

# 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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- 1 BIM in brief
- 2 BIM-GIS Cycle
- 3 Phases and Examples
- 4 Outlook

### **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

## 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

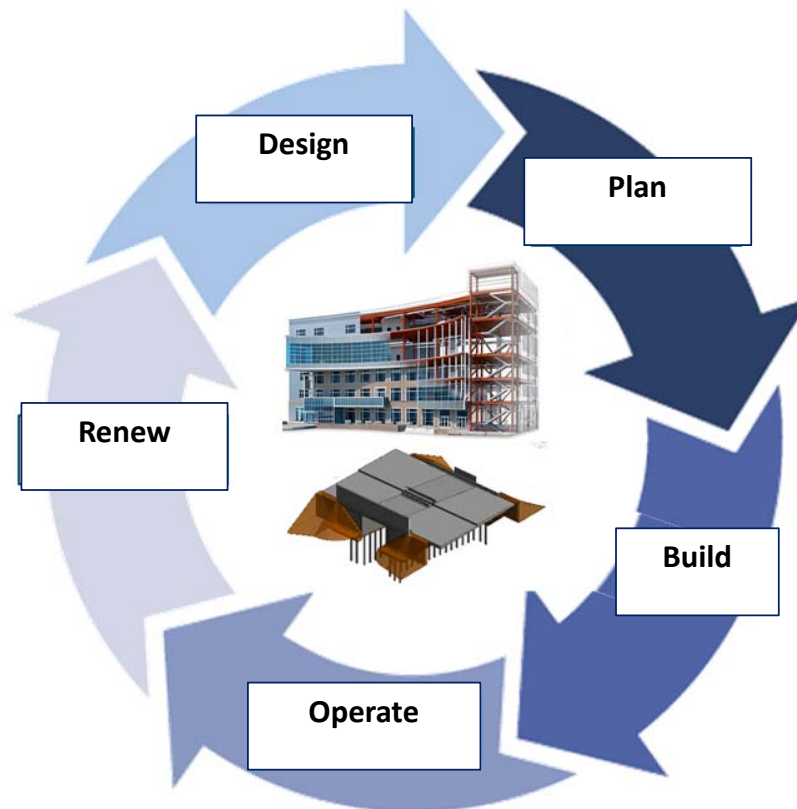
+ for software and hardware developers: processing capacities, data storage, data exchange ...

+ for data providers: availability of data ...

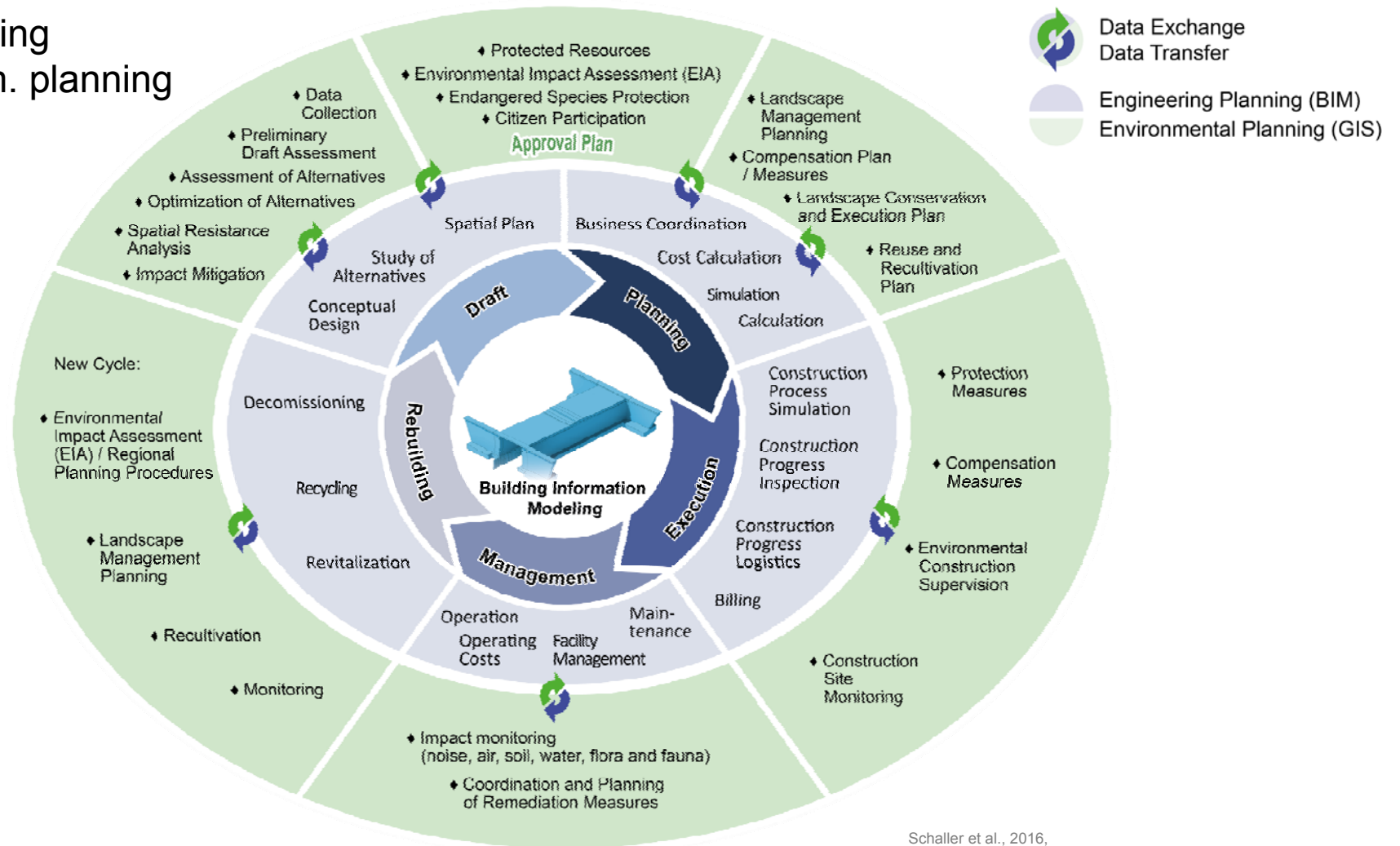
→ BIM Cycle has to be filled with working steps and workflows



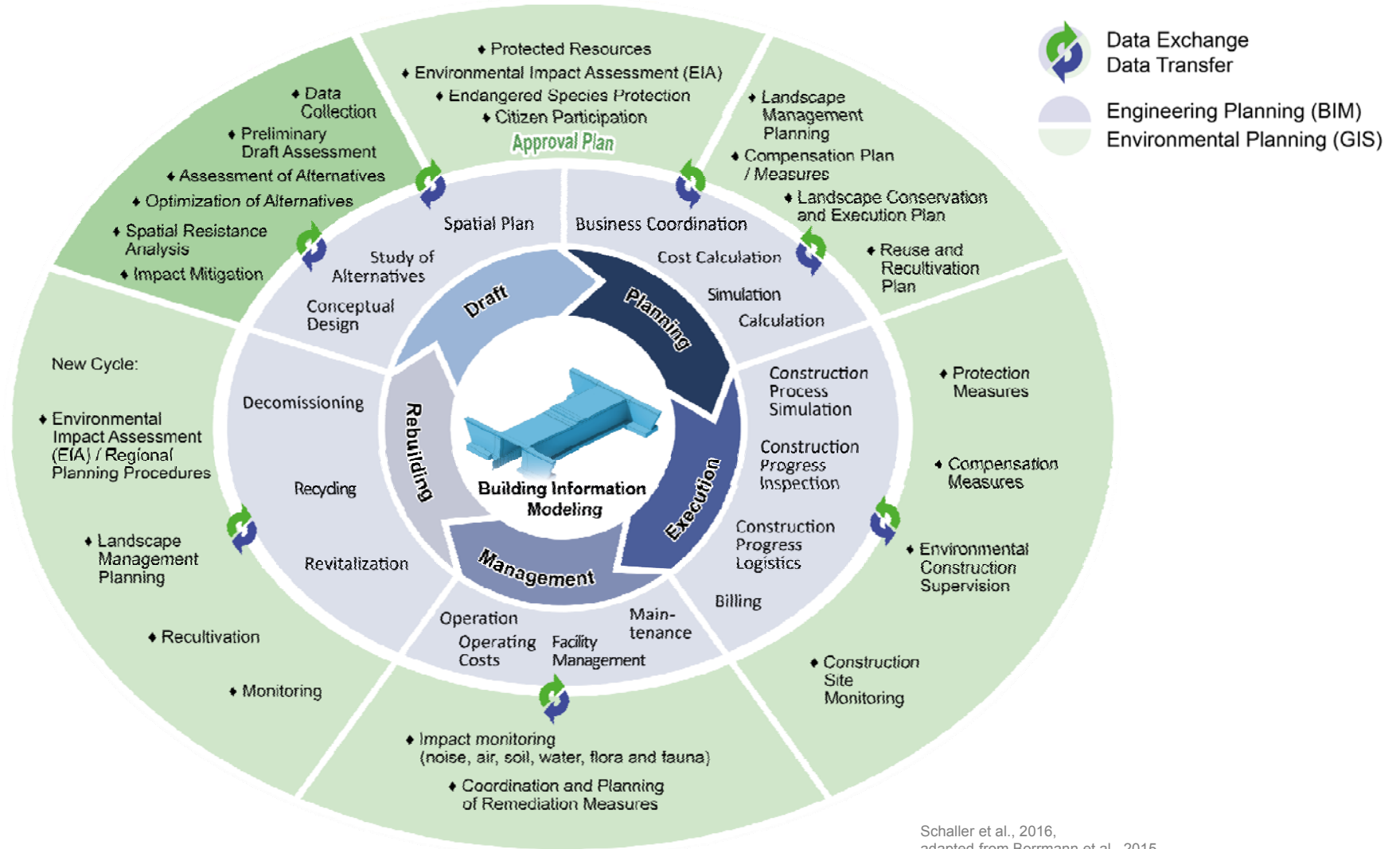
- phases in lifecycle of object
- phases of planning and management



