The BIM Lifecycle
in Environmental and Landscape Planning

Dr. rer. nat. Johannes Gnädinger
May 24, 2019 11:30 am to 12:00 am

Session 4
BIM in Landscape Architecture

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DLA 2019
Digital Landscape Architecture Conference May 22-25'2019 Dessau

Agenda

1 BIM in brief

2 BIM-GIS Cycle

3 Phases and Examples

4 Outlook

BIM in brief

Purposes of BIM models and BIM cycle

- More close collaboration, higher quality, temporal and financial efficiency
- Preparation of „as-built model“
- Steering of functioning, operation and management of realized object

Co-working

CDE (Common Data Environment): data and communication platform; interdisciplinary data exchange; yet processing of expert‘s models still in individual enterprises

BIM authors system: access authorisation for collaborators

Standardisation

ISO, CEN, DIN, VDI from international to national and sectorial; OKSTRA: standard elements for road construction

buildingSMART: e. g. lossless data exchange through IFC 4 (Industry Foundation Classes)

OGC Open GIS Consortium: Interoperability

BIM in brief

State of the Art

Still no completely integrated BIM processes in all phases, but merely individual workflows and applications = „little BIM“

„big BIM“ in preparation: challenge for landscape planners, urbanists, civil engineers

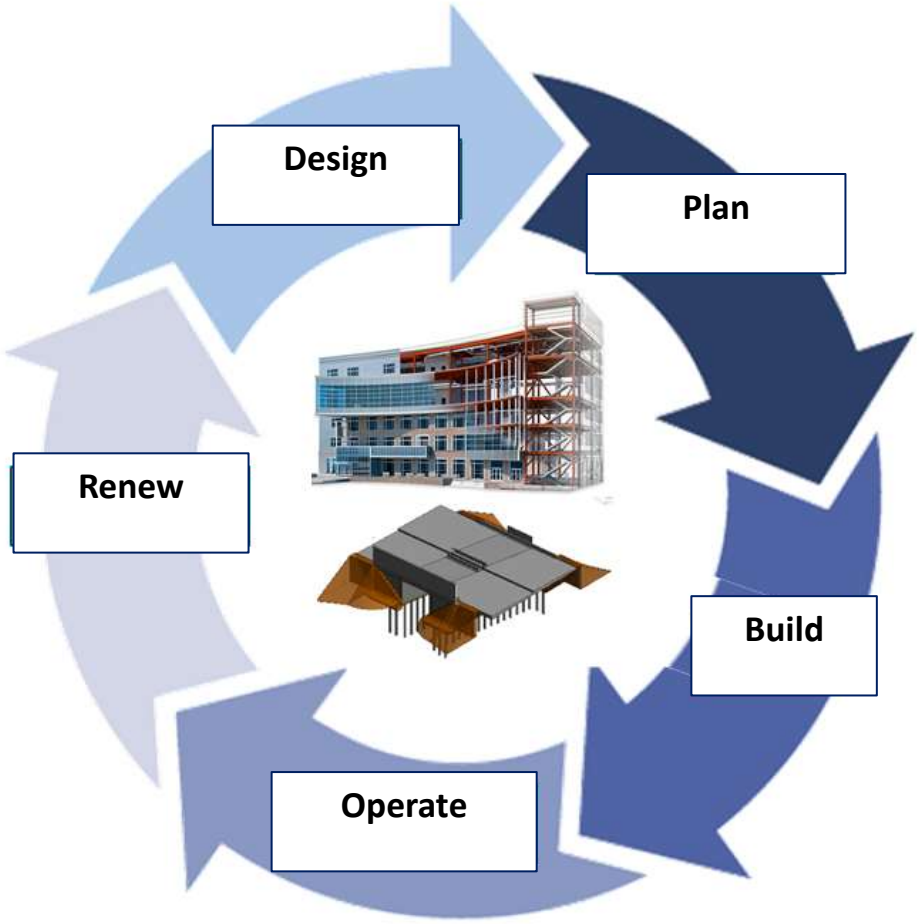
+ for software and hardware developers: processing capacities, data storage, data exchange …

