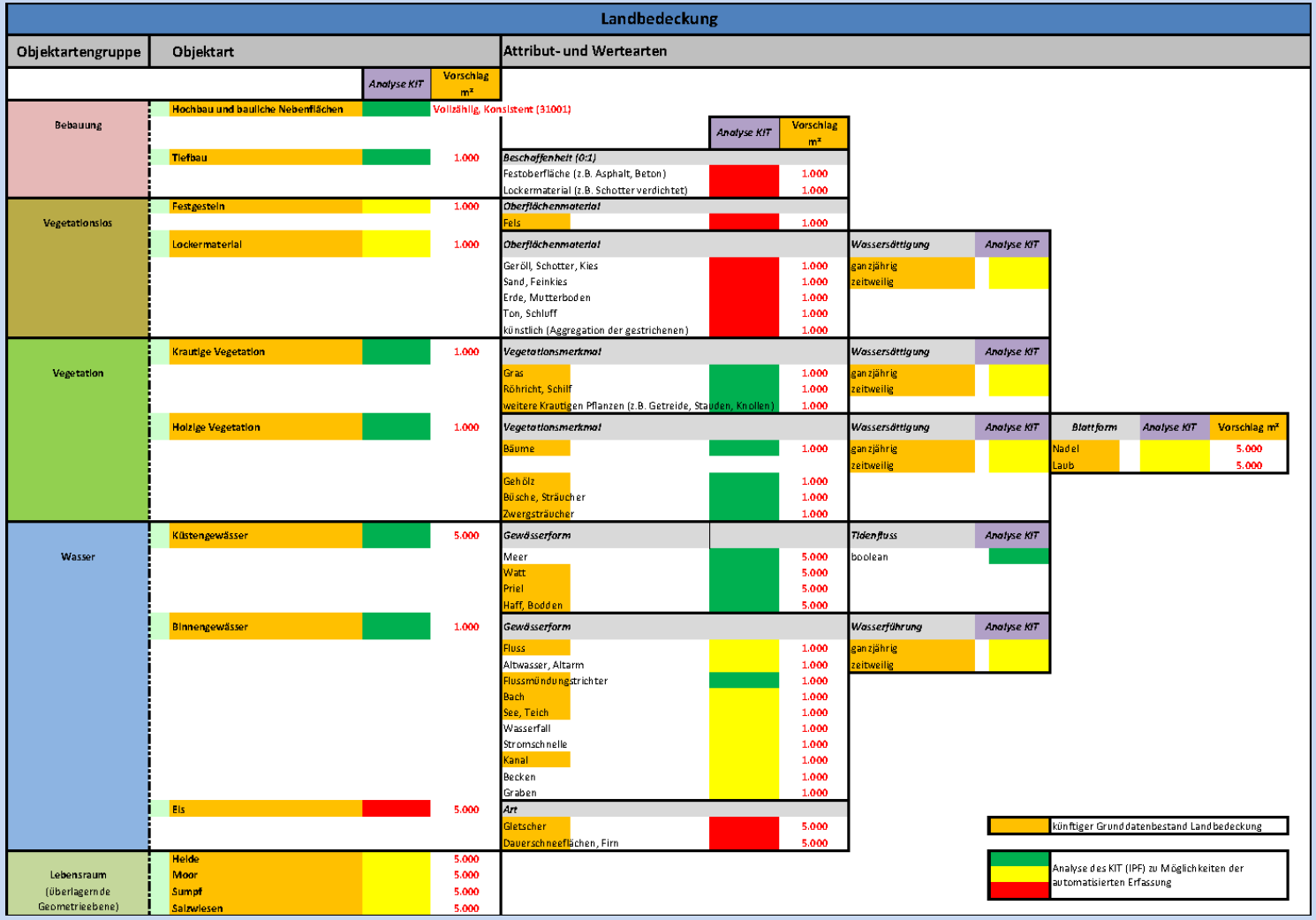
- **example Forest**

			land cover								land use											
			woody vegetation								funeral						forestry					
			vegetation feature				leaf form		water saturation		type of funeral ground				state	state	typ	typ	typ	typ	typ	
GID 7-0-2_OA		7-0-2_Wert+Bezeichnung	trees	regular bushes	shrubs	dwarf shrubs	needle leaved	broad leaved	whole year	temporary	cemetery	forest funeral surface	historic cemetery	park cemetery	out of service	extension, resettlement	forestry area	forest regeneration, new planting area	medium and long-term growth momentum	permanently unpopulated area (for example, groves, aisles)	production area forestry	no primary use
AX_Forest																						
AX_Forest	vegetation feature		m				k	k				w					w					w
AX_Forest	vegetation feature	1100: hardwood (broad)	m					m									w					w
AX_Forest	vegetation feature	1200: softwood (needle)	m				m										w					w
AX_Forest	vegetation feature	1300: Hard- and Softwood	m				m	m									w					w
AX_Forest	vegetation feature	1310: Deciduous forest with softwood	m				m	m									w					w
AX_Forest	vegetation feature	1320: Coniferous forest with hardwood	m				m	m									w					w
AX_Forest	state		m				k	k									w					w
AX_Forest	state	6100: Forest regeneration area, new planting area	m				k	k										m				
AX_Forest	state	6200: Forest funeral surface	m				k	k				m										