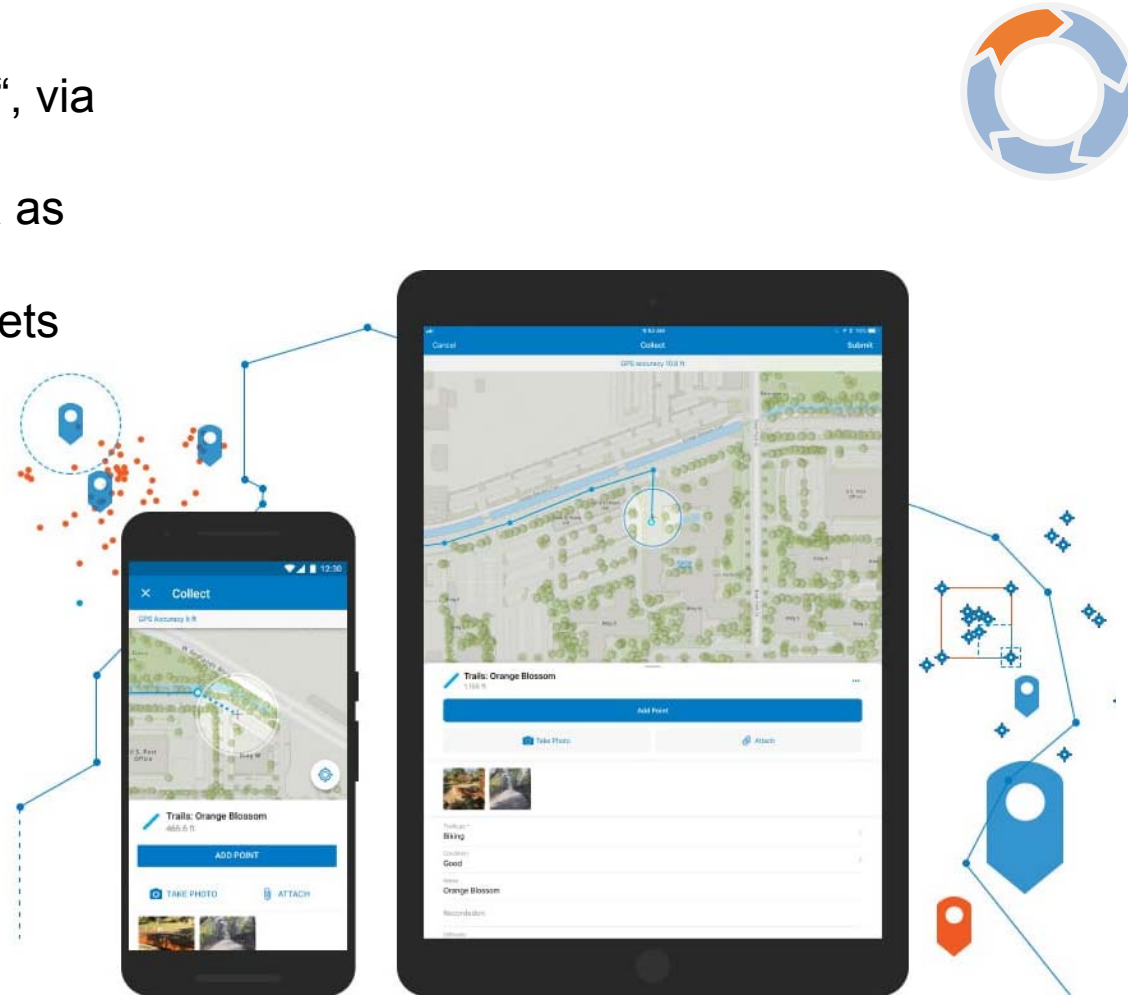
- works in engineering
- works in environm. planning



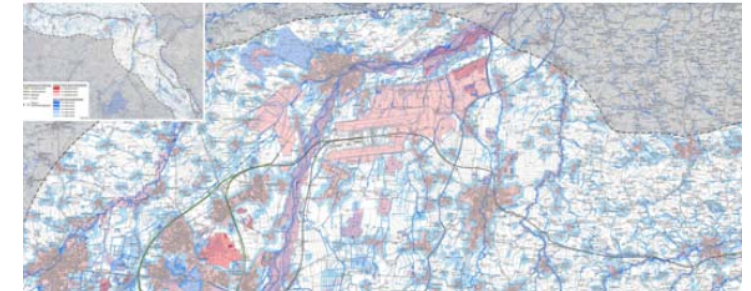
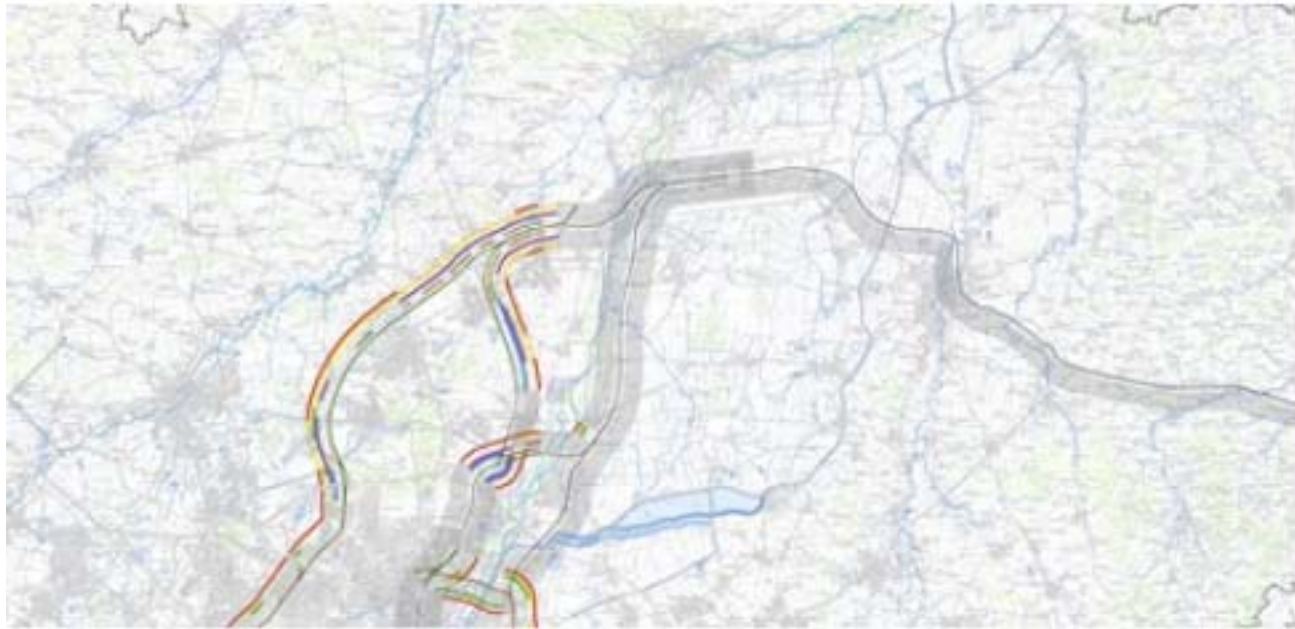
Schaller et al., 2016,  
adapted from Borrmann et al., 2015



- 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

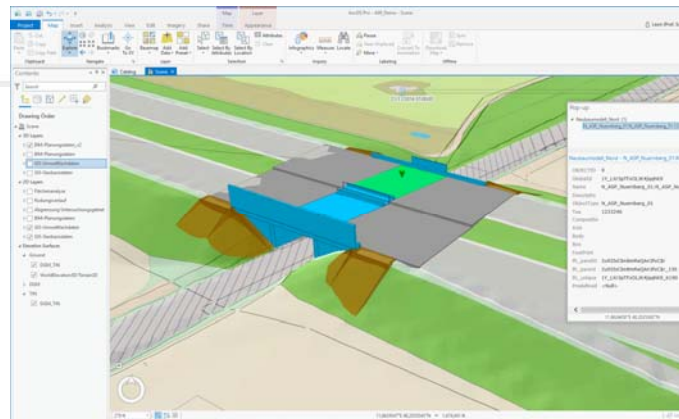
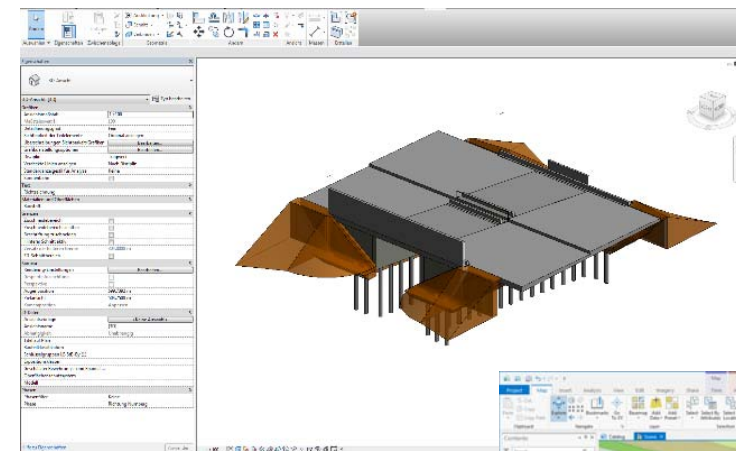




