



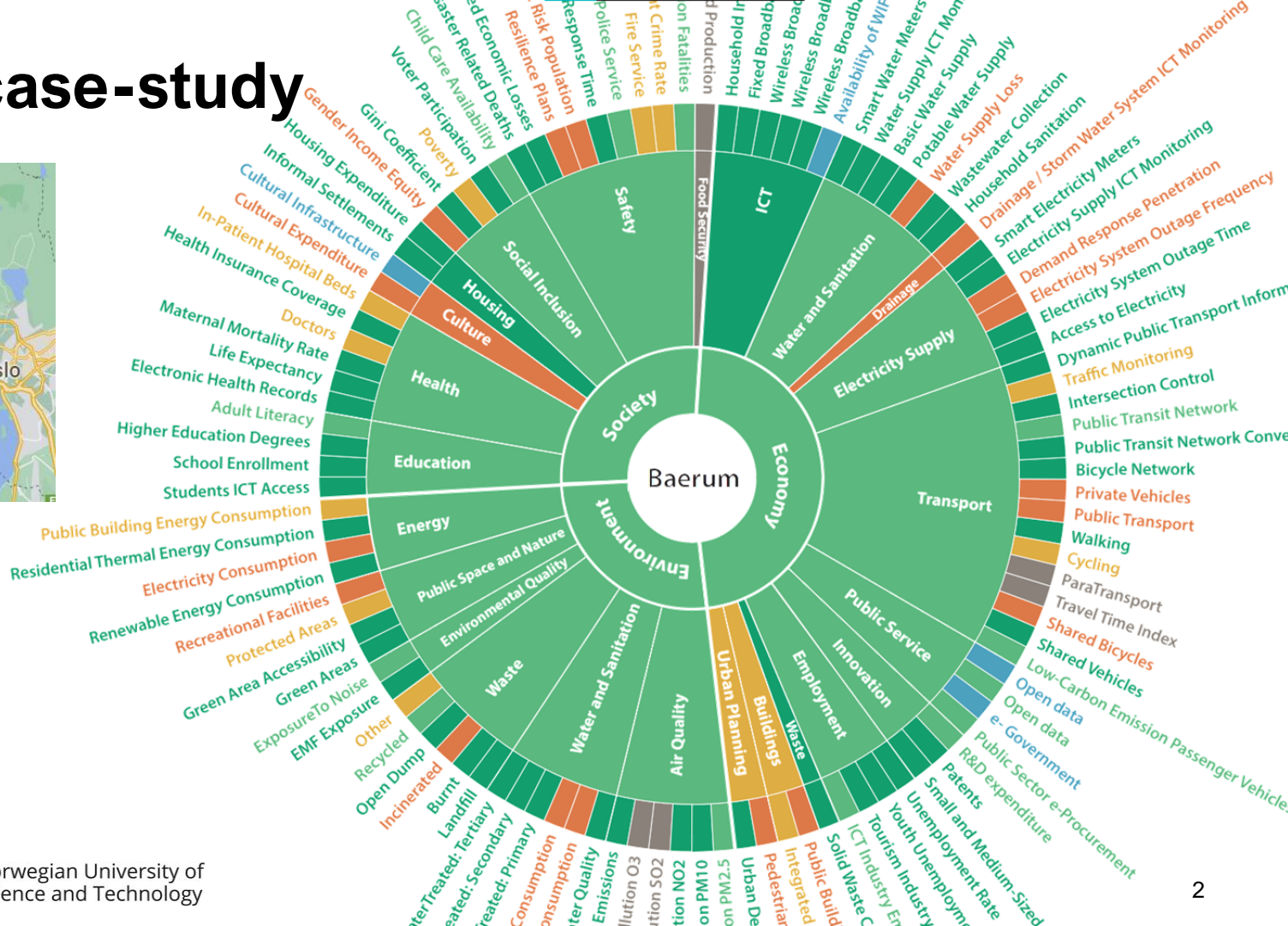
NTNU

Norwegian University of
Science and Technology

From bold sustainability objectives to BIM requirements

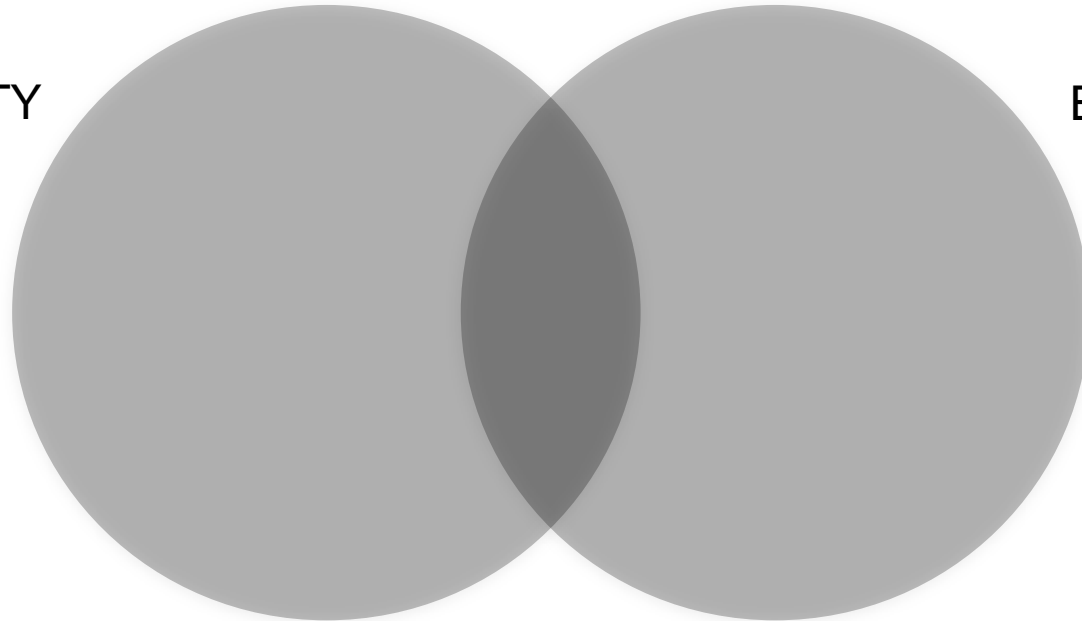
Artur Tomczak, 14.10.2021, Luxembourg

Baerum case-study



Mapping objectives with BIM

DEFINED
SUSTAINABILITY
OBJECTIVES



BIM MODEL

Mapping objectives with BIM - limitations

Global Warming Potential (GWP) comparison of structural materials

		A1-A3
		cradle-gate
Concrete	Ready-mix	238.2
	Prefabricates (HDS)	200.2
Steel	Steel profile	1.0
	Steel reinforcement	0.6
Timber	CLT	34.0
	Glulam	44.0

EPD comparison based on data from EPDnorge.no

Mapping objectives with BIM - limitations

Global Warming Potential (GWP) comparison of structural materials

		A1-A3	Unit	A1-A3/t
		cradle-gate	kgCO2eq	cradle-gate
Concrete	Ready-mix	238.2	/m3	108.3
	Prefabricates (HDS)	200.2	/t	200.2
Steel	Steel profile	1.0	/kg	1030
	Steel reinforcement	0.6	/kg	581
Timber	CLT	34.0	/m3	79
	Glulam	44.0	/m3	87

EPD comparison based on data from EPDnorge.no

Mapping objectives with BIM - limitations

Global Warming Potential (GWP) comparison of structural materials

		A1-A3	Unit	A1-A3/t	A4/t
		cradle-gate	kgCO2eq	cradle-gate	transport
Concrete	Ready-mix	238.2	/m3	108.3	0.2
	Prefabricates (HDS)	200.2	/t	200.2	17
Steel	Steel profile	1.0	/kg	1030	19.1
	Steel reinforcement	0.6	/kg	581	174
Timber	CLT	34.0	/m3	79	14
	Glulam	44.0	/m3	87	183