Nomenclature LU/LC

- **Landcover**
  - 55 OA*/WA*
- **Feature type groups**
  - Building (2 OA, 2 WA)
  - Vegetationless (2 OA, 6 WA)
  - Vegetation (2 OA, 13 WA)
  - Water (3 OA, 19 WA)
  - Habitat (4 OA)

*OA – Feature Types
*WA - Attributes

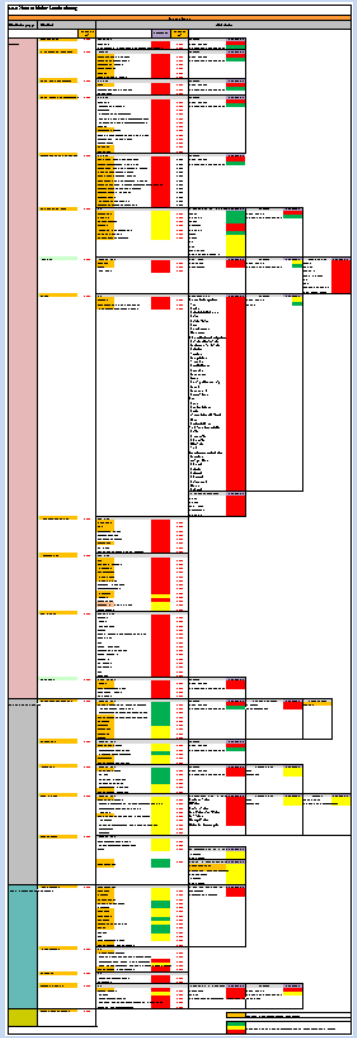


Nomenclature LU/LC

Landbedeckung										
Objektartengruppe	**Objektart**			**Attribut- und Wertearten**						
Vegetation	Krautige Vegetation		1.000	*Vegetationsmerkmal*			*Wassersättigung*	*Analyse KIT*		
				Gras		1.000	ganzjährig			
				Röhricht, Schilf		1.000	zeitweilig			
				weitere Krautigen Pflanzen (z.B. Getreide, Stauden, Knolle		1.000				
	Holzige Vegetation		1.000	*Vegetationsmerkmal*			*Wassersättigung*	*Analyse KIT*	*Blattform*	*Analyse KIT*	*Vorschlag m²*
				Bäume		1.000	ganzjährig		Nadel		5.000
							zeitweilig		Laub		5.000
				Gehölz		1.000					
				Büsche, Sträucher		1.000					
				Zwergsträucher		1.000					

Nomenclature LU/LC

- **Landuse**
  - 296 OA*/WA*
- **Feature type groups**
  - Settlement (12 OA, 180 WA)
  - Traffic and Infrastructure (5 OA, 61WA)
  - Agriculture, forestry and water management (4 OA, 33 WA)
  - no primary use (1 OA, 0 WA)
- **Reduction of object and value types**
  - TN 475 (+115)
  - LB/LN 351



*OA – Feature Types
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Modeling principles