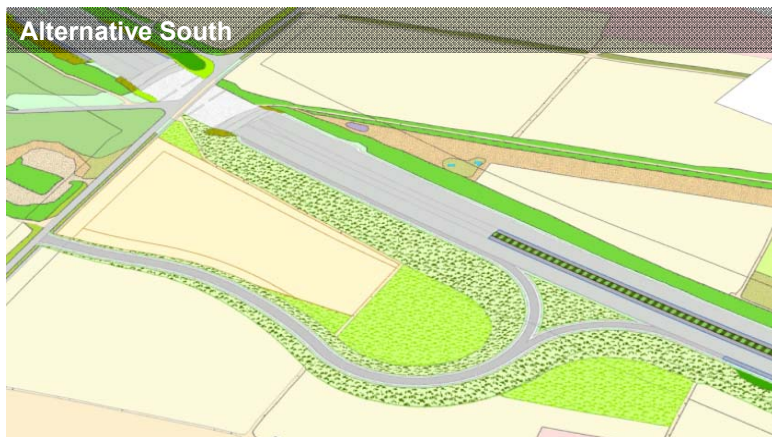


- Spatial resistance analysis
- Assessment of alternatives
- Impact mitigation

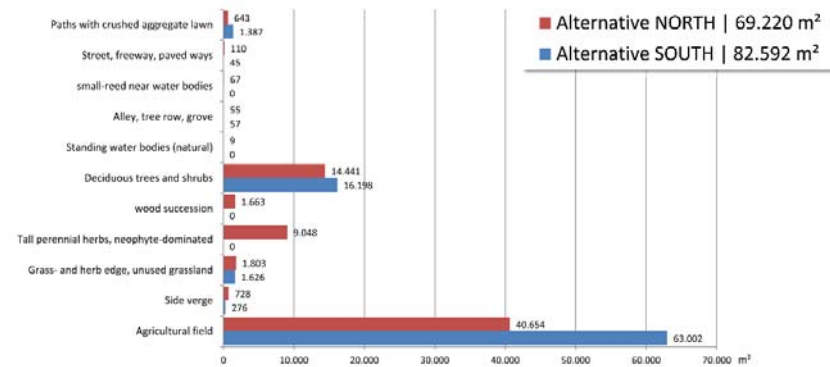
## BIM GIS Integration A99 / S8



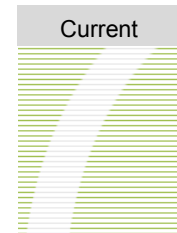
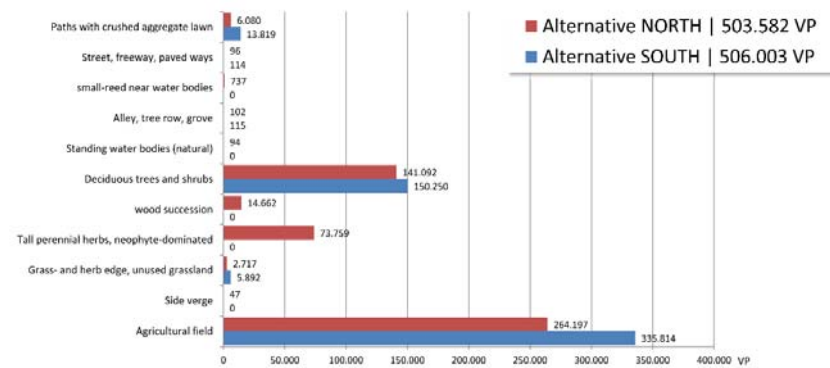