+ for data providers: availability of data …

→ BIM Cycle has to be filled with working steps and workflows

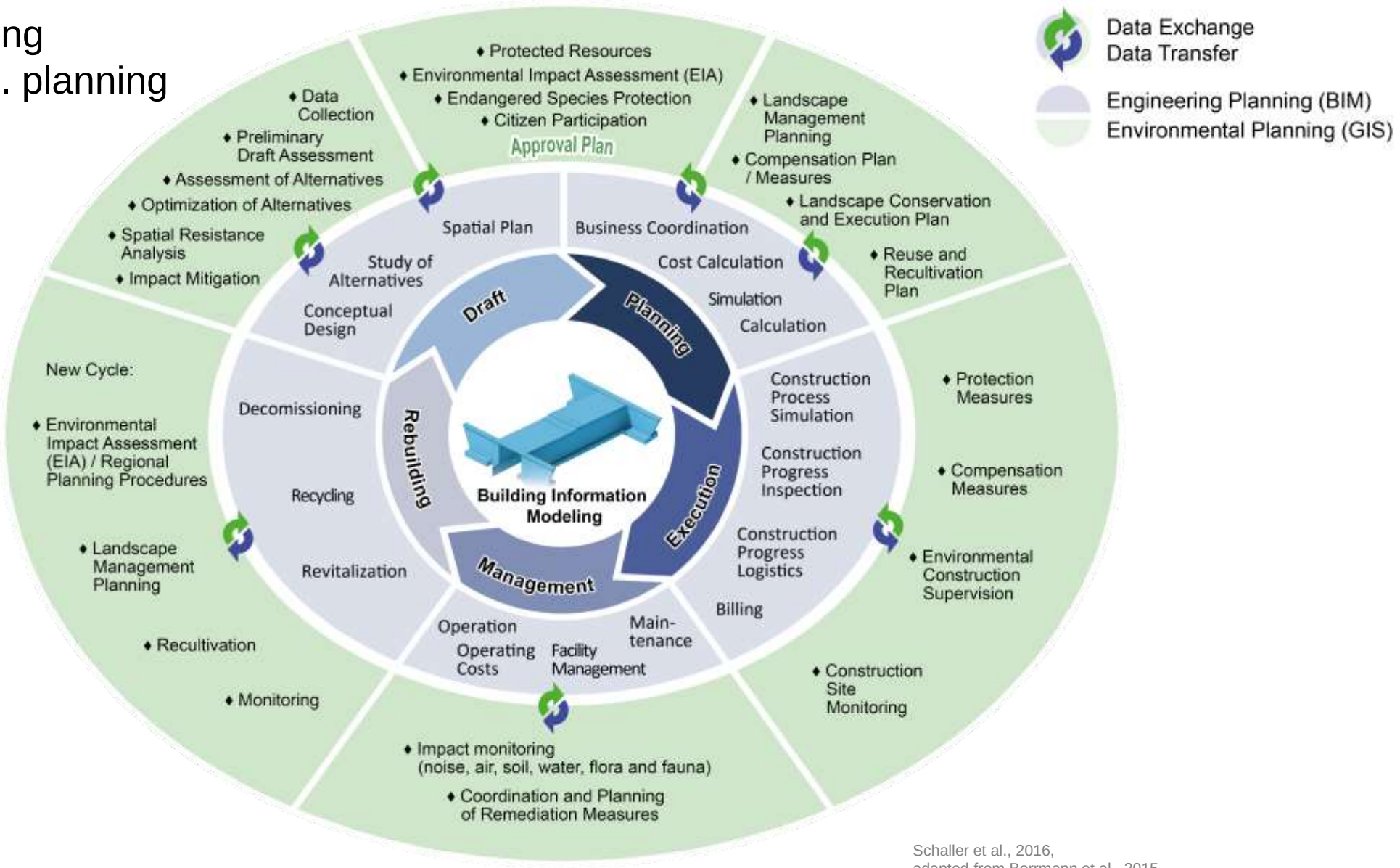
BIM Cycle

- phases in lifecycle of object
- phases of planning and management



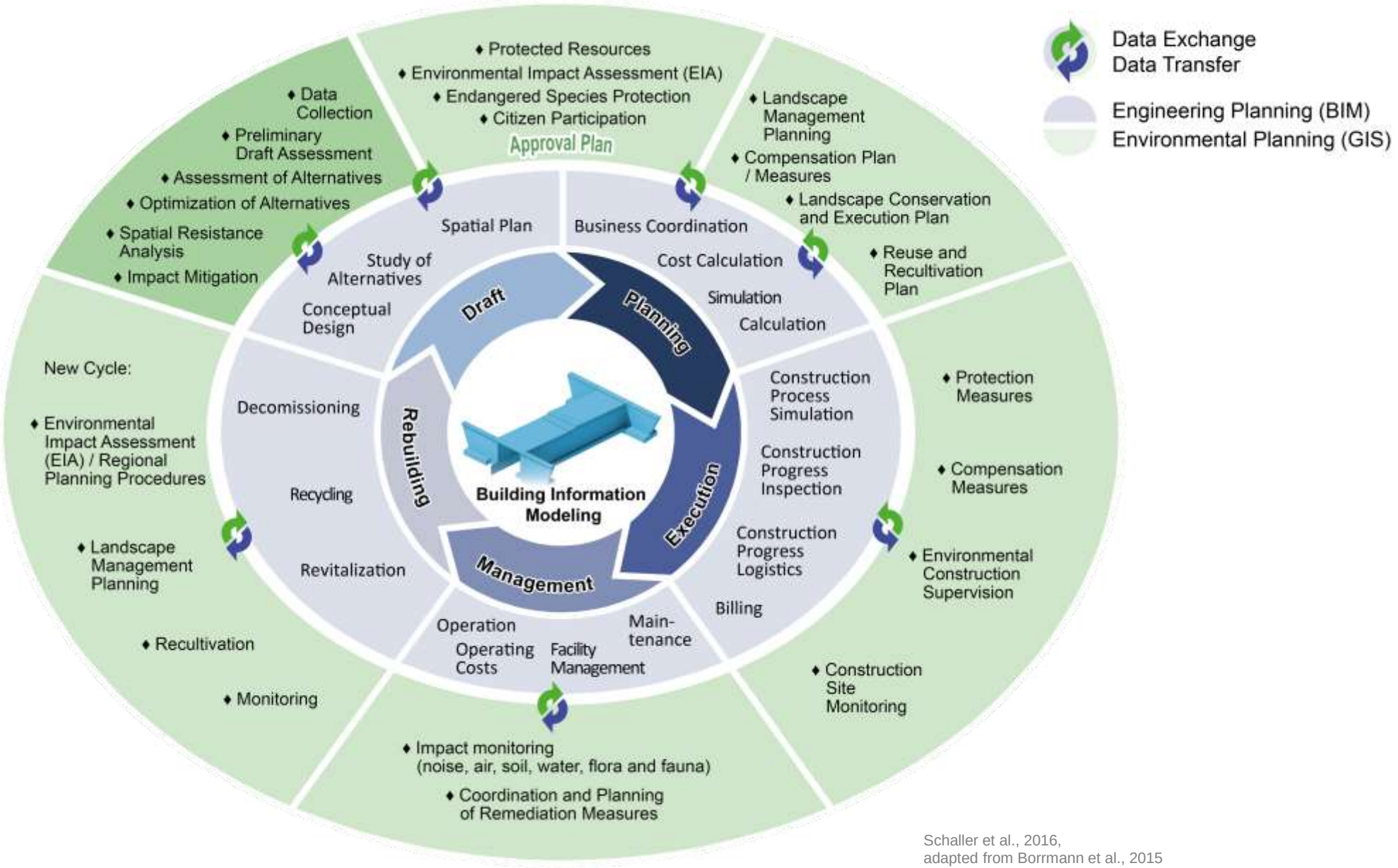
BIM-GIS Cycle

- works in engineering
- works in environm. planning



Schaller et al., 2016,
adapted from Borrmann et al., 2015

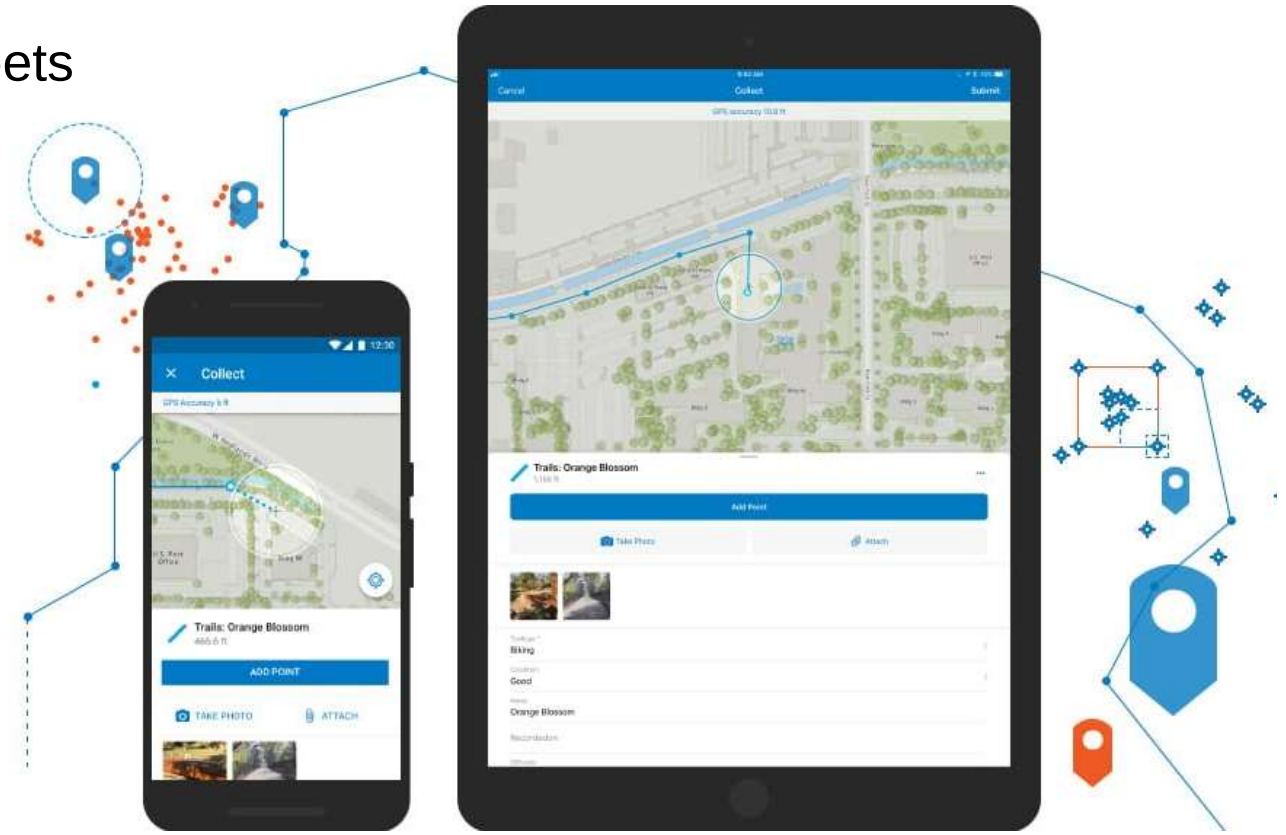
Draft Phase



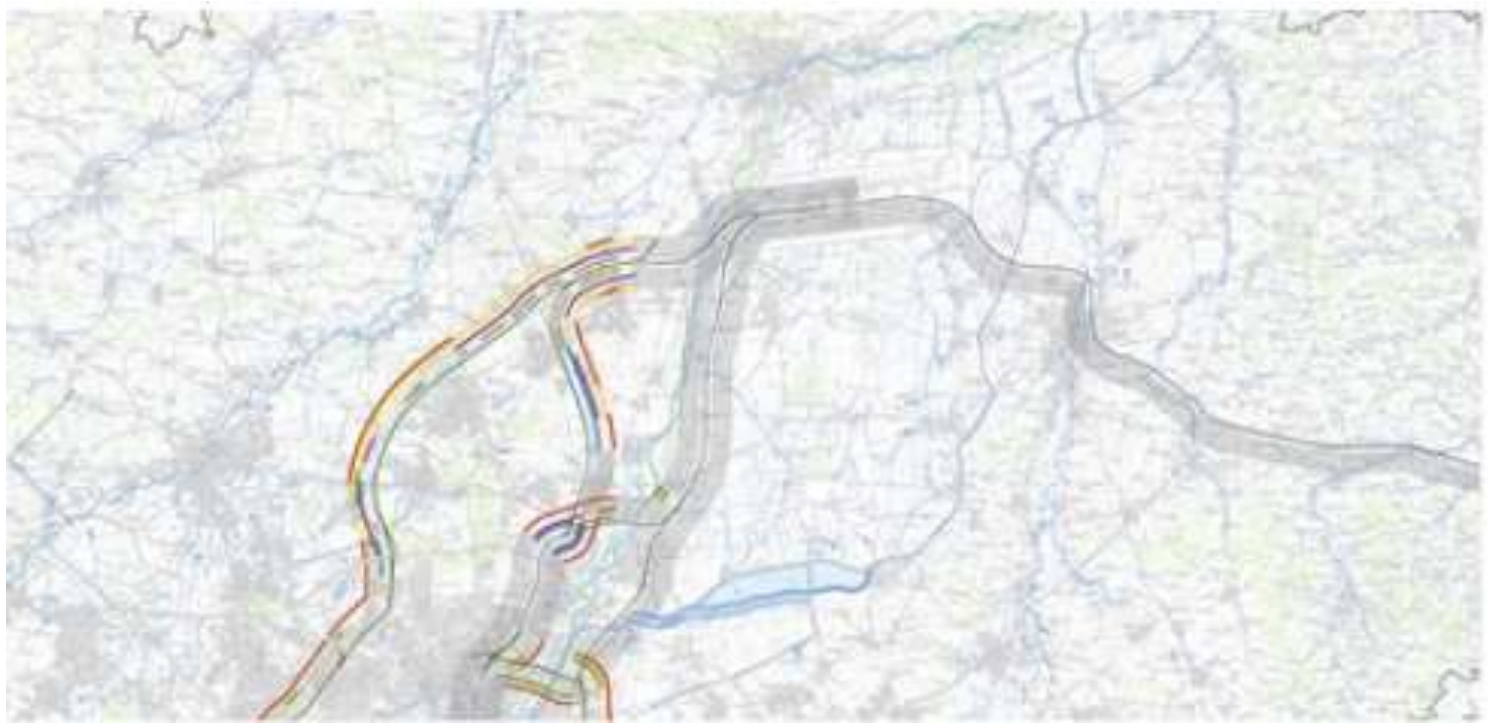
Schaller et al., 2016,
adapted from Borrmann et al., 2015

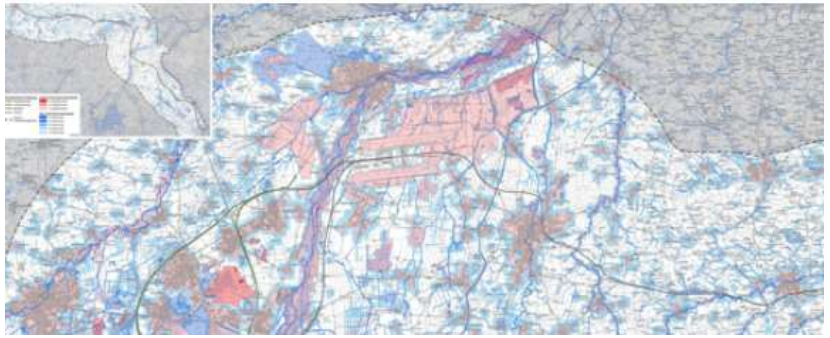
Draft Phase

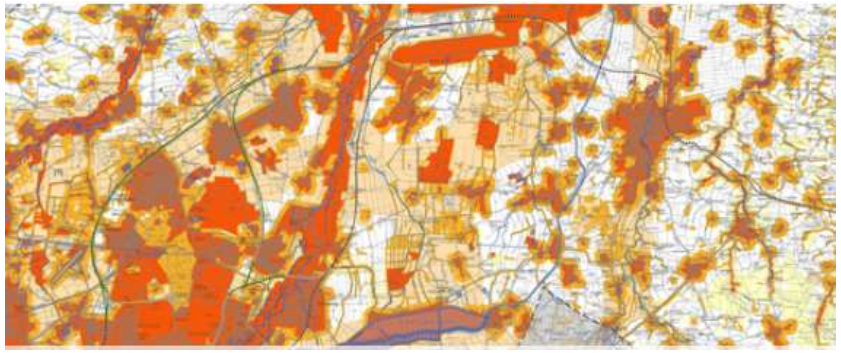
- On-site data collection digitally, e. g. „collector“, via mobile phone etc.
- Use maps online and offline, synchronize data as soon as connectivity works again
- Improved data quality by map-driven form sheets
- Routing
- Easy digitizing of polygons in the field
- Share immediately pictures, videos, any collected data