EPD comparison based on data from EPDnorge.no

Mapping objectives with BIM - limitations

Global Warming Potential (GWP) comparison of structural materials

		A1-A3	Unit	A1-A3/t	A4/t	utilisation	distance
		cradle-gate	kgCO2eq	cradle-gate	transport	%	km
Concrete	Ready-mix	238.2	/m3	108.3	0.2	53	3
	Prefabricates (HDS)	200.2	/t	200.2	17	70	200
Steel	Steel profile	1.0	/kg	1030	19.1	39	120
	Steel reinforcement	0.6	/kg	581	174	26	1270
Timber	CLT	34.0	/m3	79	14	75	269
	Glulam	44.0	/m3	87	183	53	2075

EPD comparison based on data from EPDnorge.no

Mapping objectives with BIM - limitations

Global Warming Potential (GWP) comparison of structural materials

		A1-A3	Unit	A1-A3/t	A4/t	utilisation	distance
		cradle-gate	kgCO2eq	cradle-gate	transport	%	km
Concrete	Ready-mix	238.2	/m3	108.3	0.2	53	3
	Prefabricates (HDS)	200.2	/t	200.2	17	70	200
Steel	Steel profile	1.0	/kg	1030	19.1	39	120
	Steel reinforcement	0.6	/kg	581	174	26	1270
Timber	CLT	34.0	/m3	79	14	75	269
	Glulam	44.0	/m3	87	183	53	2075