Access alternative comparison by land usage in m<sup>2</sup>

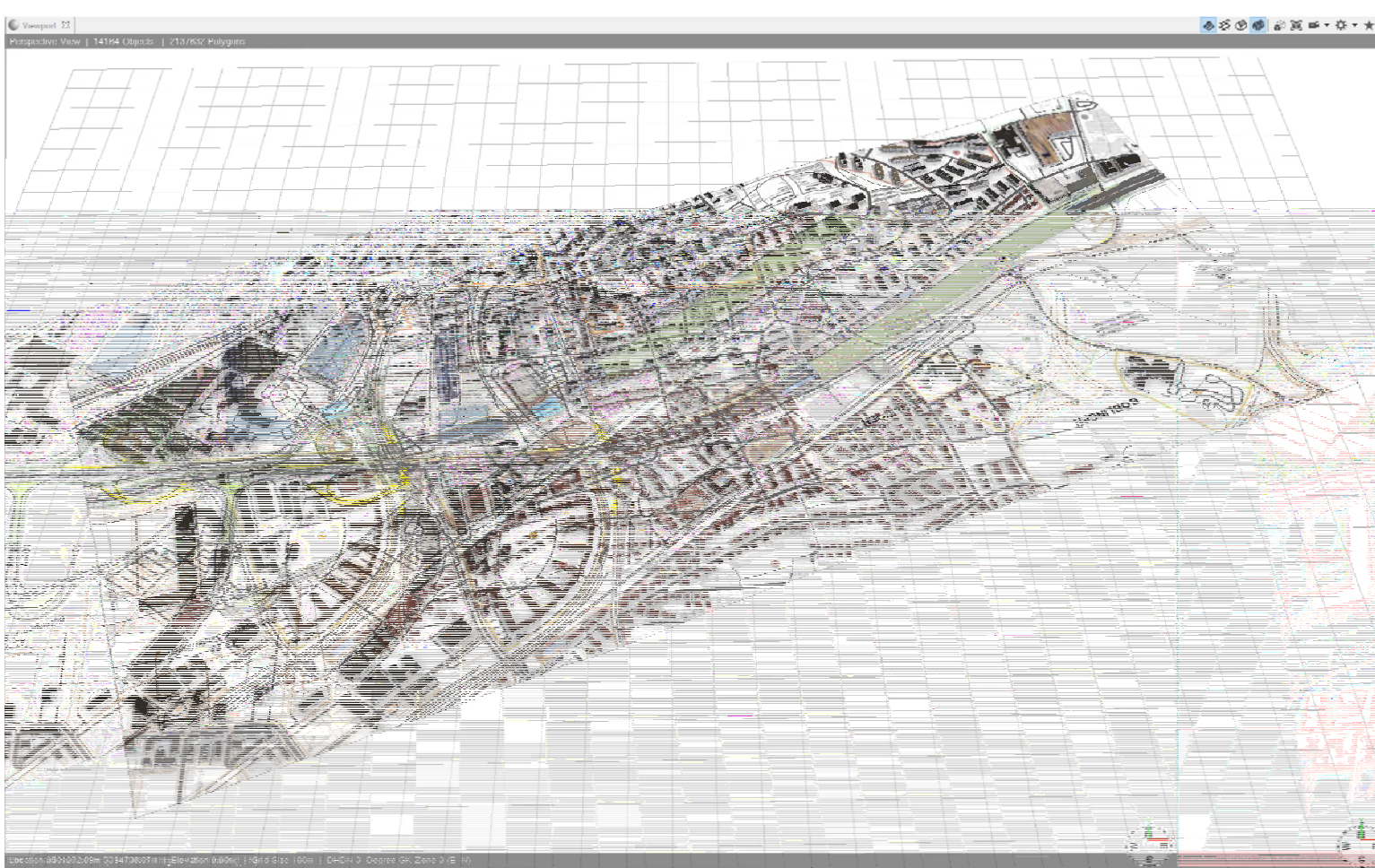


Access alternative comparison by biotope quality in value points



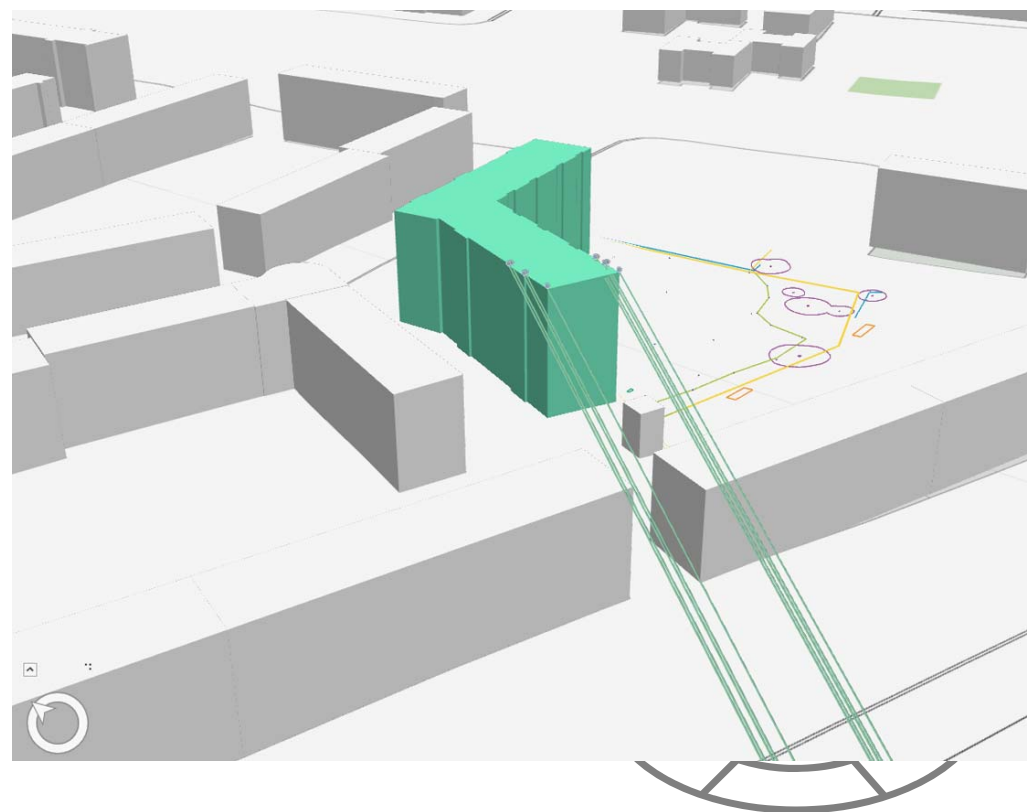
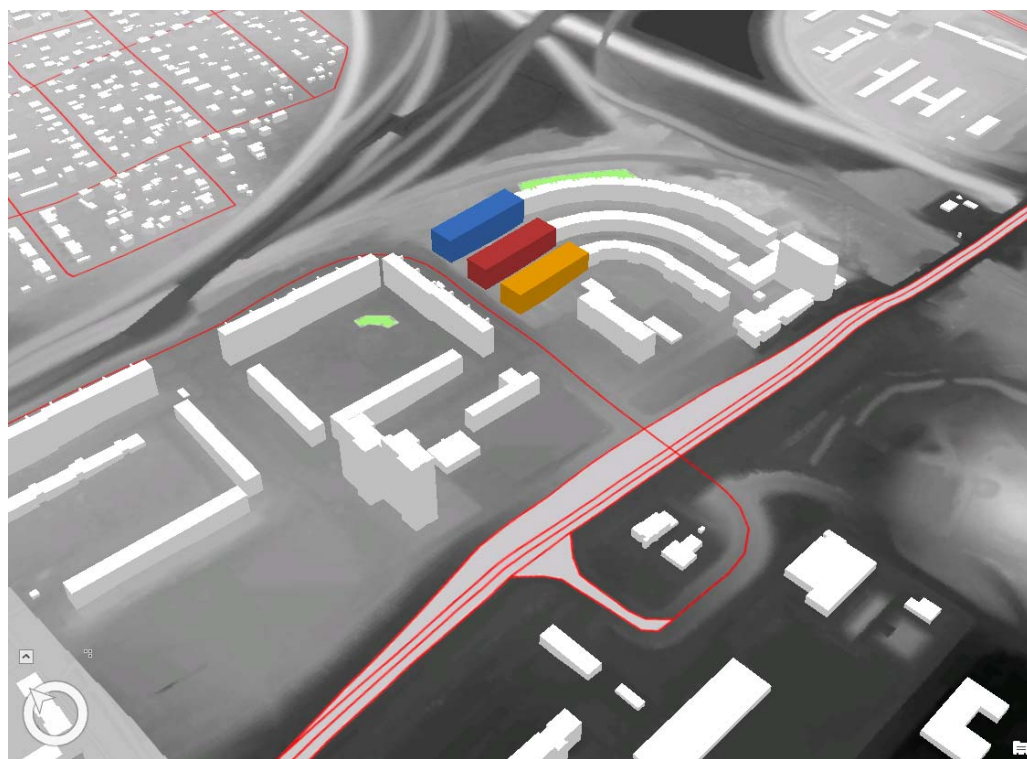
■ permanent  
■ temporary

## Integration of technical project into surroundings

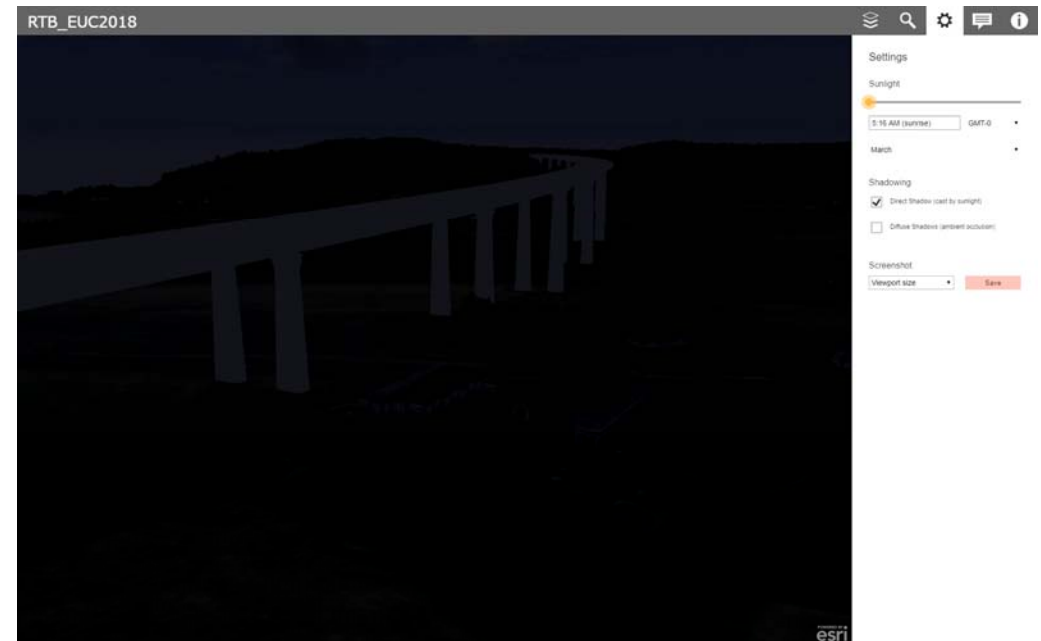


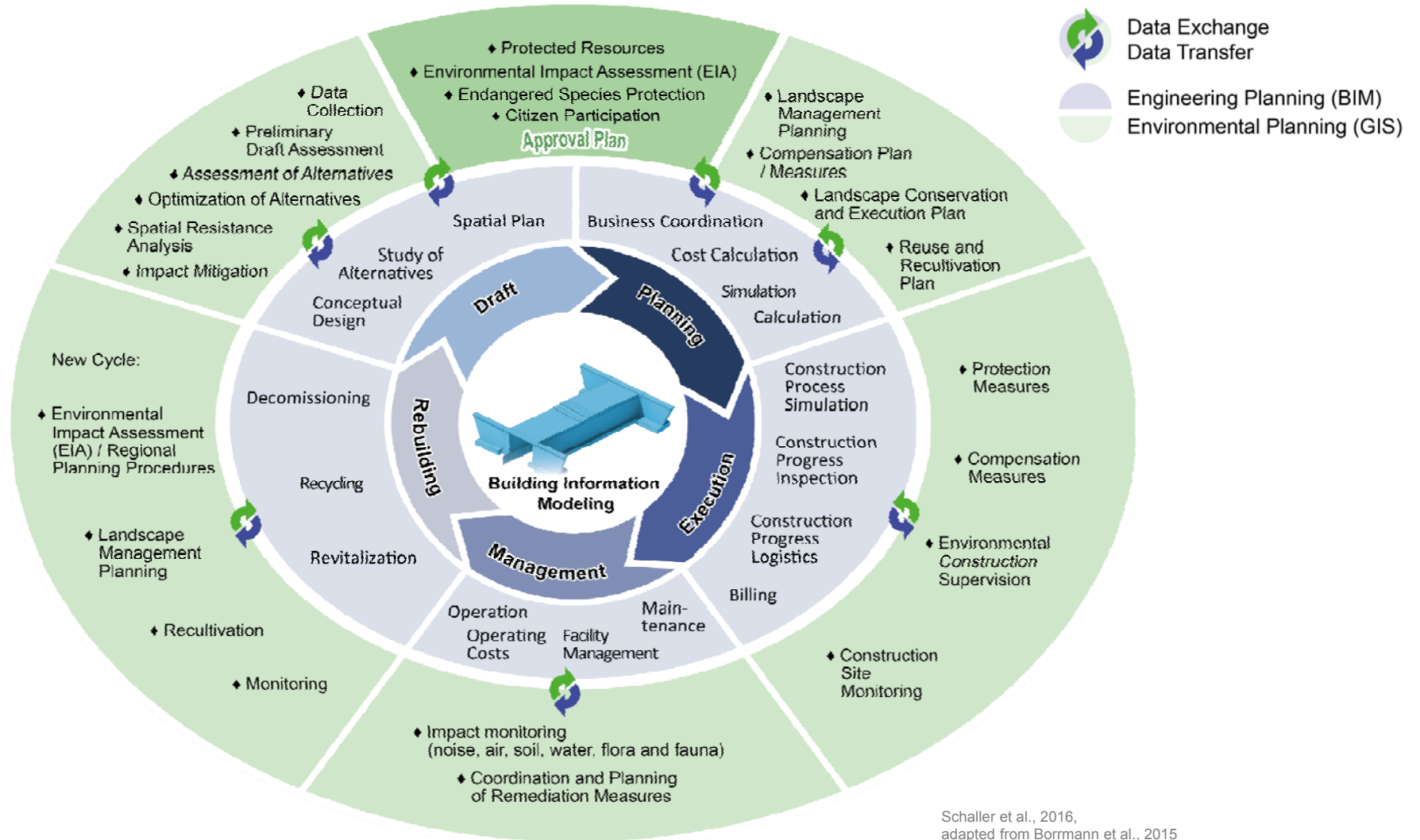


- various GIS analyses
- 3D specific analyses (visibility, sightlines, viewshed)
- results as report