Draft Phase

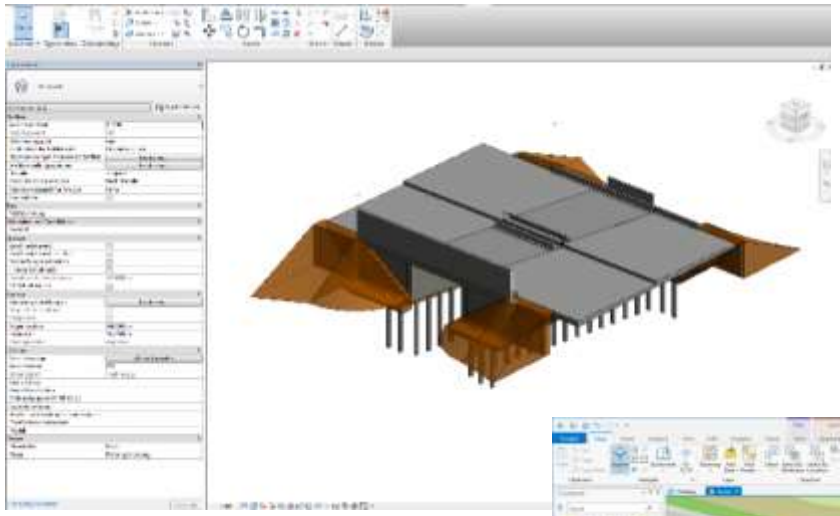


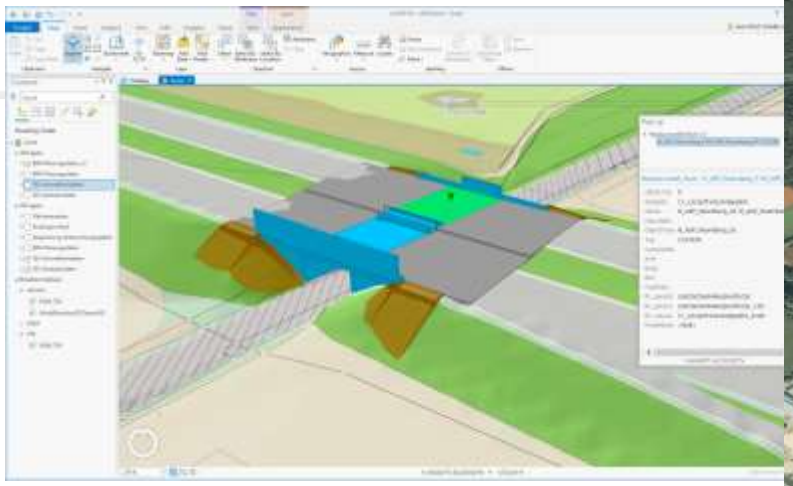




- Spatial resistance analysis
- Assessment of alternatives
- Impact mitigation

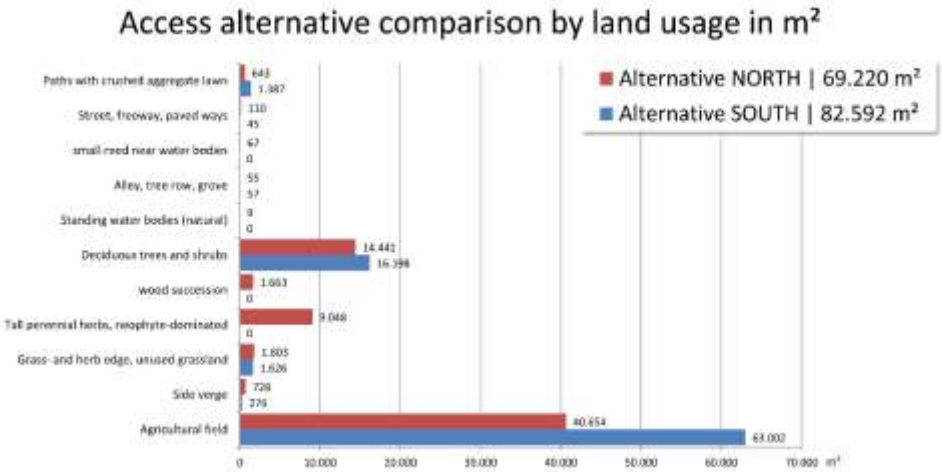
BIM GIS Integration A99 / S8

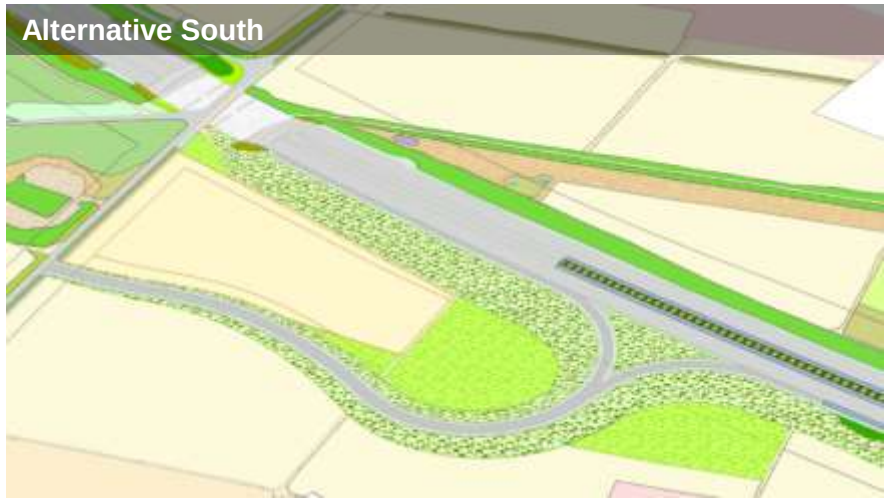


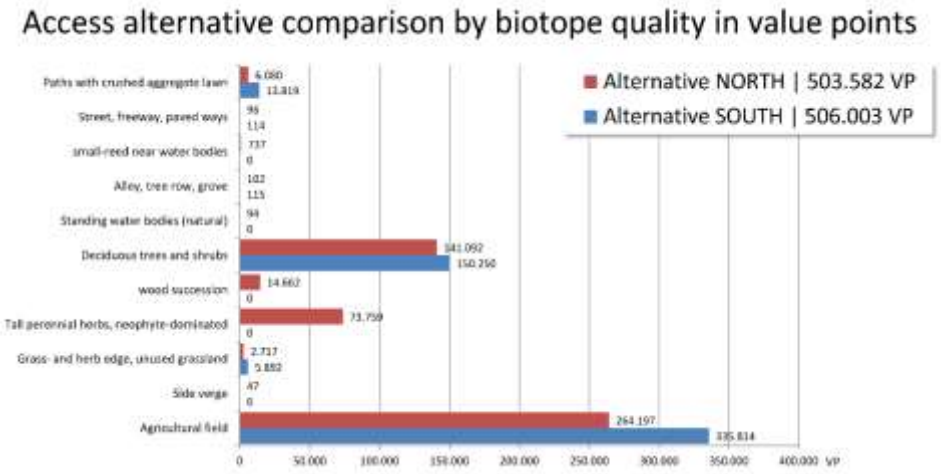


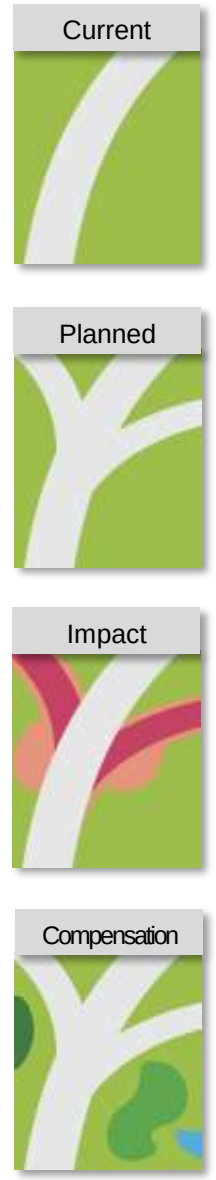
Draft Phase


Alternative North


Access alternative comparison by land usage in m²
Alternative NORTH | 69.220 m²
Alternative SOUTH | 82.592 m²
Paths with crushed aggregate lawn
Street, freeway, paved ways
small-reed near water bodies
Alley, tree row, grove
Standing water bodies (natural)
Deciduous trees and shrubs
wood succession
Tall perennial herbs, neophyte-dominated
Grass- and herb edge, unused grassland
Side verge
Agricultural field
643
1.387
110
45
67
0
55
57
0
0
14.441
16.398
1.663
0
9.048
0
1.805
1.626
728
276
40.654
63.002
0
10.000
20.000
30.000
40.000
50.000
60.000
70.000 m²