EPD comparison based on data from EPDnorge.no

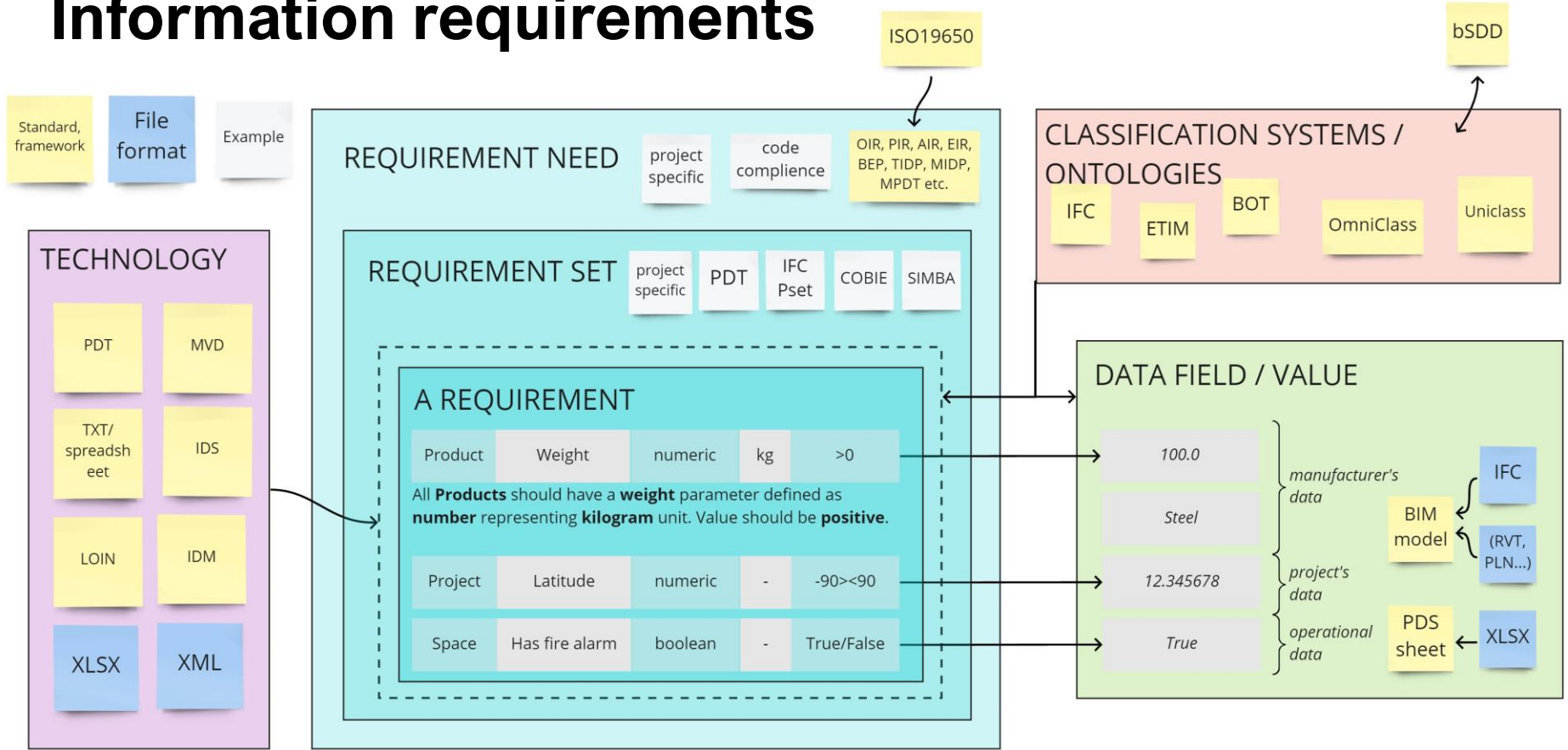


Data quality assurance

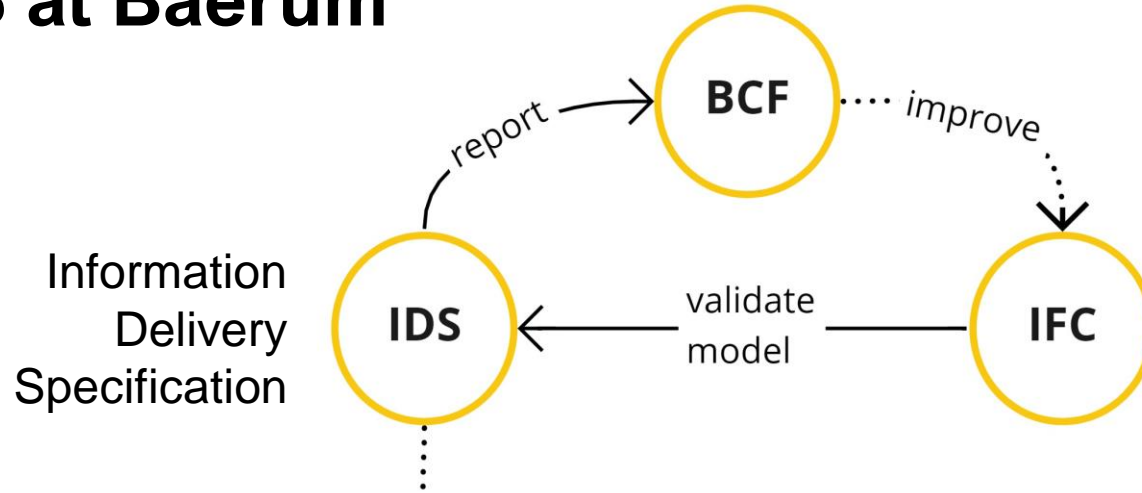


ISO19650

Information requirements



IDS at Baerum









github.com/IfcOpenShell



1. Environmental specification of concrete elements




All elements	of entity	IfcWall	IfcSlab	IfcColumn	+	🗑️	should have	a property	GWP	from set	EPD	of value		🗑️
	of material	Reinforced Concrete				🗑️		a property	Reference	from set	EPD	of value	https://epdr	🗑️
	+ ▾							a classification	Green Yellow Red	from system	Environmental			🗑️
								+ ▾						




