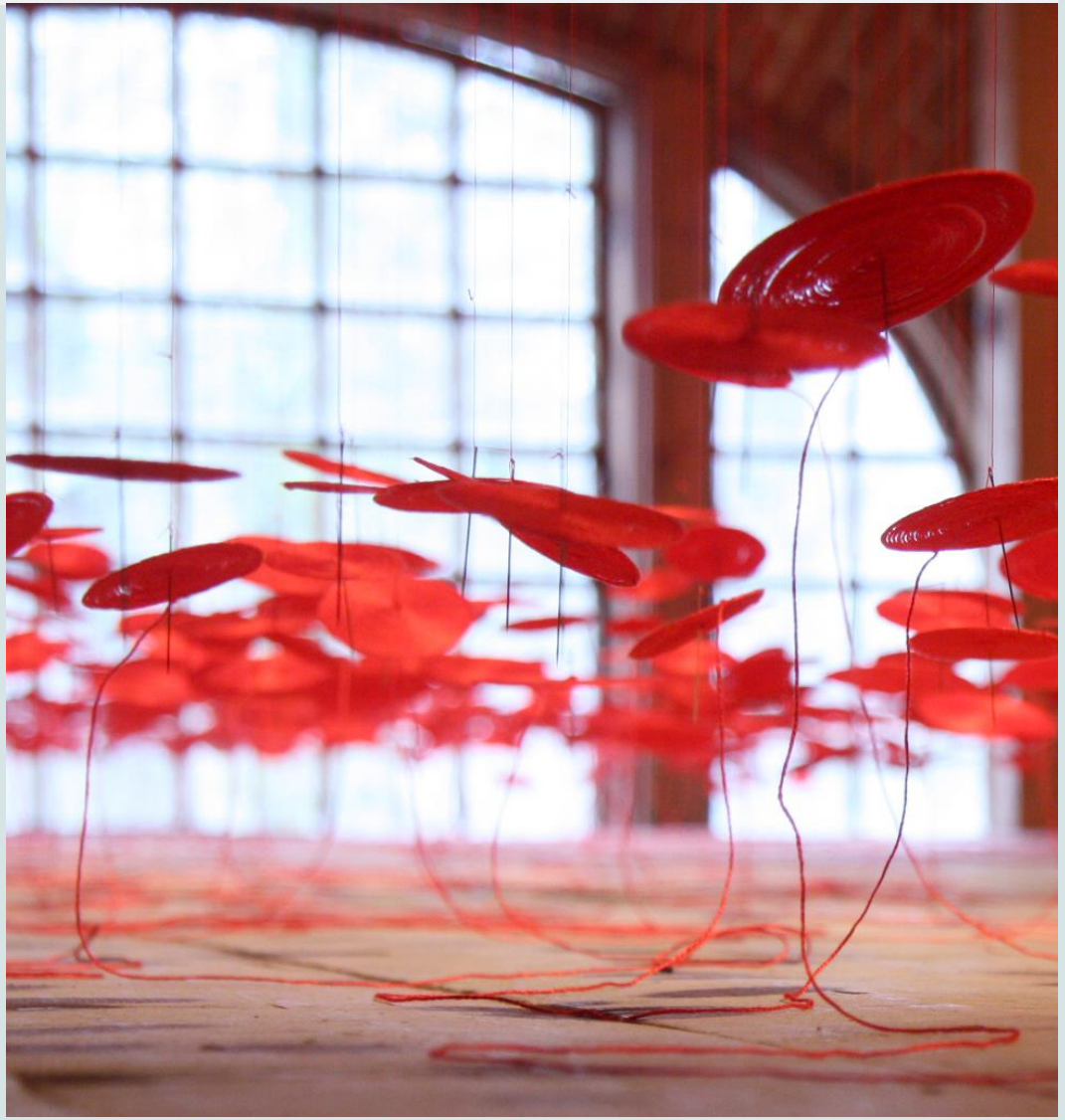
Den röda tråden mellan design och hållbarhet

Byggnadsinformationsmodellering (BIM), dataflöde och beräkningar, varför det är viktigt att ha en strategi



Beili Liu, ''Lure''

WHO IS AKSEL ALVAREZ?