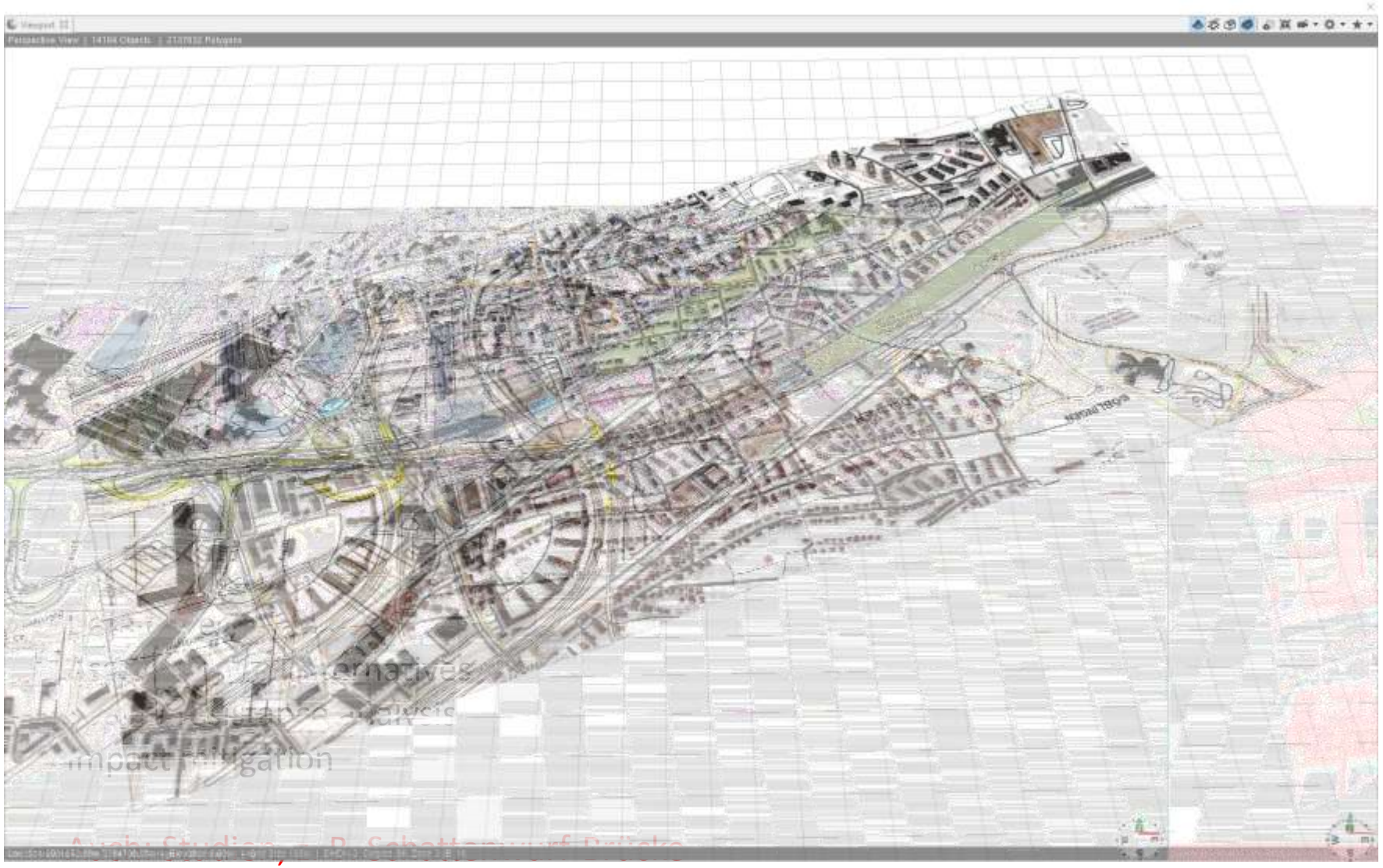

Alternative South


Access alternative comparison by biotope quality in value points
Alternative NORTH | 503.582 VP
Alternative SOUTH | 506.003 VP
Paths with crushed aggregate lawn
Street, freeway, paved ways
small-reed near water bodies
Alley, tree row, grove
Standing water bodies (natural)
Deciduous trees and shrubs
wood succession
Tall perennial herbs, neophyte-dominated
Grass- and herb edge, unused grassland
Side verge
Agricultural field
4.080
13.819
99
114
737
0
102
115
94
0
141.092
150.256
14.667
0
73.759
0
2.737
5.882
47
0
264.197
335.814
0
50.000
100.000
150.000
200.000
250.000
300.000
350.000
400.000 VP


Current
Planned
Impact
Compensation
permanent
temporary

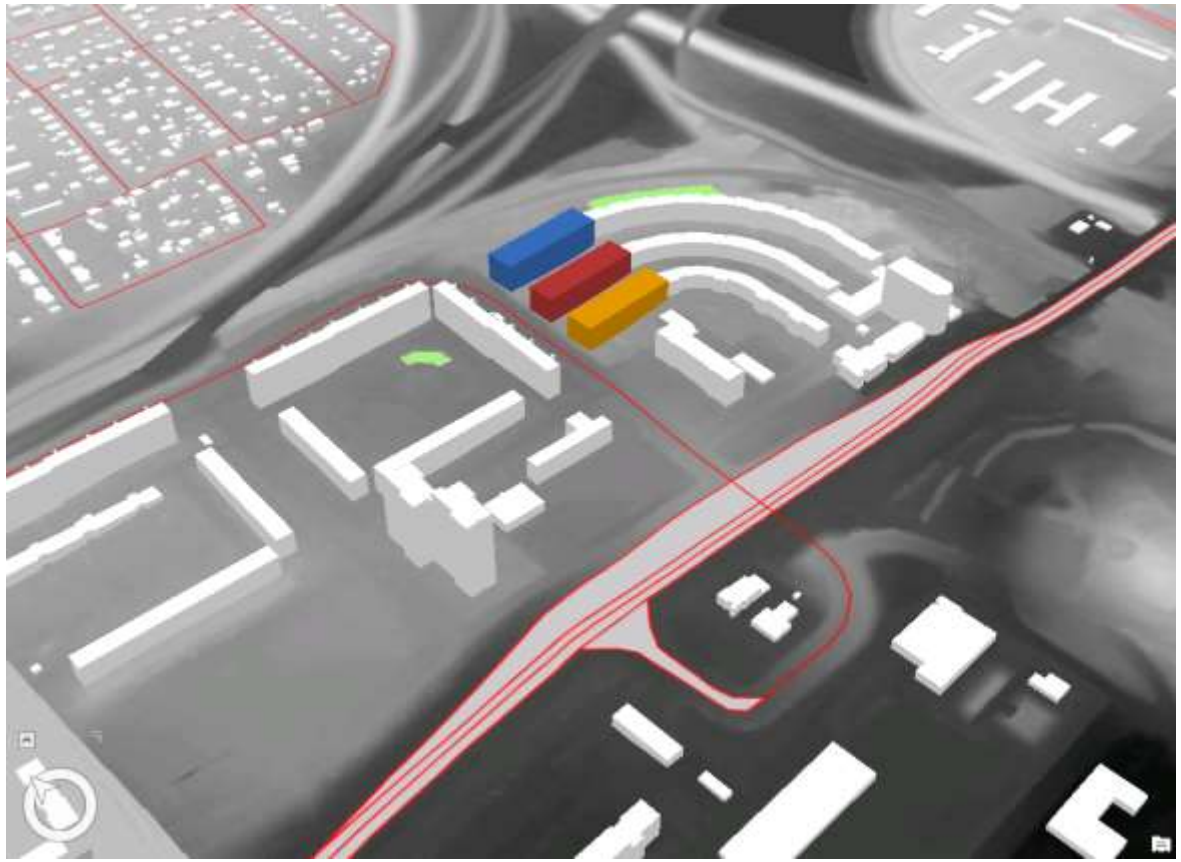
Draft Phase

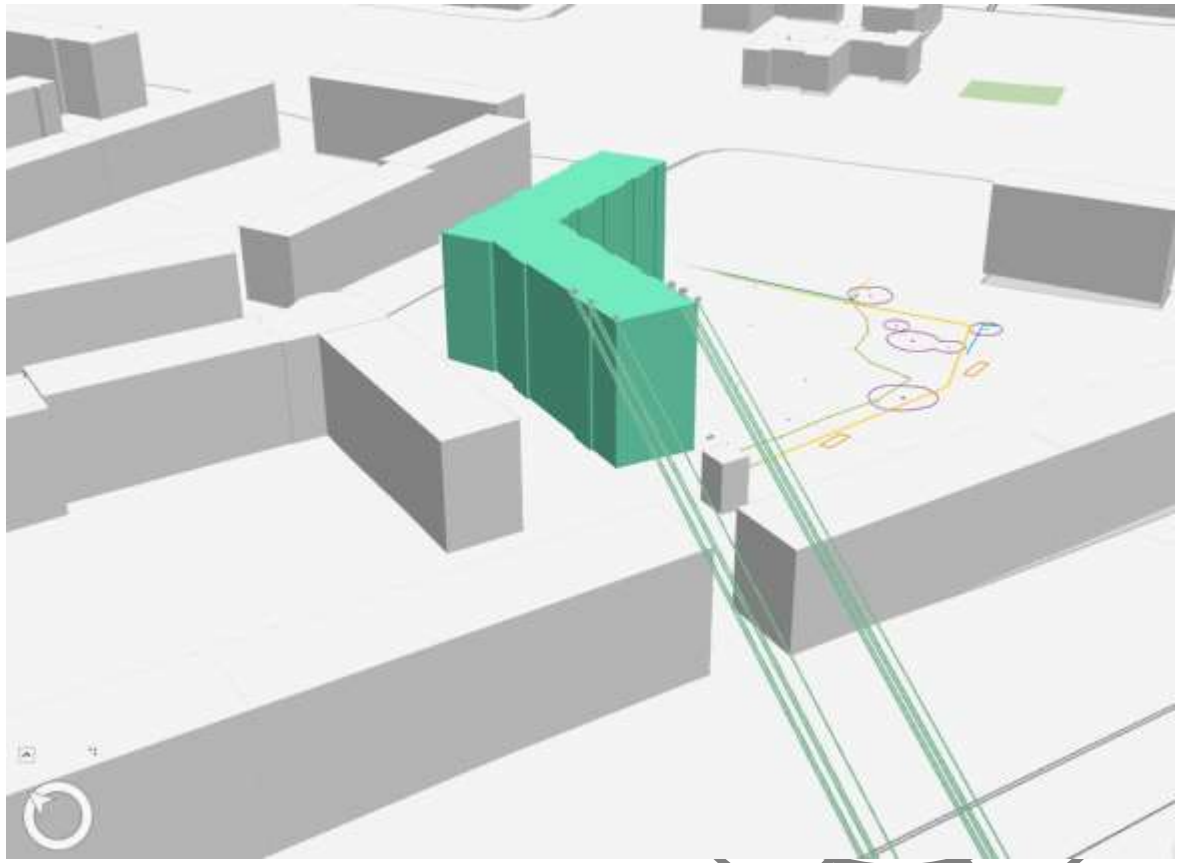
Integration of technical project into surroundings