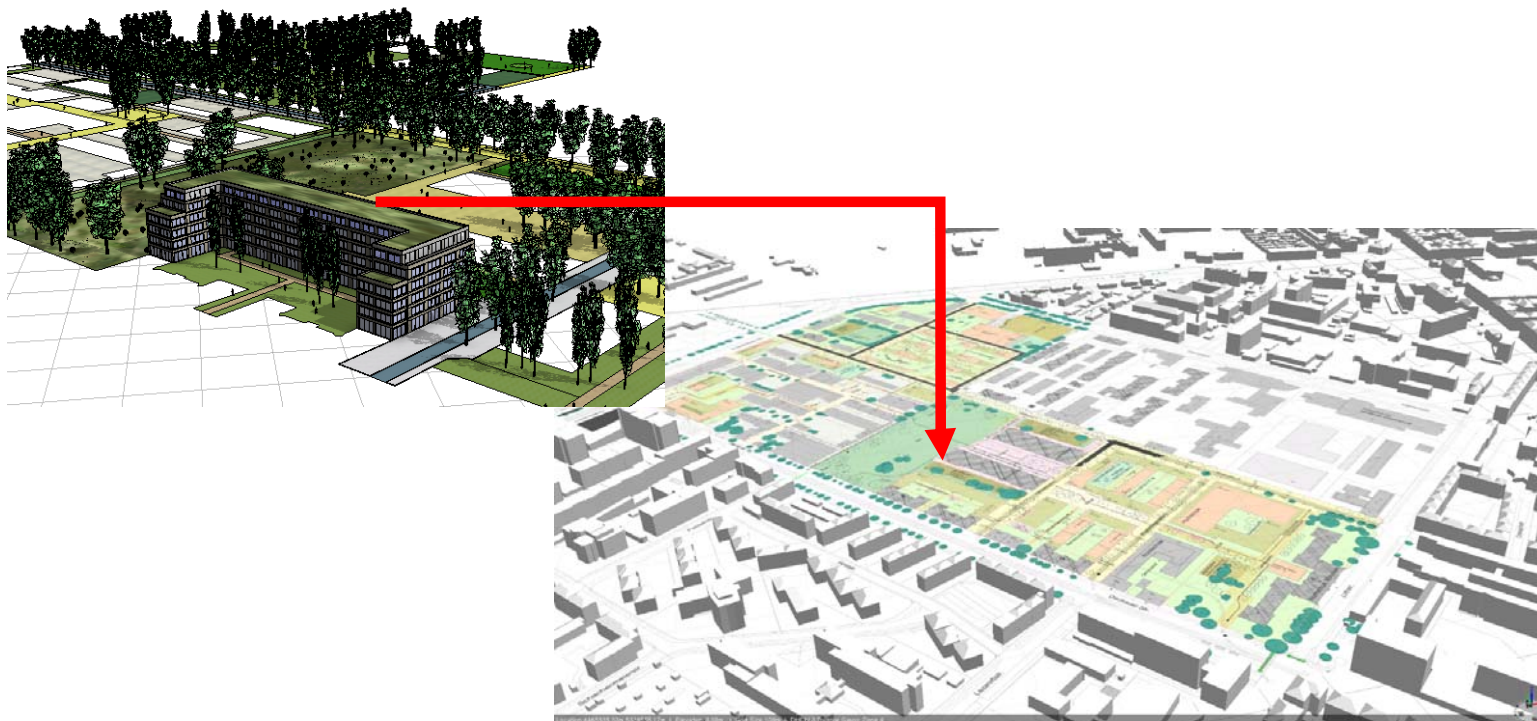
## Shadow analysis of bridge





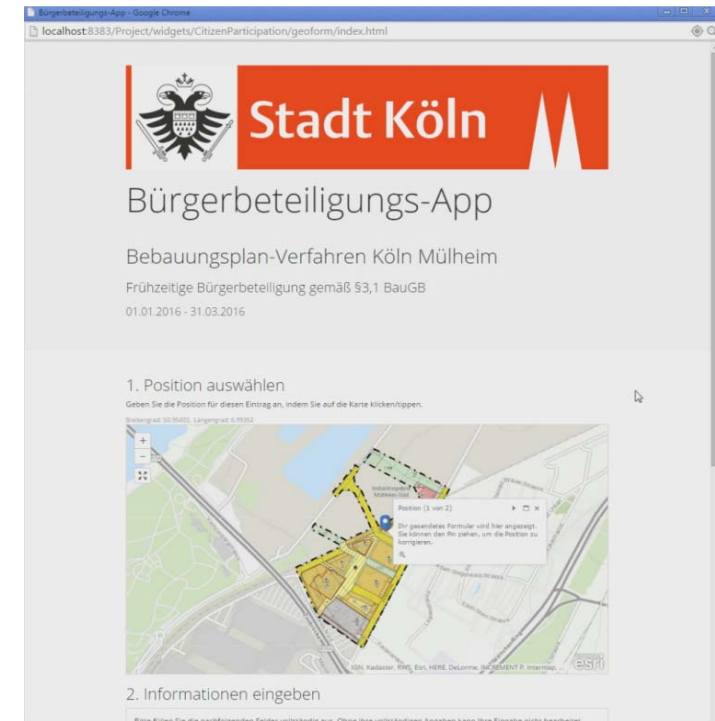
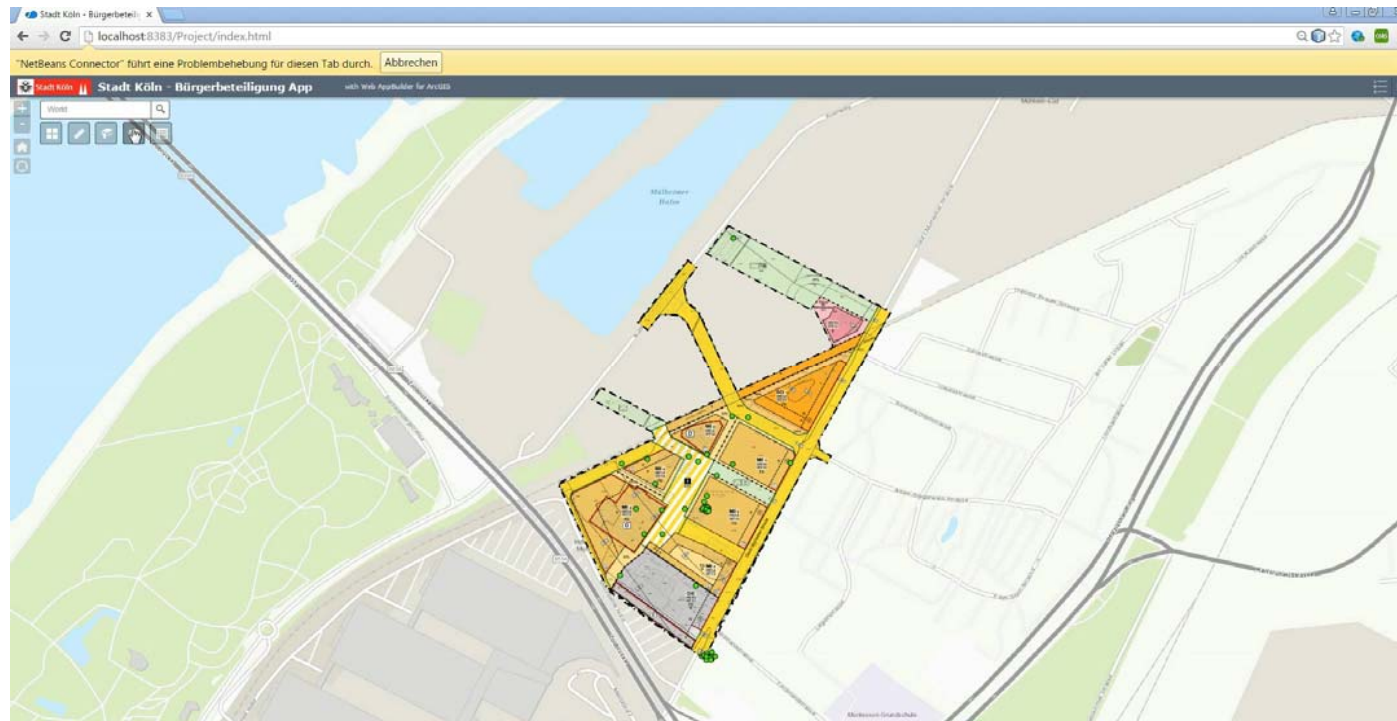
Schaller et al., 2016,  
adapted from Borrmann et al., 2015