IDS at Baerum



3. Asbestos and copper not permitted   




All elements of entity IfcBuiltElement   should have a material `^(?!asbest[copper].)*$` 




 



4. Materials need a reference to EPD   

All elements of entity IfcMaterial   should have a property EPD URL from set LCA of value `"^https://w` 

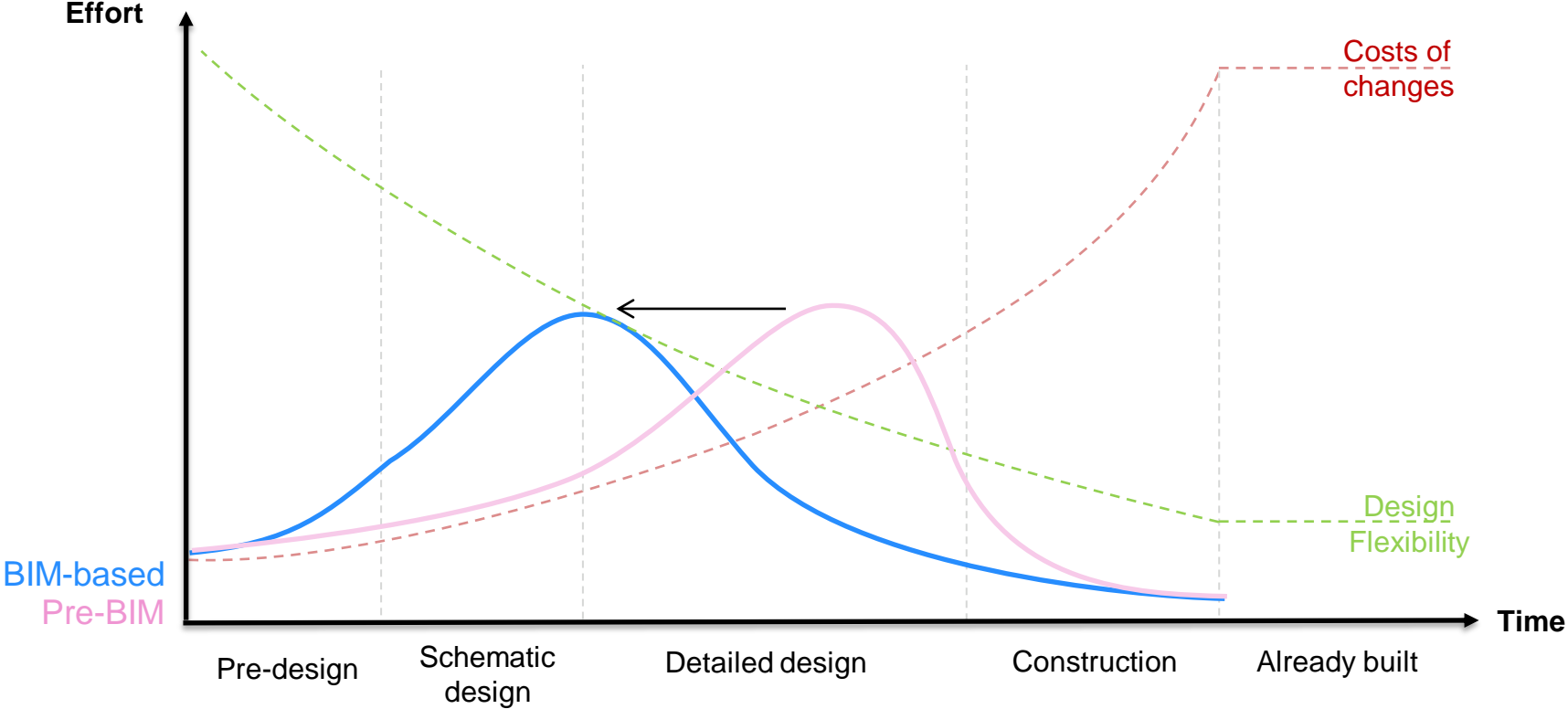
 

5. Blue-Green Factor (BGF)   

All elements of entity IfcSite   should have a property BGF from set LCA of value `>0; <1.00` 