- **Modeling principles**
  - Land use and land cover independent to each other
  - modeling is gapless and non-overlapping
  - Land use can be specified by secondary information layer
  - topological network of infrastructure lines (waters, traffic) remains intact

Modeling principles

- **example**

N

Modeling principles

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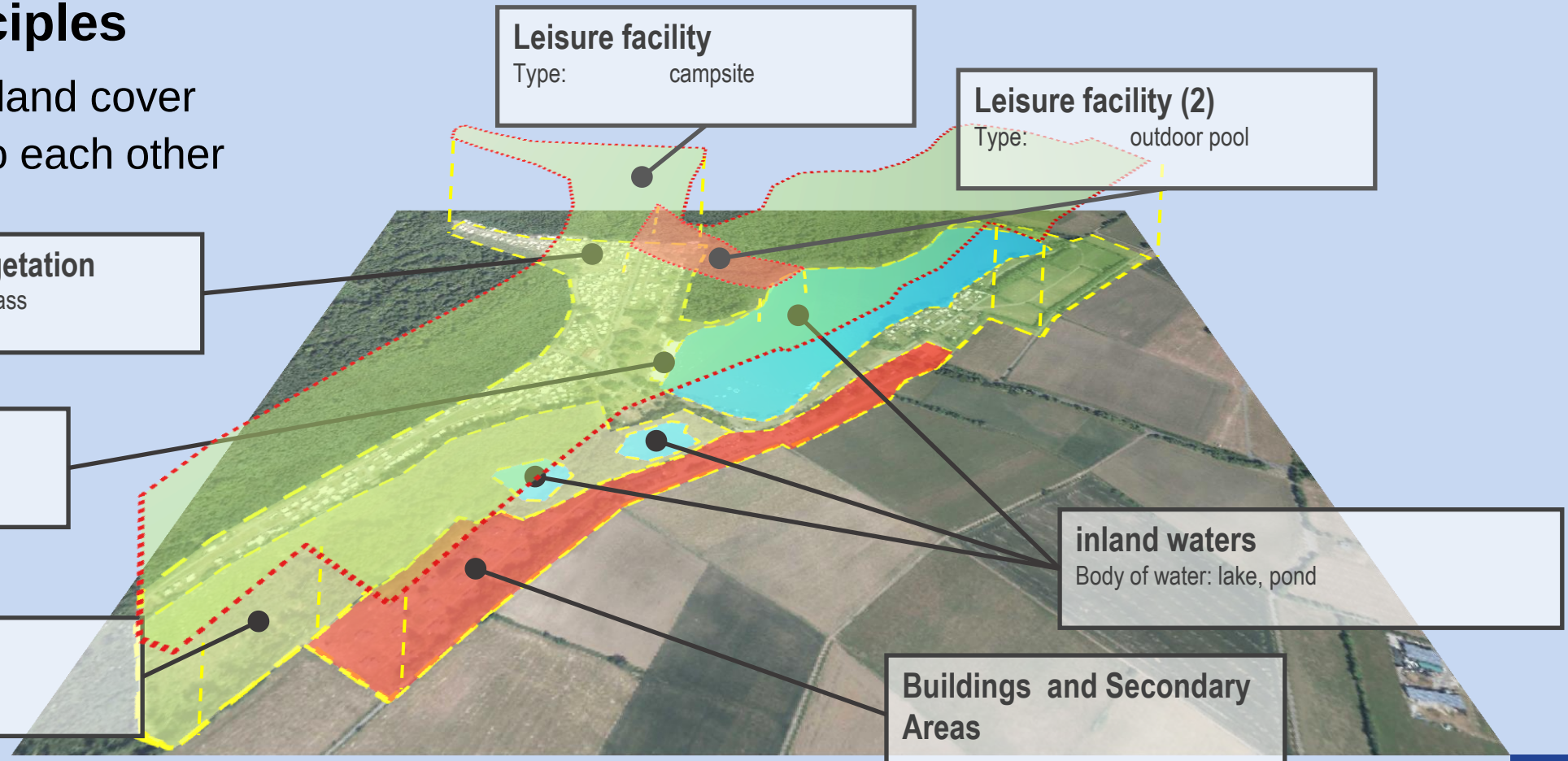
  - Land use and land cover independent to each other