Draft Phase

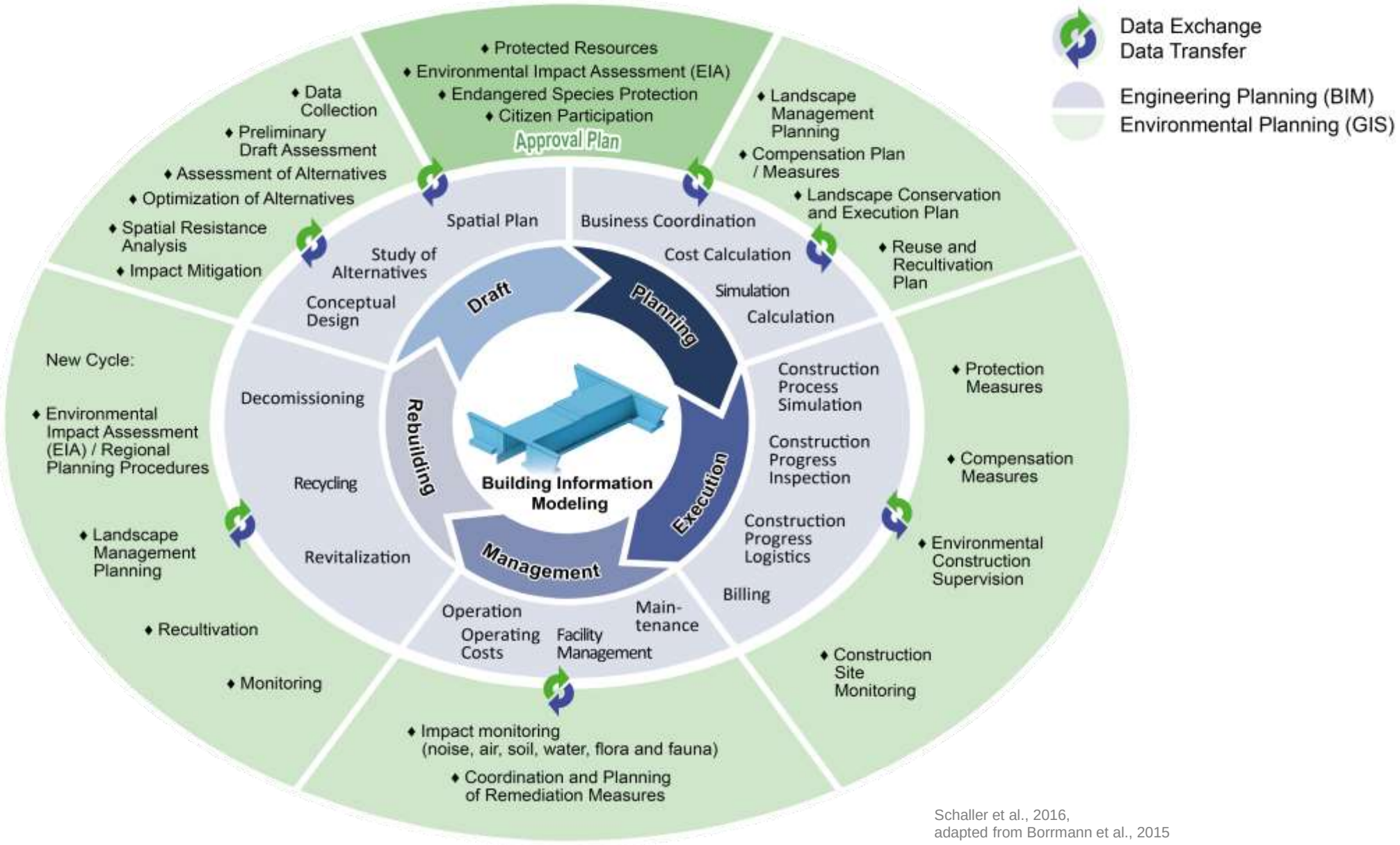
- various GIS analyses
- 3D specific analyses (visibility, sightlines, viewshed)
- results as report





Shadow analysis of bridge

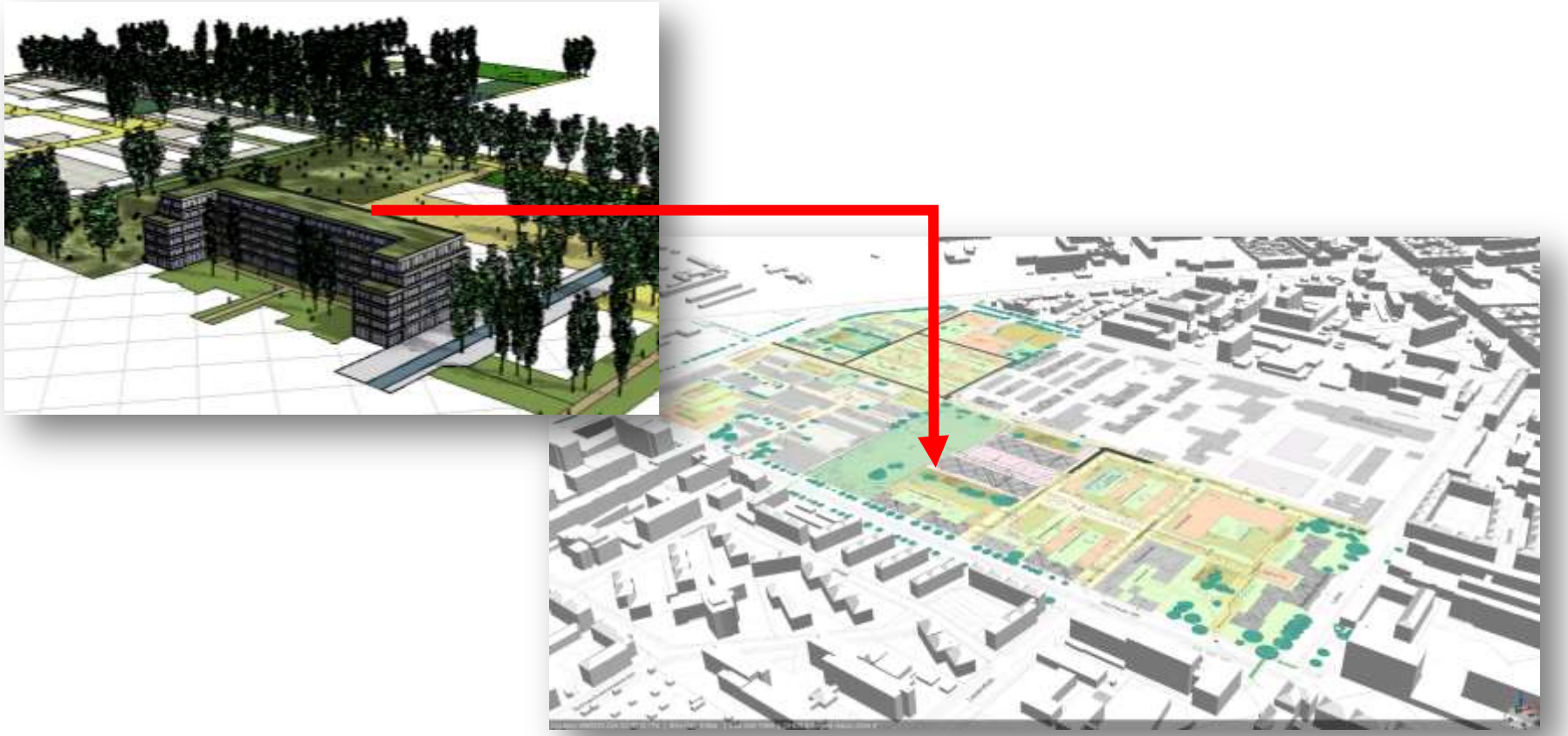
Environmental Licensing Phase



Schaller et al., 2016,
adapted from Borrmann et al., 2015

Environmental Licensing Phase

3D BIM building (draft) assessment of legal requirements through integration into GIS Binding Land Use Plan

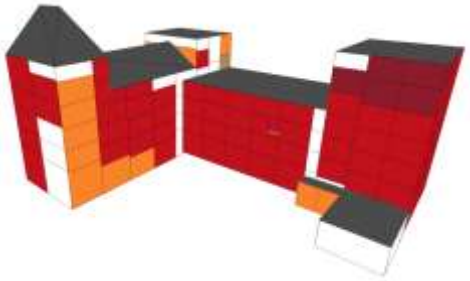


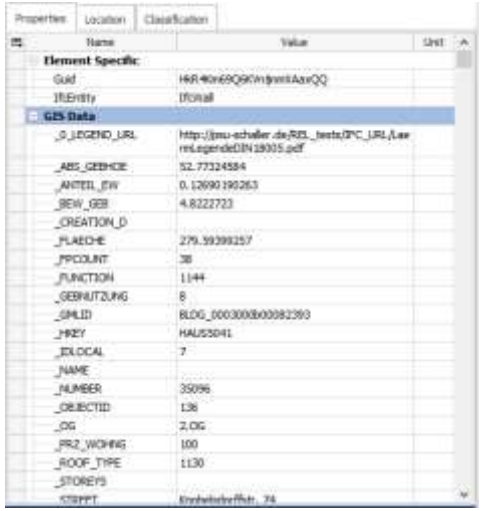
Environmental Licensing Phase

Binding Land Use Plan coupled with 3D Building Model in GIS:
Modern form of participation