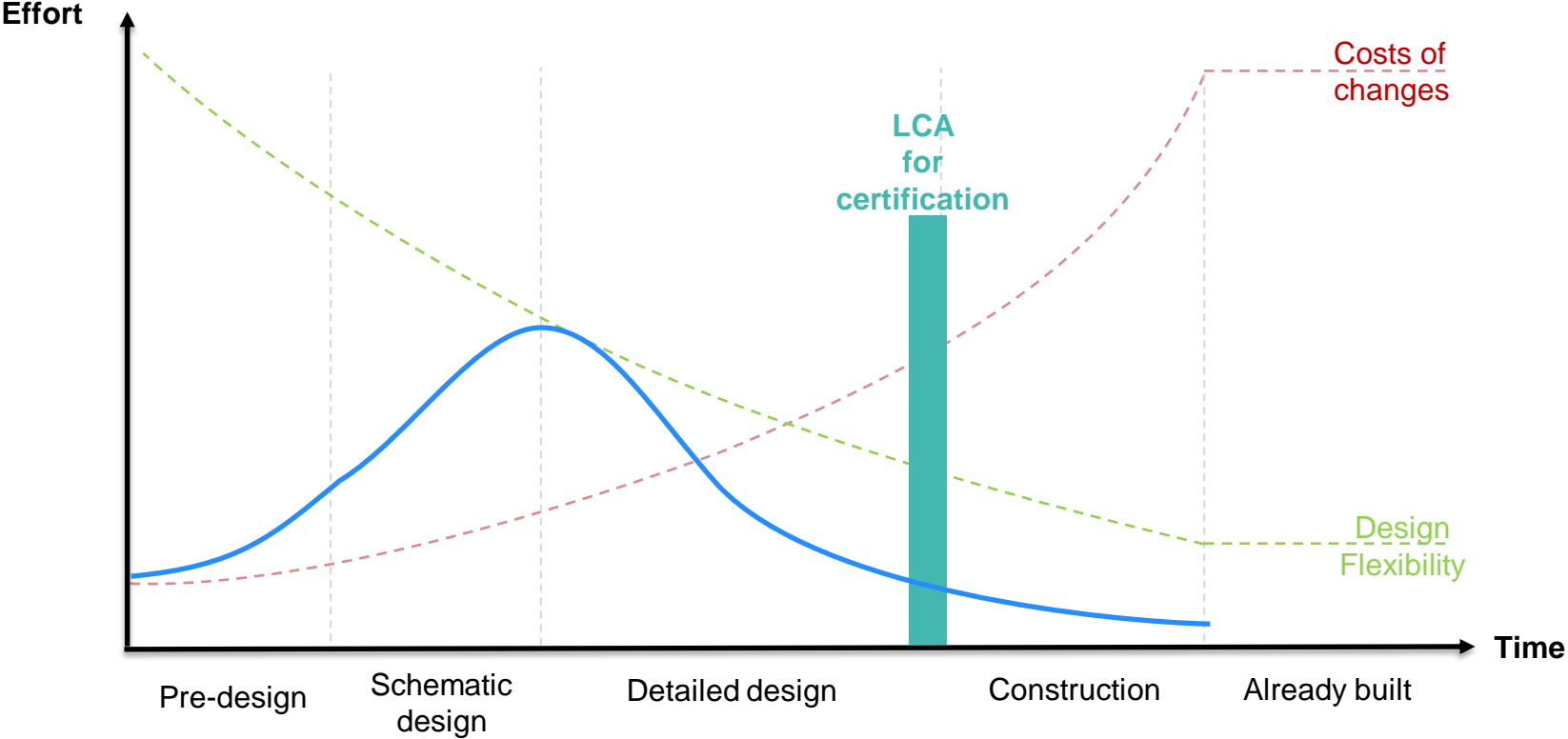
 

Shift of efforts