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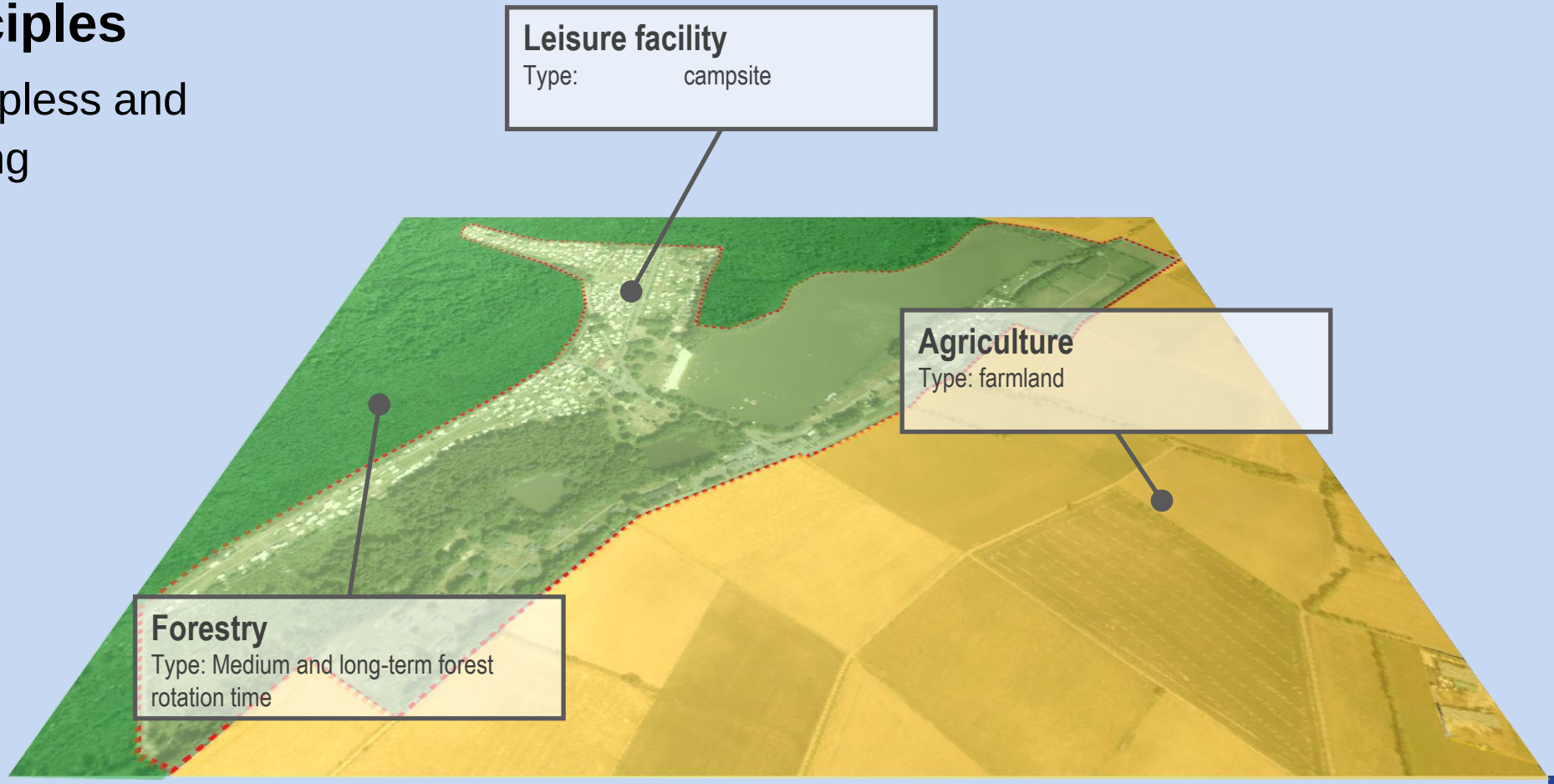