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

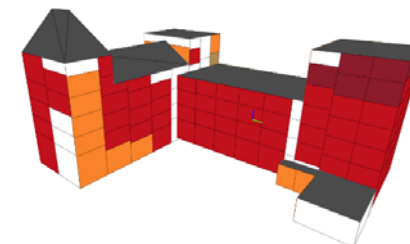




## Binding Land Use Plan coupled with 3D Building Model in GIS: Modern form of participation



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



Properties	Location	Classification		
	Name		Value	Unit
<b>Element Specific</b>				
Guid			H4R4Km69Q8Kv\$nmXAaxQQ	
IfcEntity			IfcWall	
<b>GIS Data</b>				
_0_LEGEND_URL			http://psu-schaller.de/REL_tests/IFC_URL/Lae	
			rmLegendeDIN18005.pdf	
_ABS_GEBHOE			52.77324584	
_ANTEIL_EW			0.12690190263	
_BEW_GEB			4.8222723	
_CREATION_D				
_FLAEOHE			279.59399257	
_FPCOUNT			38	
_FUNCTION			1144	
_GEBNUTZUNG			8	
_GMLID			BLDG_0003000b00082393	
_HKEY			HAUS041	
_IDLOCAL			7	
_NAME				
_NUMBER			35096	
_OBJECTID			136	
_OG			2.OG	
_PRZ_WOHN			100	
_ROOF_TYPE			1130	
_STOREYS				
STREET			Knothelsdorfstr. 74	

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



**Farbpalette der Pegelklassen gemäß DIN 18005 Blatt 1**

**Legende**

- ≤ 35 dB(A)
- ≤ 40 dB(A)
- ≤ 45 dB(A)
- ≤ 50 dB(A)
- ≤ 55 dB(A)
- ≤ 60 dB(A)
- ≤ 65 dB(A)
- ≤ 70 dB(A)
- ≤ 75 dB(A)
- ≤ 80 dB(A)
- > 80 dB(A)

**Weiterführende Informationen**

Berücksichtigung des Schallschutzes im Städtebau - DIN 18005 Teil 1: Ausgabe Mai 1987 - Ratifiziert durch das Ministerium für Stadtentwicklung, Wohnen und Verkehr - 21.7.1999 - 1 A.3 - 10.21-2 (am 01.01.2003: 107)  
[https://psu.schaller.de/REL\\_t...](https://psu.schaller.de/REL_t...)  
[https://psu.schaller.de/REL\\_t...](https://psu.schaller.de/REL_t...)

Name	Value	Unit
Guid	tmgsu#_r5xG37UvbsSQYng	
IfcIdenty	IfcWall	
GIS Data		
_J_ECDID_URL	http://psu.schaller.de/REL_t.../C_URL/LaermLegendeDIN18005.pdf	
_ABS_GEDHOE	60.92	
_ANTEIL_EW	0.26150714	
_BEW_GEB	4.70712852	
_CREATION_D		
_FLACOE	59.37899949	
_IPCOUNT	18	
_FUNCTION	1231	
_GEBAUZITZUNG	7	
_GALID	BLDG_000000000036936	
_HKEY	HAUS5404	
_IDLOCAL	17	
_NAME		
_NUMBER	35357	
_OBJECTID	72774	
_OG	4.0G	
_PRZ_WOHNUNG	100	
_ROOF_TYPE		
_STOREYS		