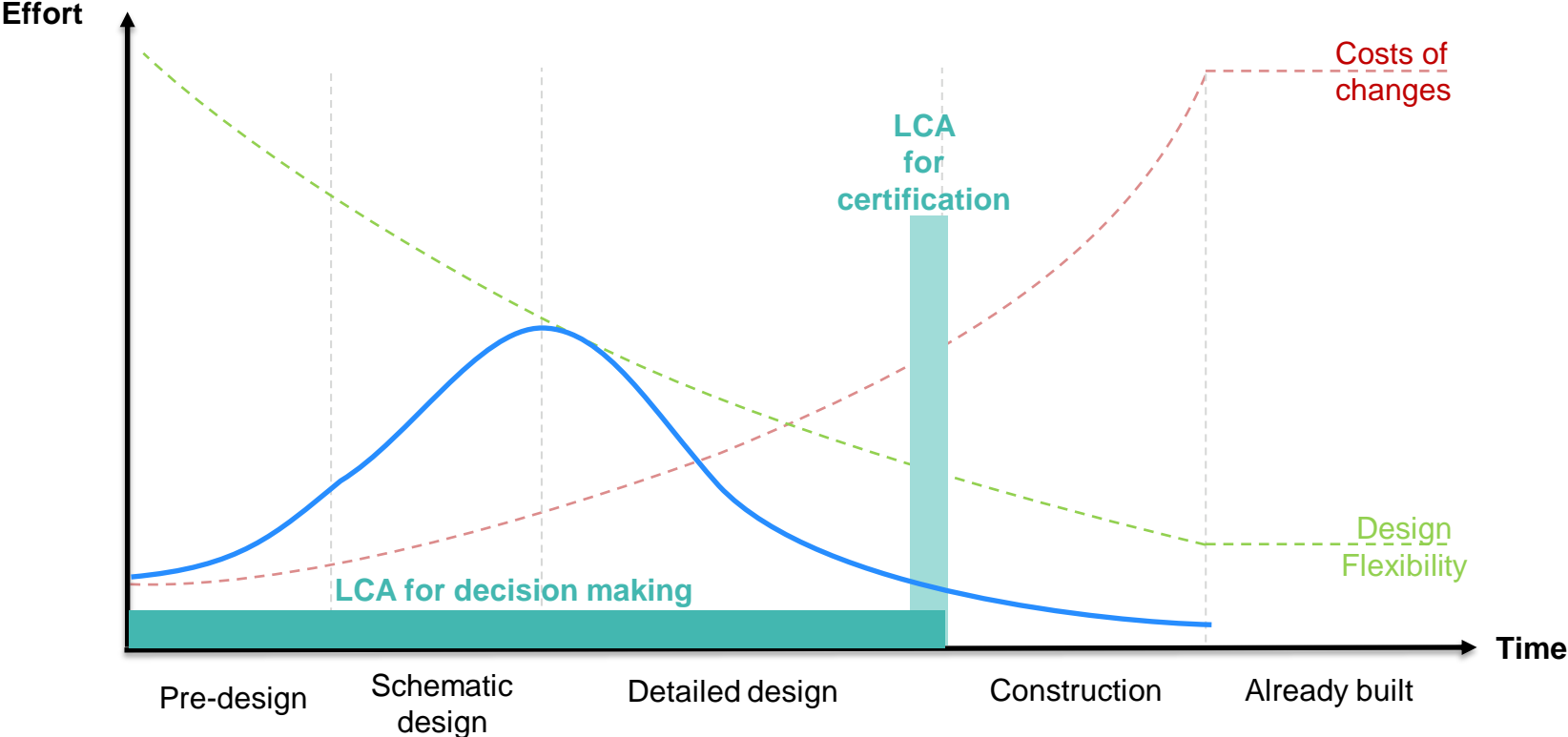
Based on Borrmann et al. 2018 after MacLeamy 2004