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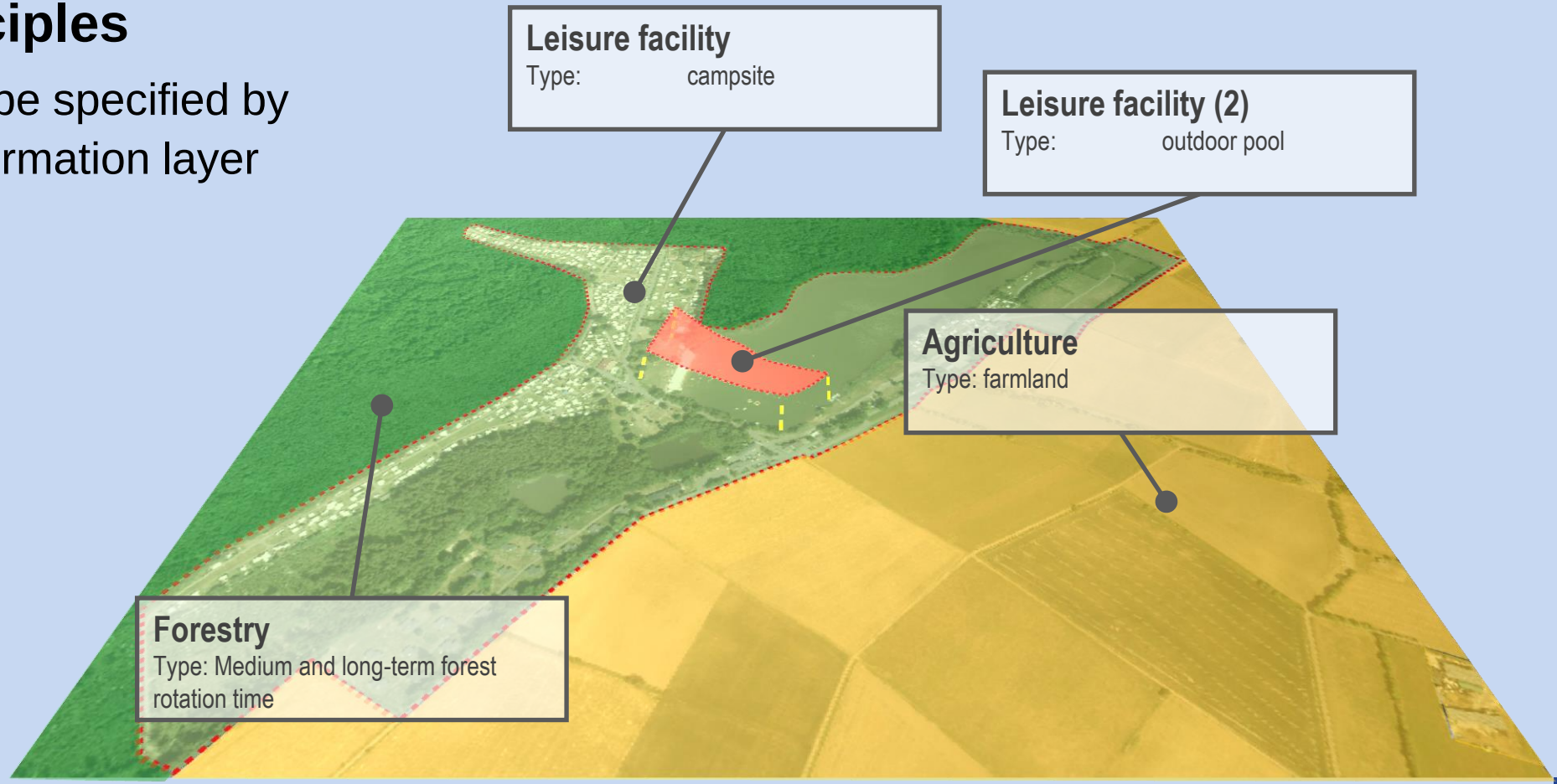

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Modeling principles

- **Modeling principles**
  - area-related minimum registration criteria
    - complete, consistent with building (31001)
    - 1000 m²
    - 5000 m²
  - area-related minimum registration criteria can be fallen below