Environmental Licensing Phase

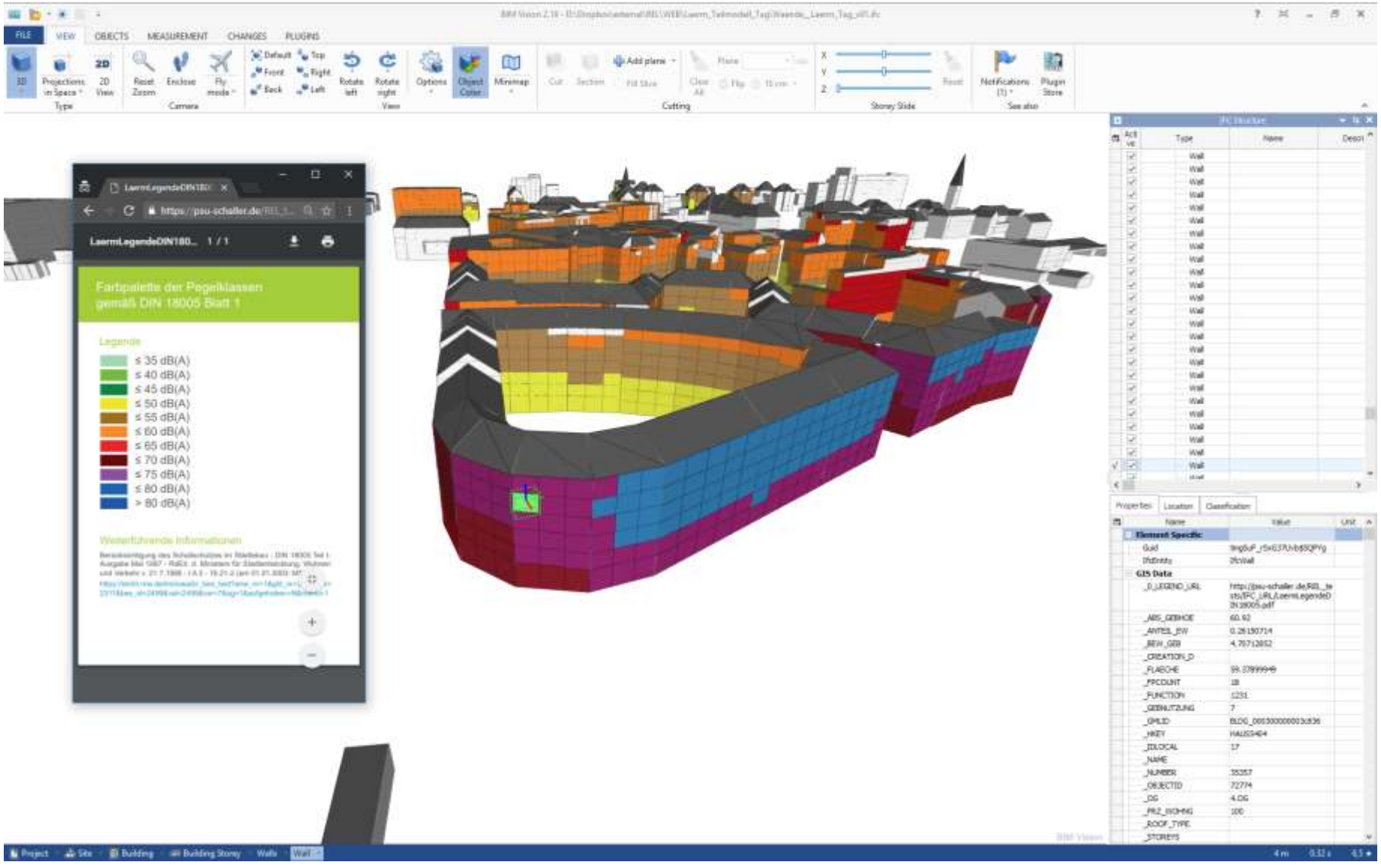
- Data from GIS analysis to IFC format
- Keep all attributes
- Integration in a CDE (Common Data Environment)





Environmental Licensing Phase

Query of noise values by inhabitants/citizens (web viewer)