Shift of efforts



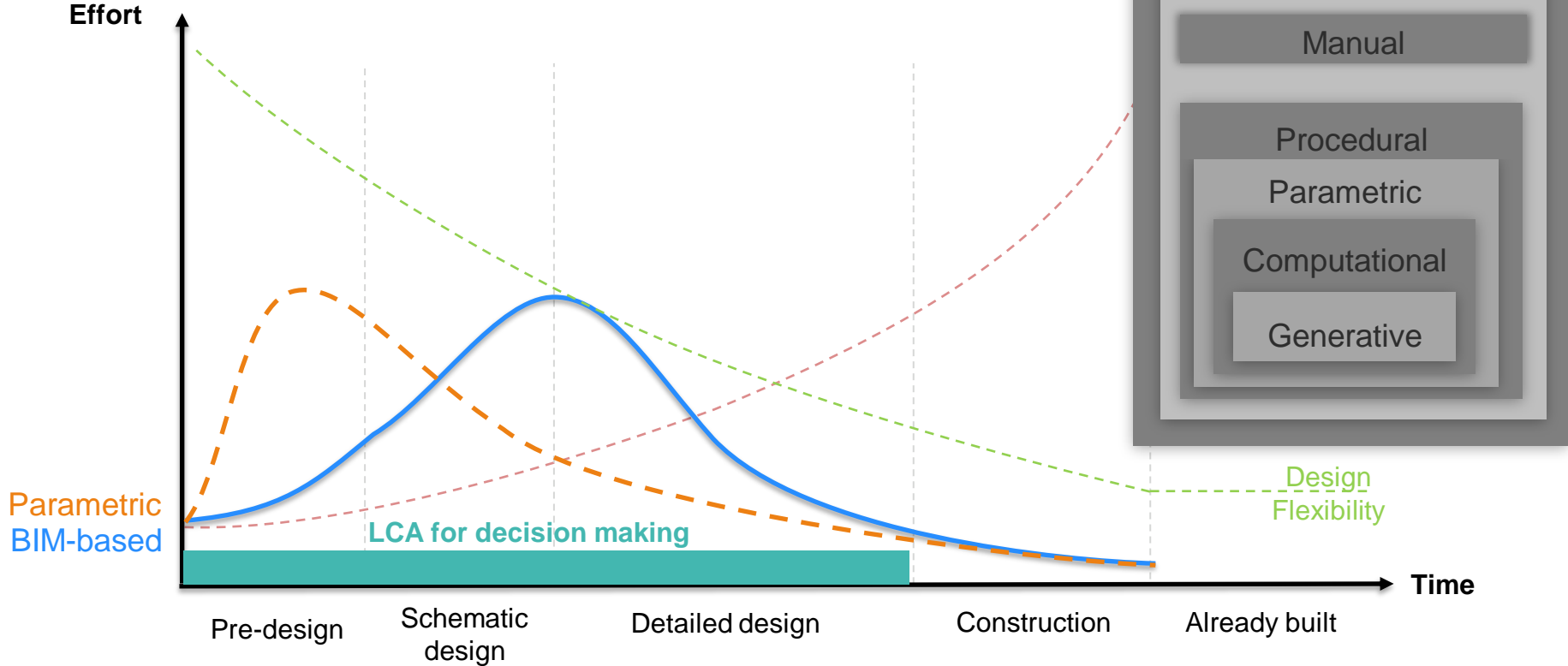
Based on Borrman et al. 2018 after MacLeamy 2004

Shift of efforts



Based on Borrman et al. 2018 after MacLeamy 2004

Shift of efforts



Conclusions