Modeling principles

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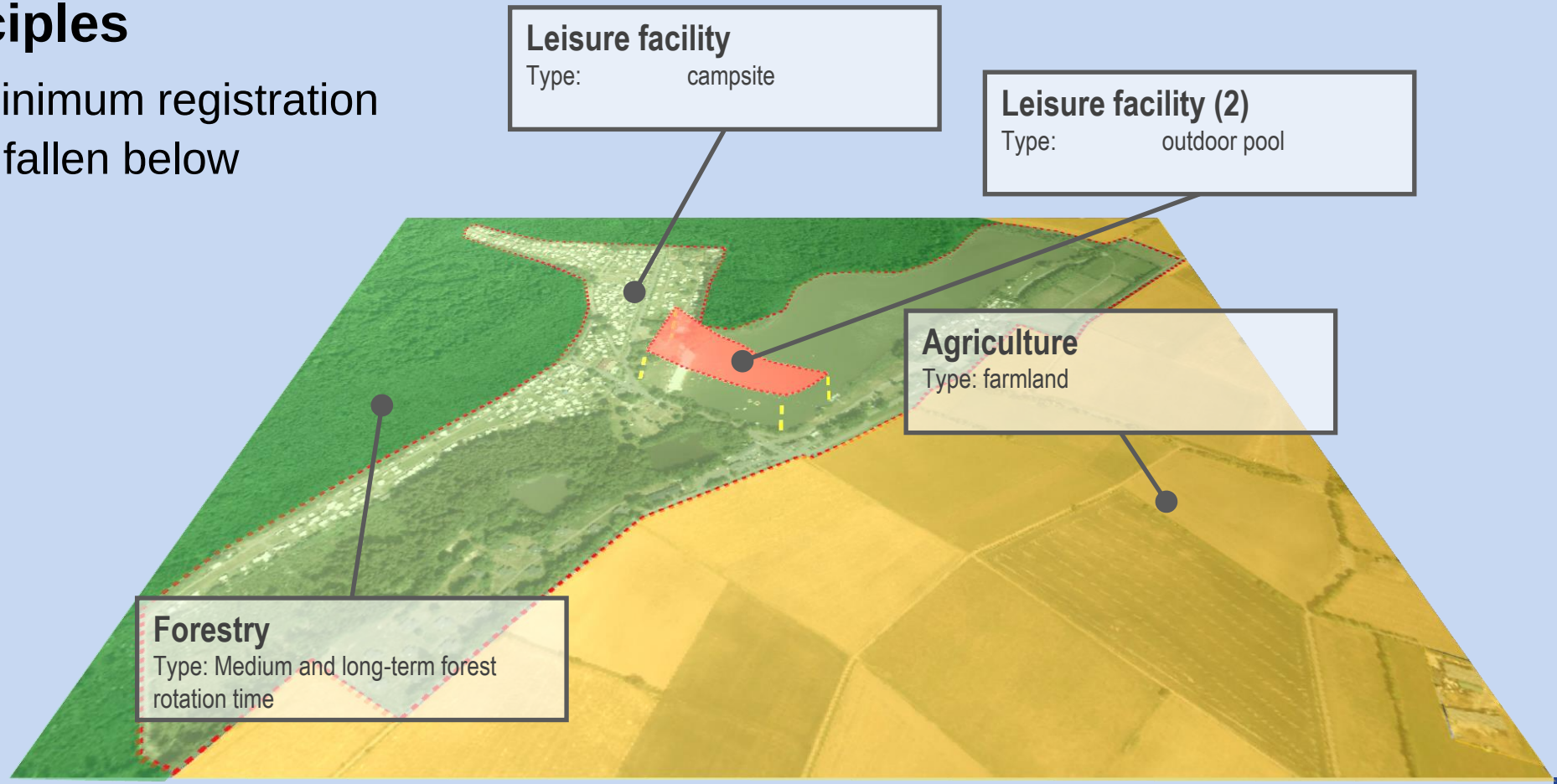