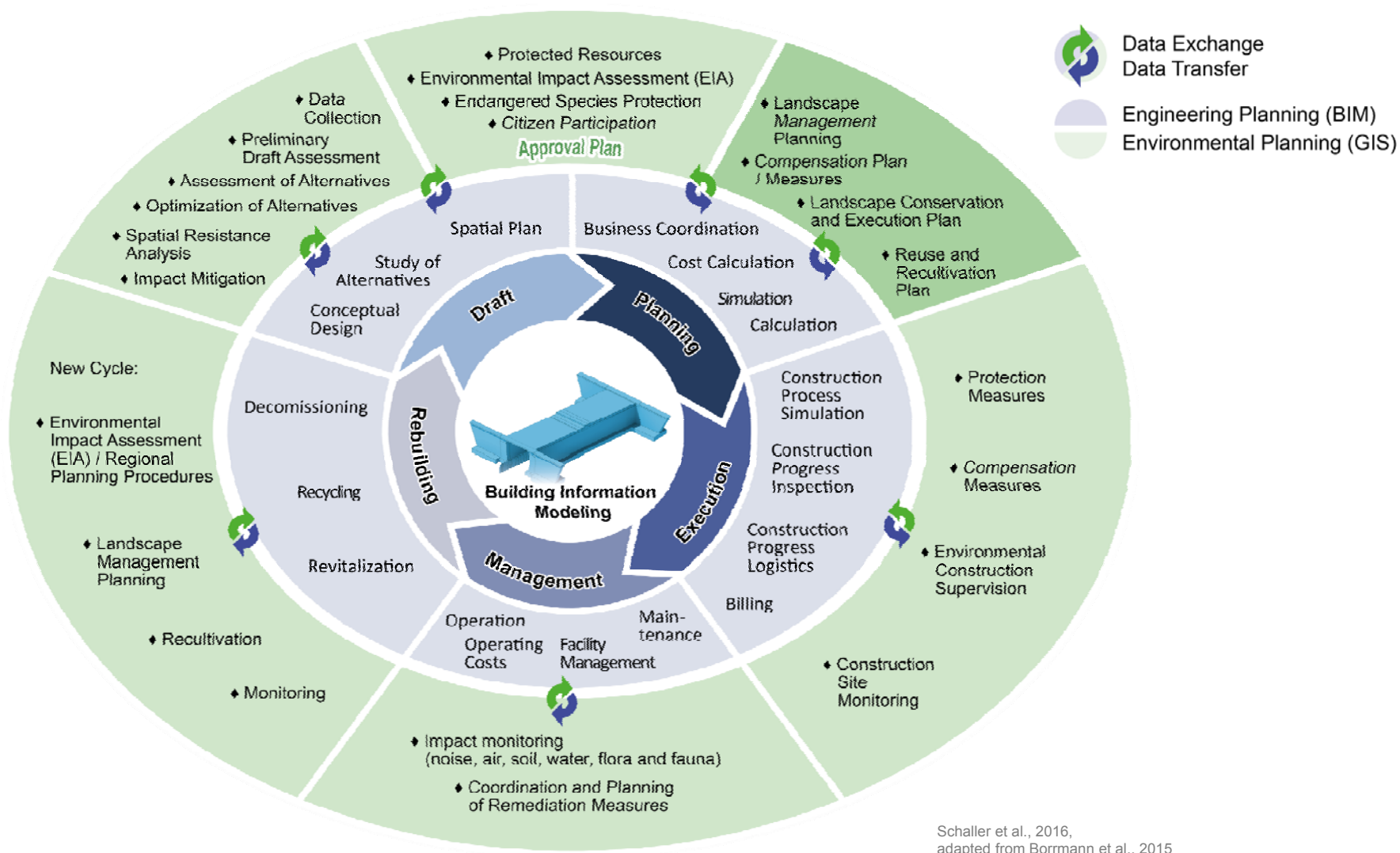
Noise at day





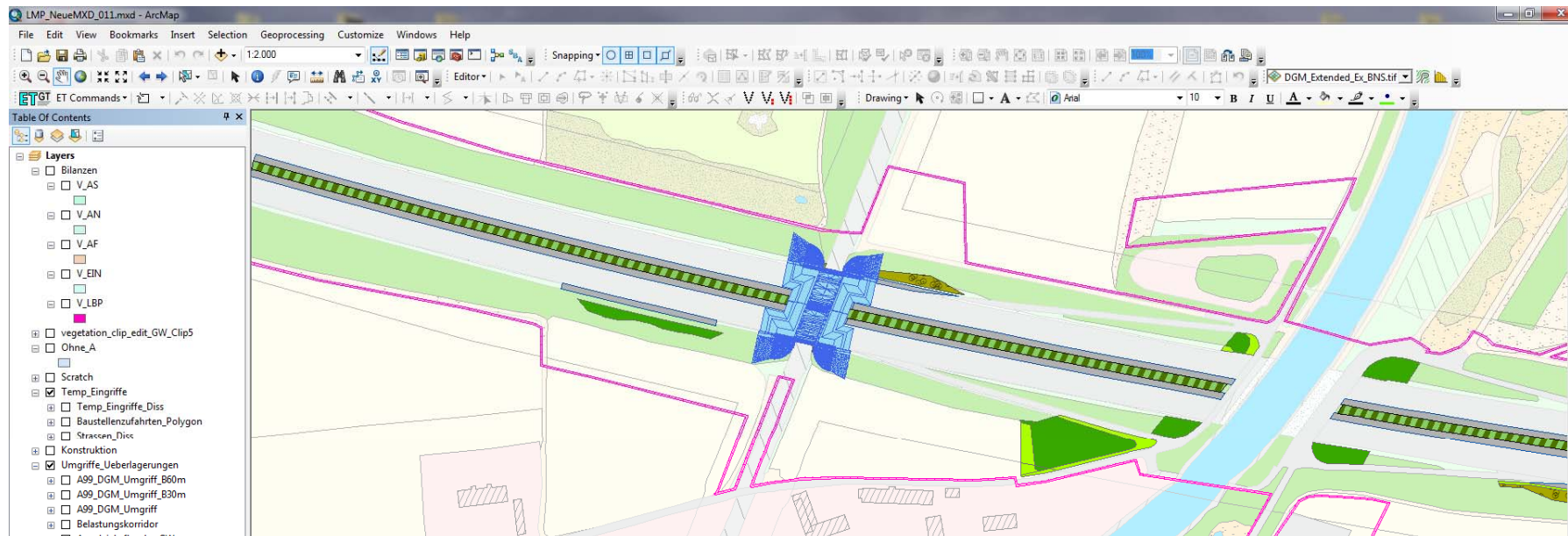
Noise at night



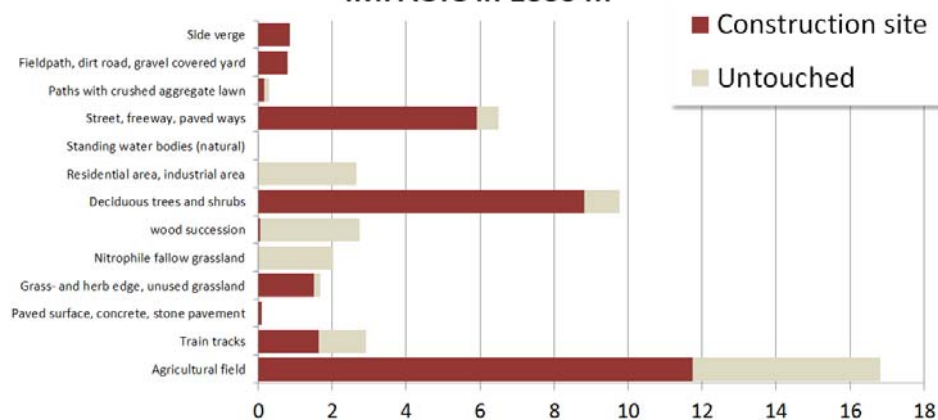


Schaller et al., 2016,  
adapted from Borrmann et al., 2015

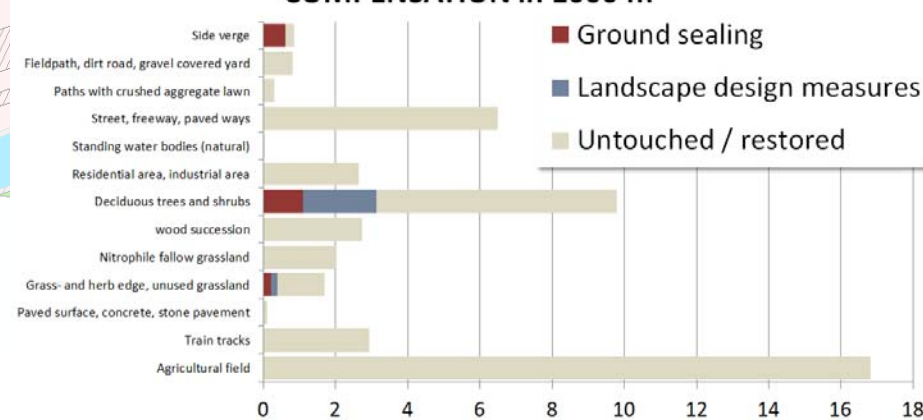




IMPACTS in 1000 m<sup>2</sup>



COMPENSATION in 1000 m<sup>2</sup>



## Landscape design / landscape architecture







Landscape design / landscape architecture

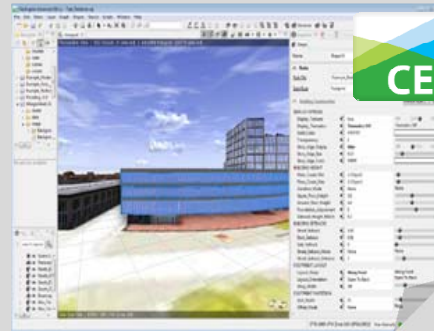
## Processing Workflow



Design-Drafts



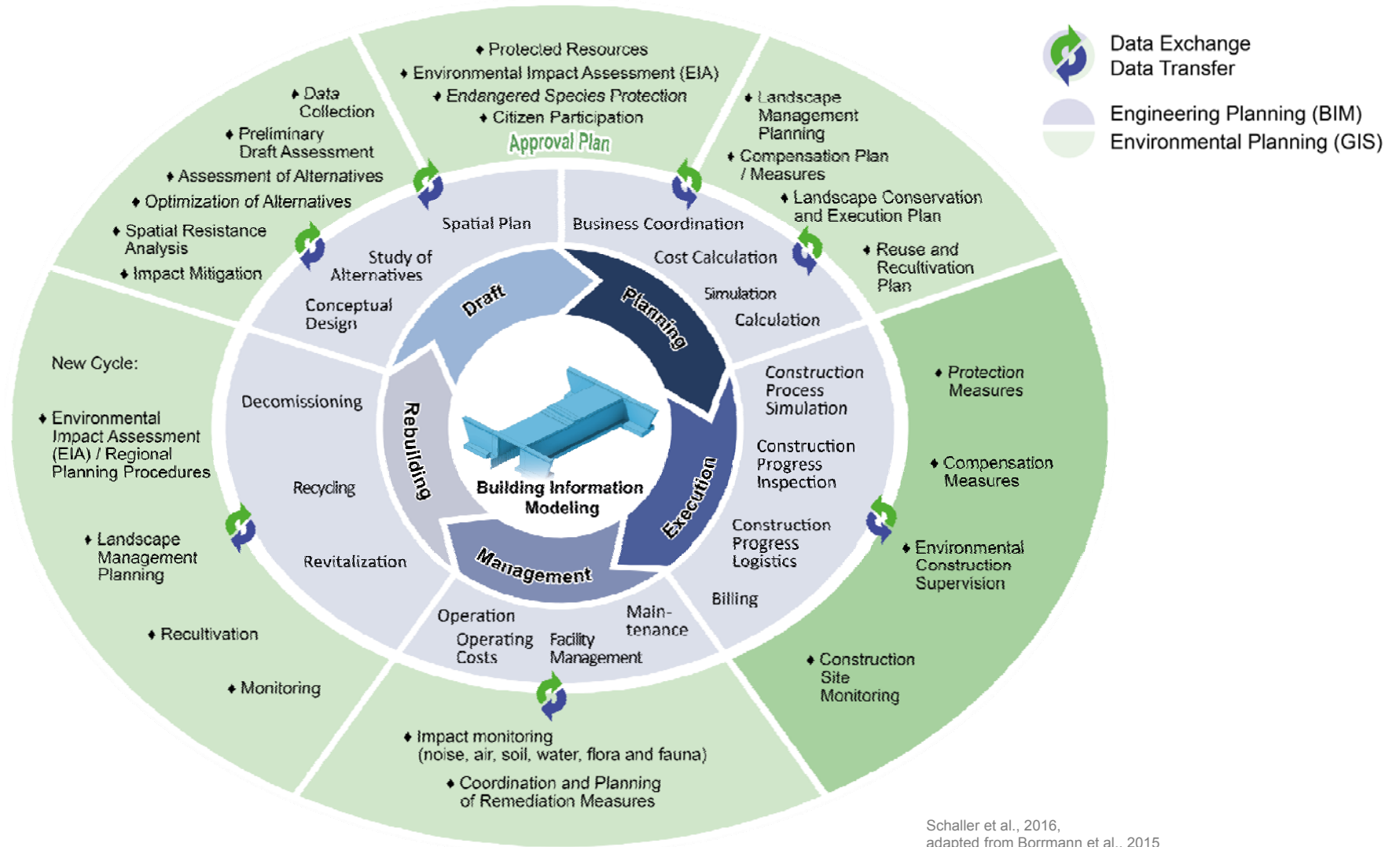
2D / 3D CAD BIM  
Integration using the  
Esri Data Interoperability  
Extension