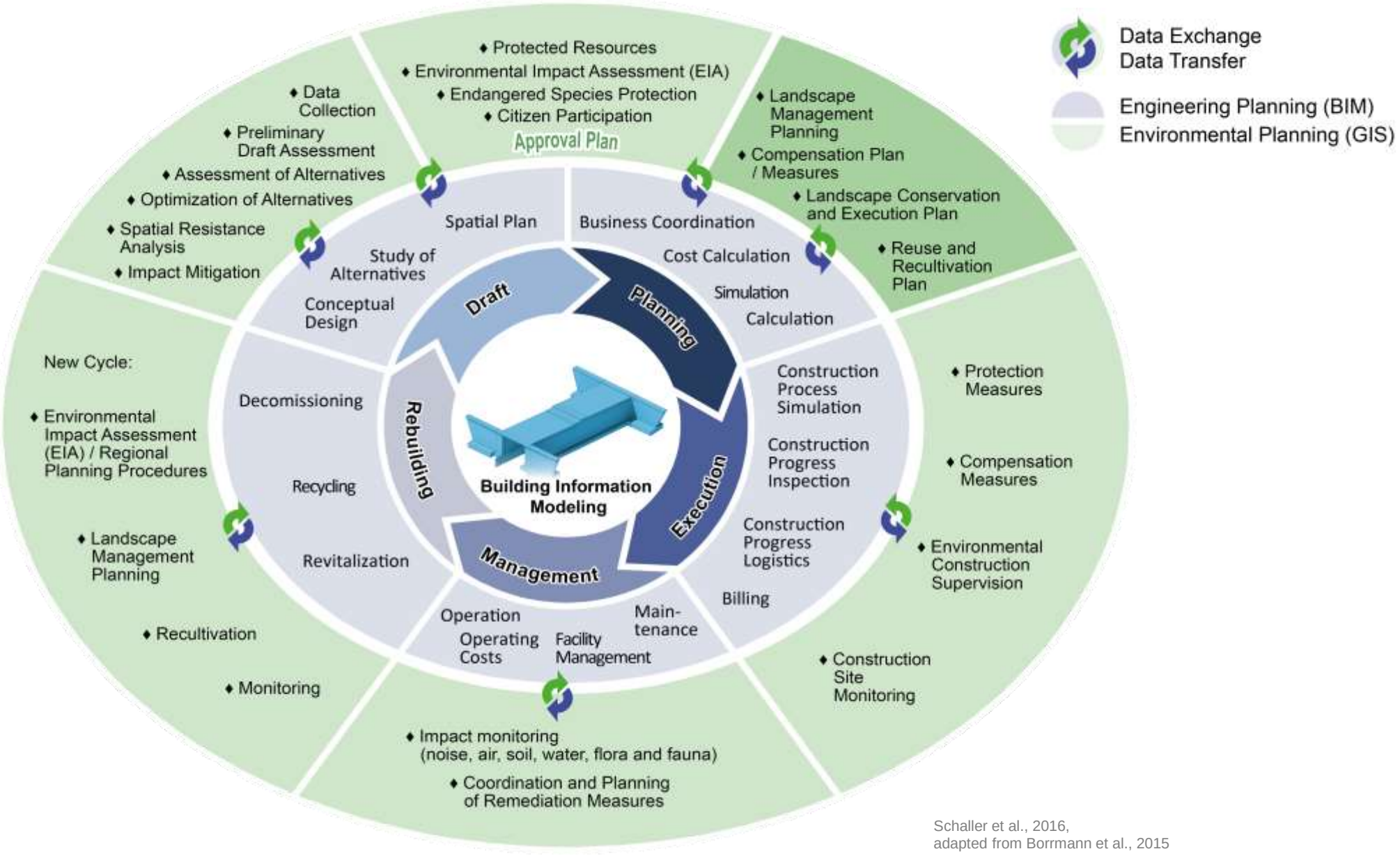
Environmental Licensing Phase

Noise at day

Environmental Licensing Phase

Noise at night

Planning Phase



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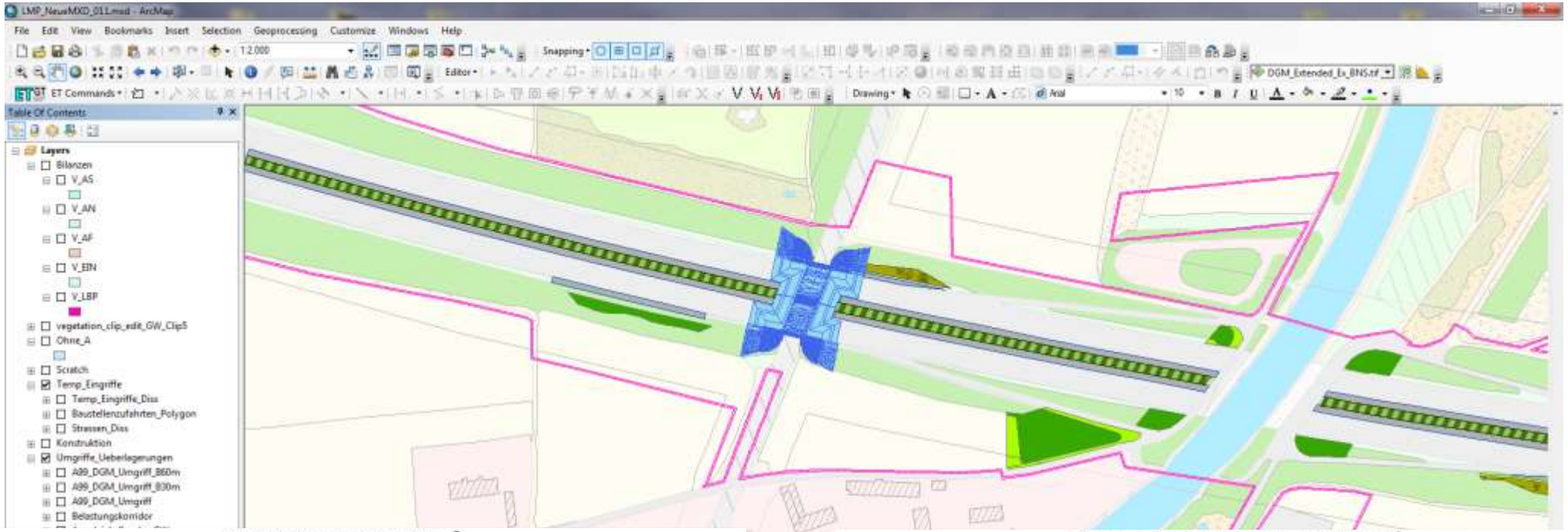
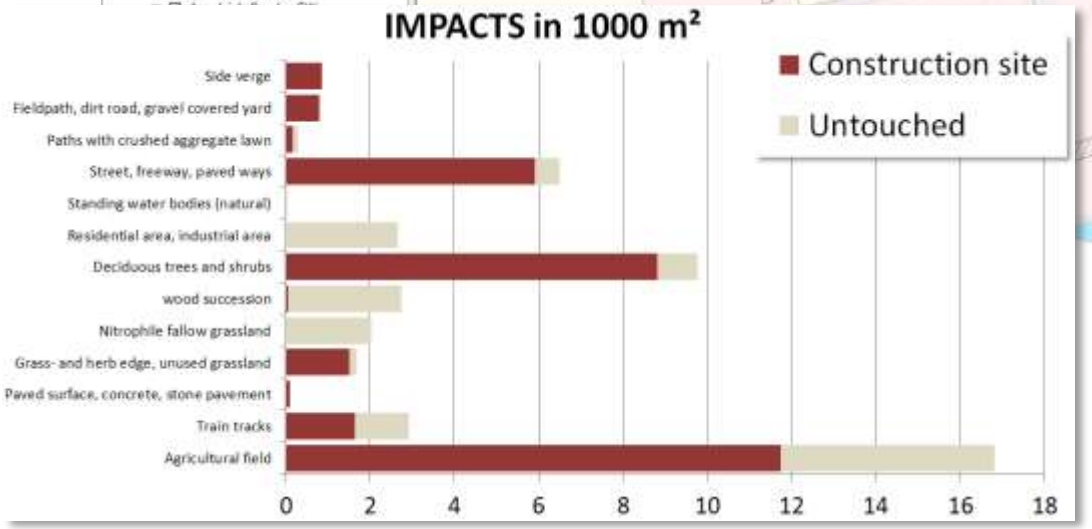
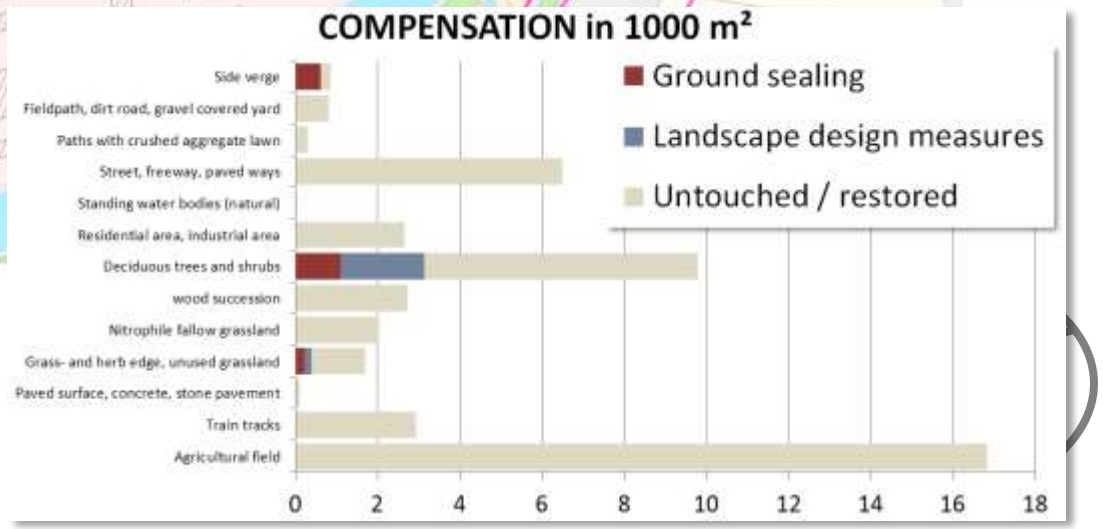
Planning Phase