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Modeling principles

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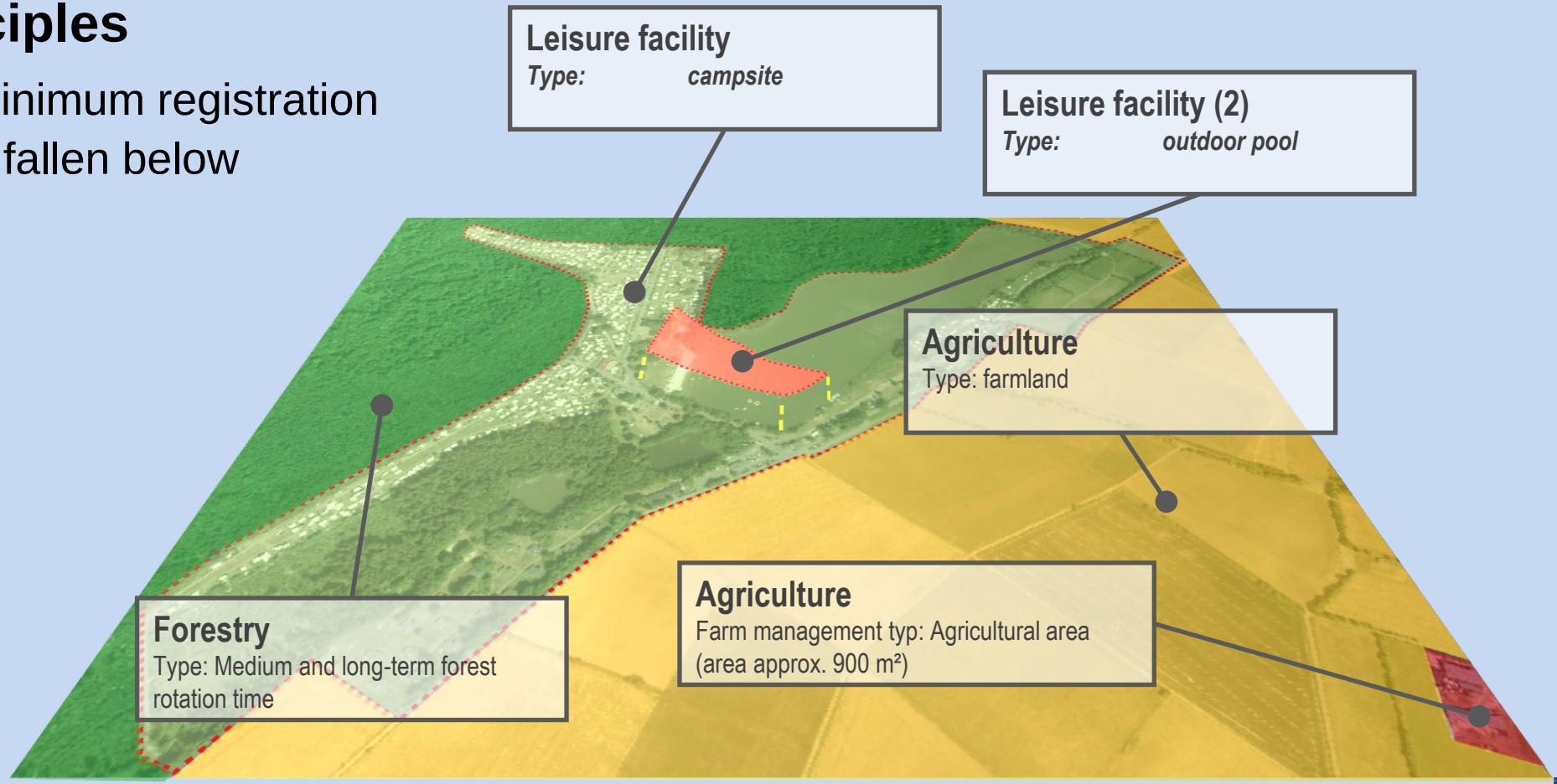

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Cost estimation first derivation

- **Cost estimation**
  - Realization of initial equipment LU (migration)
    - Feature group Settlement 82%
    - Feature group Traffic 88%
    - Feature group Vegetation 77%
    - Feature group waters 69%
  - Realization of initial equipment LC (migration)
    - 88.6% of Schleswig Holstein's territory

Backmigration

- **Backmigration**
  - 95% of the object types Backmigratable
  - remaining individual issues are identified

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