3D GIS Geodesign  
Database



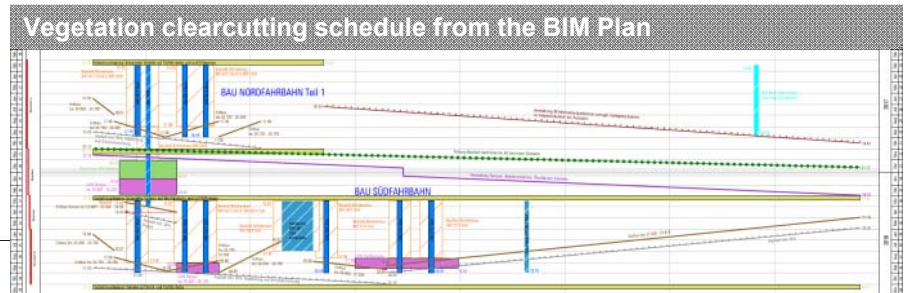
Rendering of Project



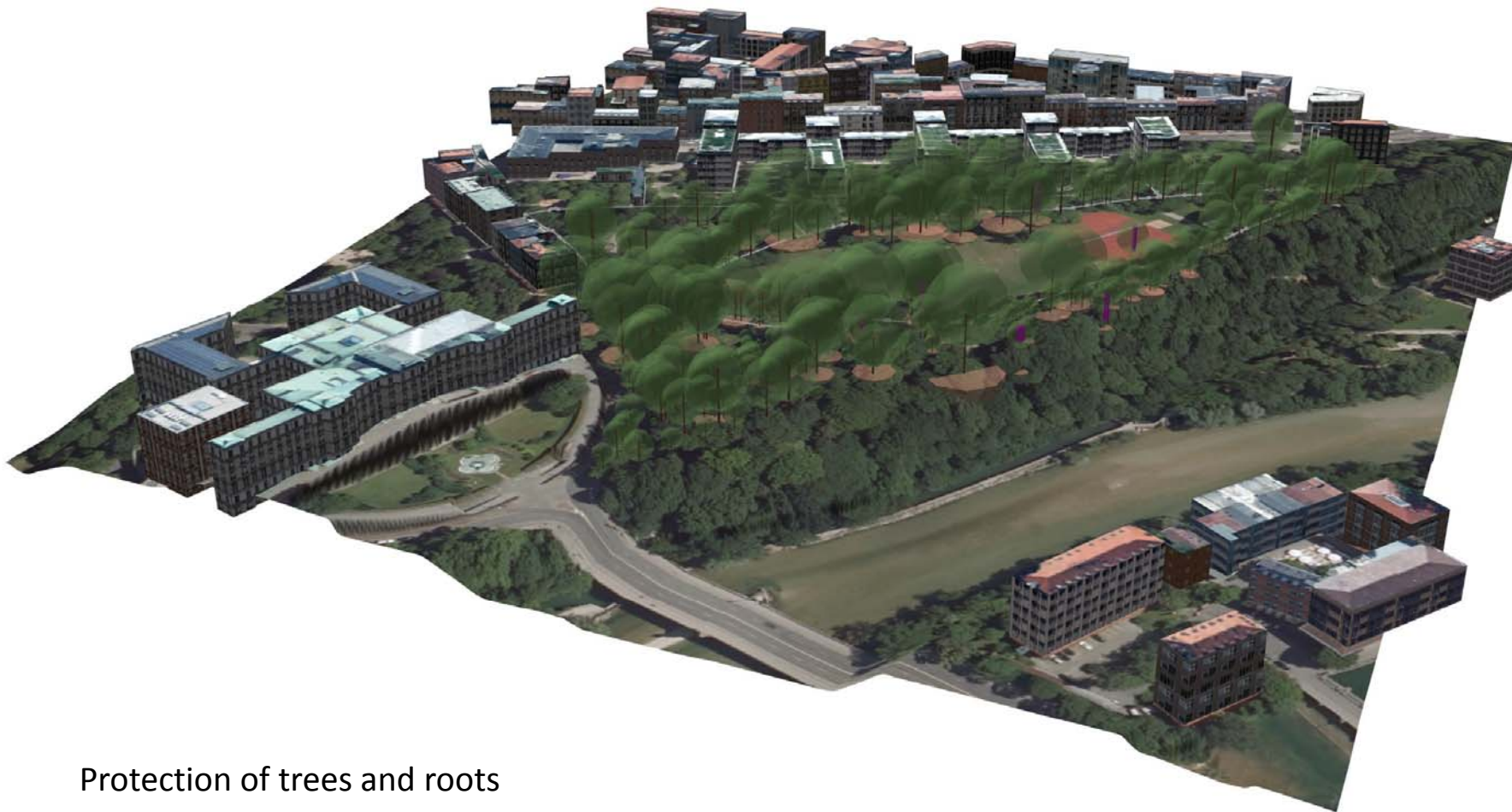


Clearing Construction Site Isarbrücke to AS Aschheim South  
(Construction km 1+300 - 4+700)

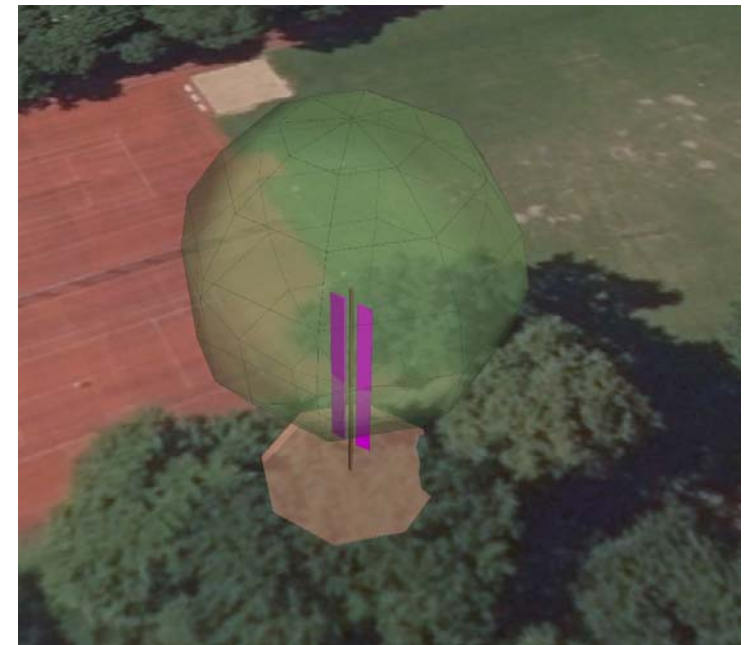
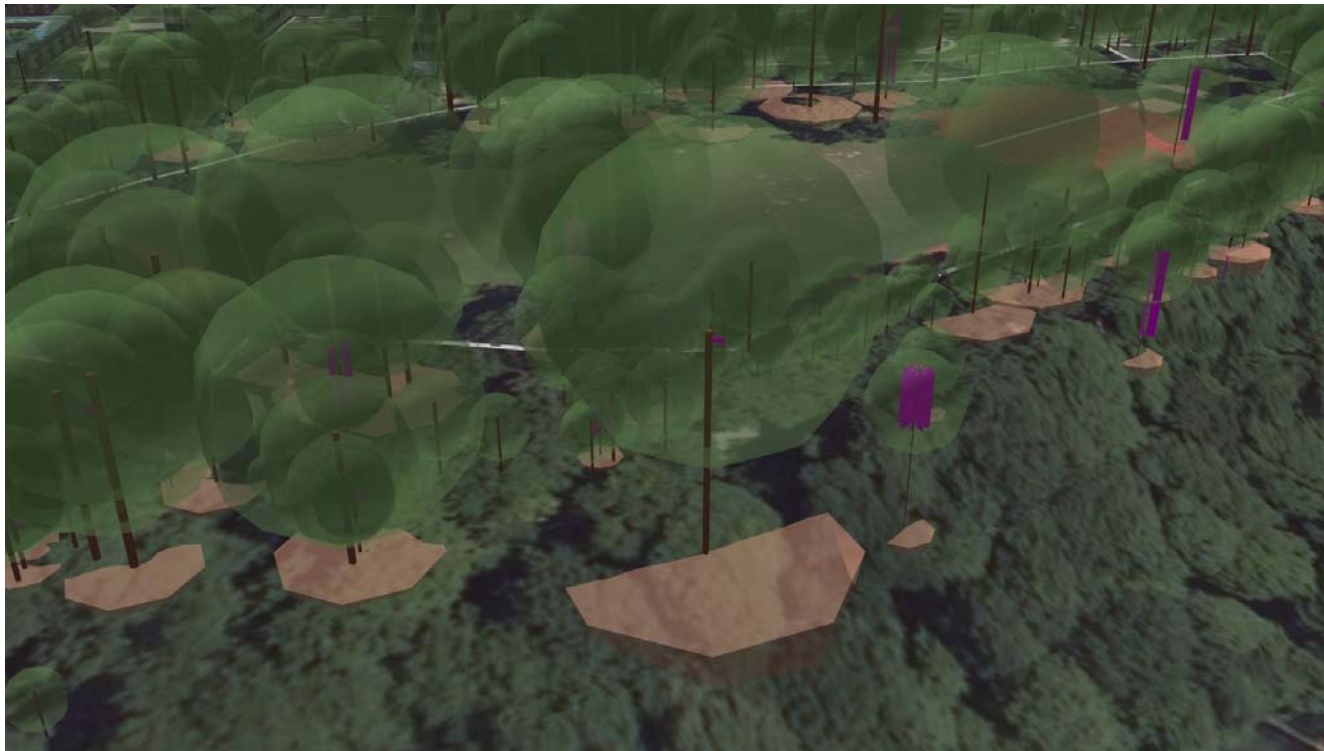
**Date: 09.11.2017**







Protection of trees and roots



Protection of trees and tree roots  
Special care of hollow trees

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, protocols	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												

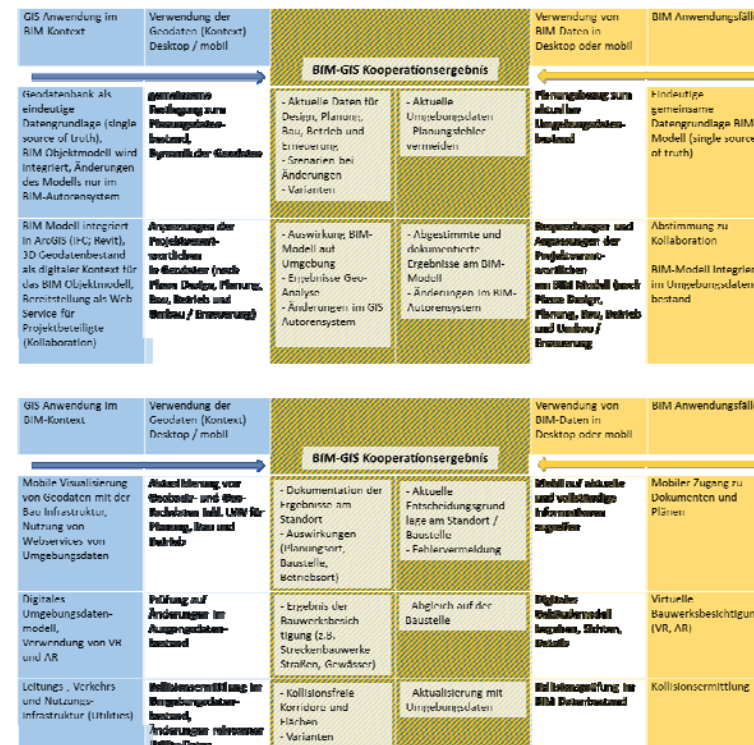
Phases with  
working steps / products / exchange of data and information



## 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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