Landscape design / landscape architecture

Planning Phase

Landscape design / landscape architecture

Processing Workflow

MorgenStadt City of the Future

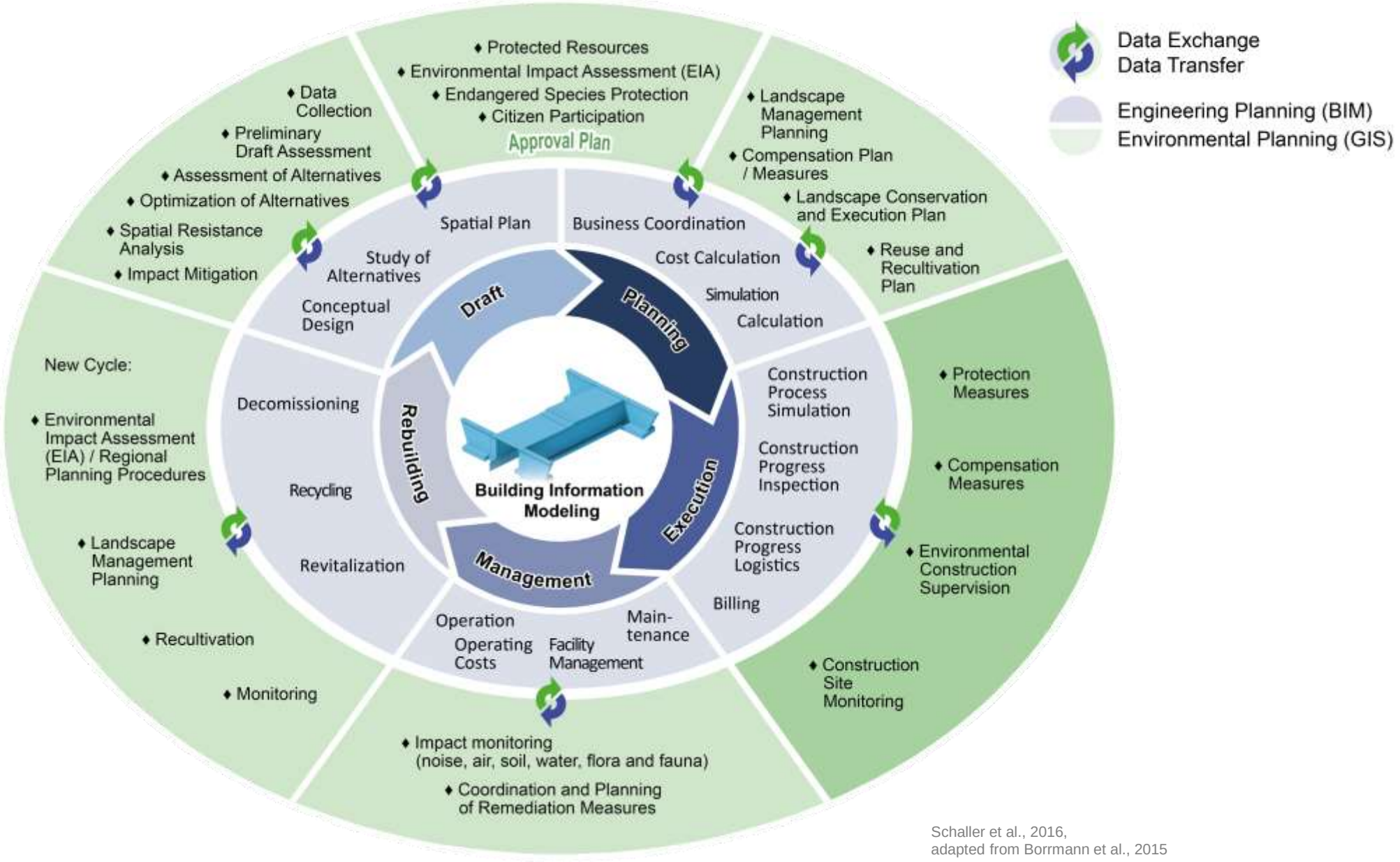
Design-Drafts

2D / 3D CAD BIM Integration using the Esri Data Interoperability Extension

3D GIS Geodesign Database

Rendering of Project

Execution Phase

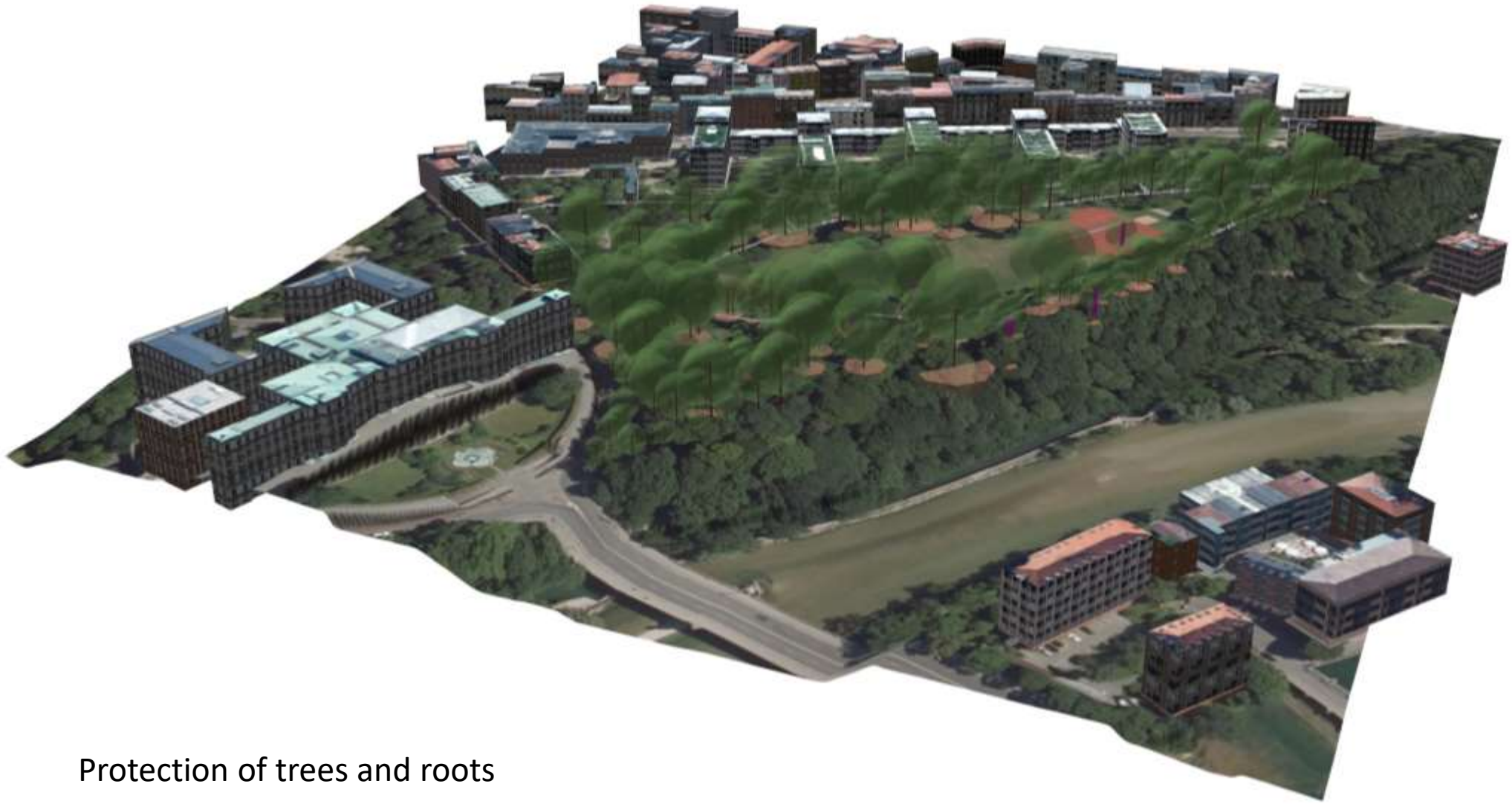


Schaller et al., 2016,
adapted from Borrmann et al., 2015

Execution Phase

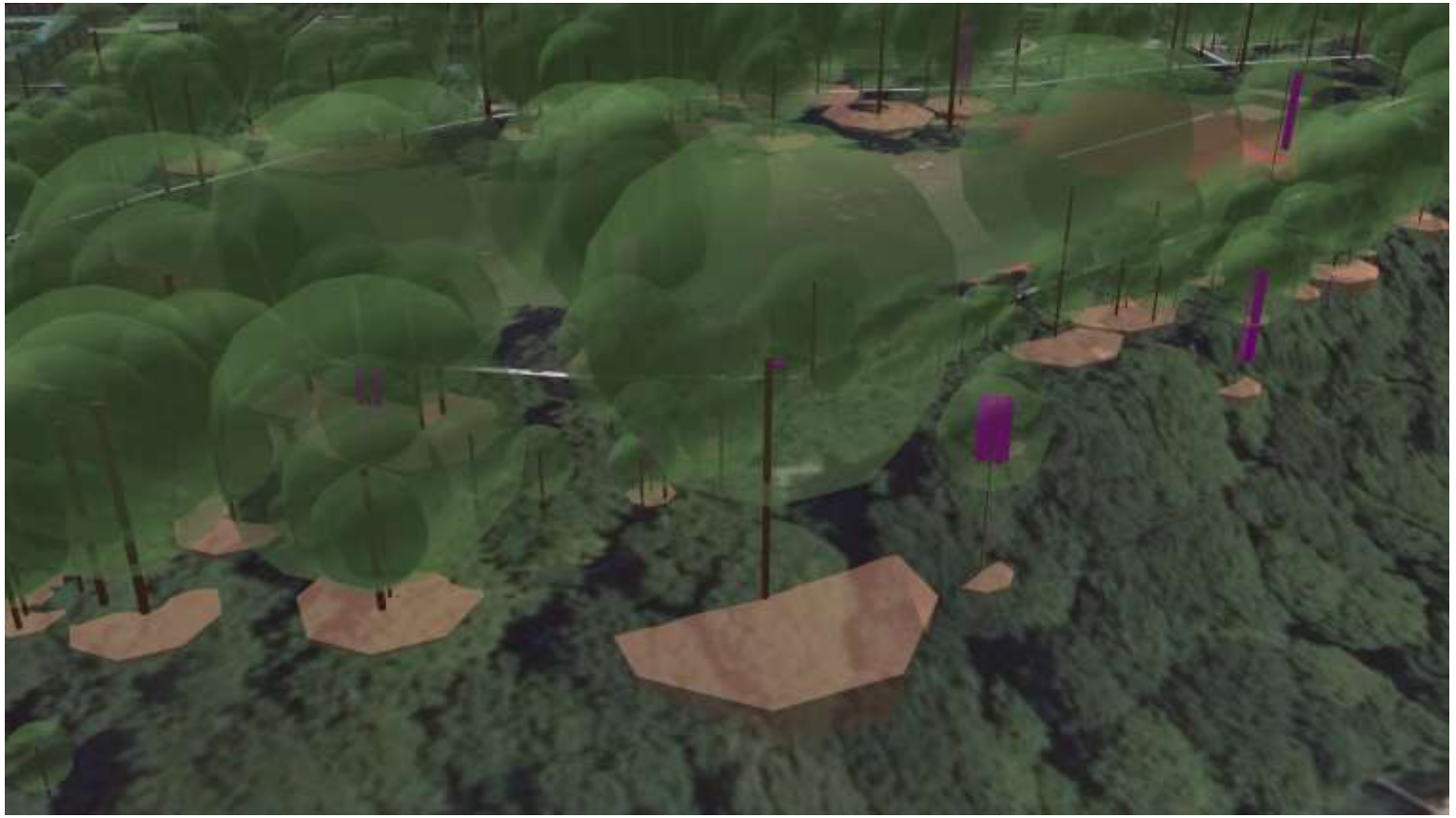
Vegetation clearcutting schedule from the BIM Plan

Execution Phase



Protection of trees and roots

Execution Phase



Protection of trees and tree roots
Special care of hollow trees

Outlook

PHASE/ Products	DRAFT	products	exchange	APPROVAL	Products	exchange	PLANNING	products	exchange	EXECUTION	products	exchange	MANAGEMENT	products	exchange	REBUILD	products	exchange
	Mapping, data collection	data base		**EIA Environmental Impact Assessment**			**Landscape Management Plan (LBP)**	Present state, analysis, measures		**Landscape protection and execution plan**	2D, 3D		**Impact monitoring**			EIA		
	Impact mitigation: Optimization of technical project	collision test	X	Analysis of environmental data (soil, topography, water, air, climate, flora, fauna, landscape, man, cultural values etc.)	thematic maps, 2D, 3D case-specific	X	Compensation balance	2D maps, tables	X	**Protection measures**	2D, 3D, specifications protocols	x	Coordination and planning of remediation measures	2D, 3D, specifications, procotols	X	Landscape Management Planning		
	Spatial resistance analysis	generalised maps 2D, 3D case-specific	X	**Integration of special studies and collision tests:**			**Compensation measures**	2D maps	X	Compensation measures	2D, 3D, specifications protocols	X				Recultivation		
	Assessment and optimization of alternatives	maps	X	**Noise study integration**	3D, statistics	X	Landscape protection and execution plan	2D, 3D		**Environmental and construction supervision**	specifications protocols	X				Monitoring		
	Assessment of preliminary draft	maps 2D, 3D case-specific	X	Air pollution	3D, stat	X	**clearcut plan**	2D, 3D, specifications	X	Construction site monitoring	Protocols, pictures, checklists	X						
	affected habitats analysis	2D, 3D	X	**Soil + Geology**	3D, stat	X												
	shadow analysis	3D	X	Hydrogeology	3D, stat	X												
	sight analysis	3D	X	**Flooding scenarios**	3D, statistics													
				Endangered species assessment	2D, 3D	X												
				Habitat trees	3D model	X												
				EIA: Analysis of environmental impact	maps 2D/3D	X												

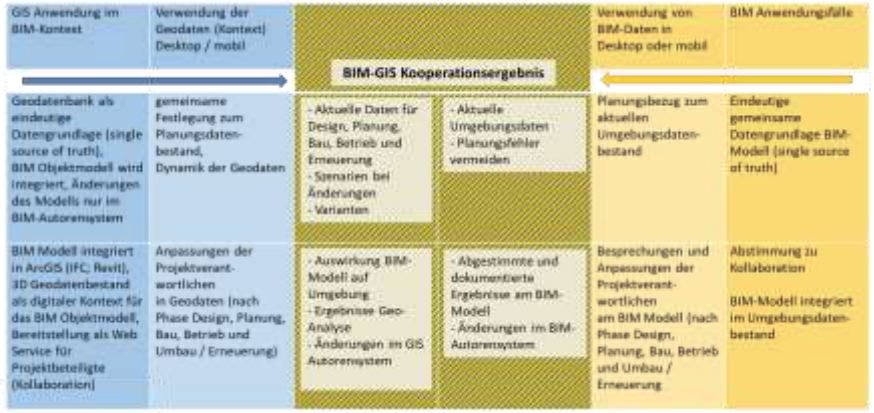
Phases with
working steps / products / exchange of data and information

Outlook

BIM-GIS Chart of Collaboration

- supports co-working of GIS and BIM teams of different faculties
- Foundation:
  - > Common data base
  - > Integration of data of object and environment
- Result:
  - > consistent project work in context of geodata
  - > integrated workflows

- BIM-GIS use cases (examples)
  - > Mobile access to documents and plans
  - > Collision tests
  - > Virtual comparison of planning object and restrictions
  - > Geotechnical, hydrological, ecological, social etc. conditions and effects
  - > Monitoring



A growing mosaic of collaborative activities!

Thank you!

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