- Born in Mérida, Venezuela (1981)
- Graduated as Architect Magna cum Laude in Universidad de Los Andes, Venezuela (2004)
- Professional Practice in Venezuela (2004-2010), Germany (2011-2016) & Sweden (2016 – present)
- Practiced in Academia, Government, Building Sector and Consultancy.
- Like Bicycles, Books, Music and Computers 😎

Roles at White Arkitekter:

- Handläggande Arkitekt (Executive Architect)
- BIM / Methodology Specialist
- Part of development team for Realtime Climate Capture (RTCC) App
- Member of the Informationsledning och BIM Network (Information Management and BIM) (2024 – present)
- Participant in the Reference Group CoClass for the Tillämpninganvisningar BIM – Smart Built Environment
- Office Methodology Leader, Uppsala Office (2020 – 2022)
- Part of the Germany Cluster (2017 – 2022)

I & BIM Network


Alison Petty
I&BIM Nätverk Ledare, Uppsala


John Nordmark
Uppsala


Lars Åstrand
Stockholm


Jerome Beresford
Stockholm


Aksel Alvarez Jurgueson
Malmö

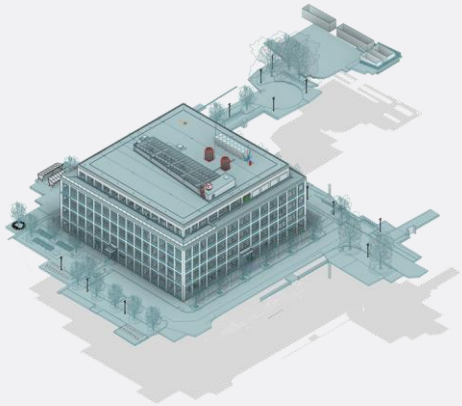

David Johansson
Halmstad


Mikael Welander
Göteborg


Karl Elvsnö
Göteborg

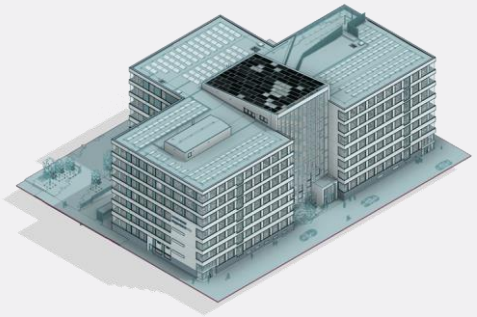

Daniel Hasselvind
Göteborg

If you want to know more, please follow the QR-Code or visit Informationsledning och BIM | White Arkitekter



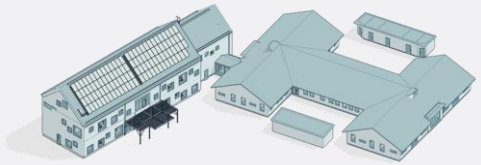
Celsius

Location: Uppsala, Sweden
Involvement: 2017-2020
GFA: ~ 12.000 m²
Use: Offices + Laboratories



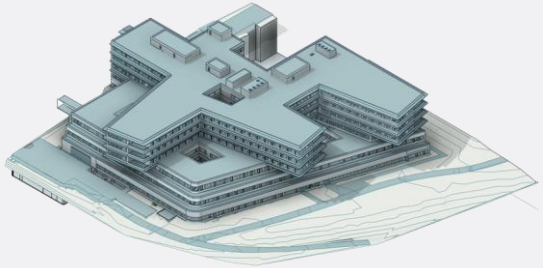
Hugin | Lumi

Location: Uppsala, Sweden
Involvement: 2020-2021
GFA: ~ 16.000 m²
Use: Offices + Laboratories



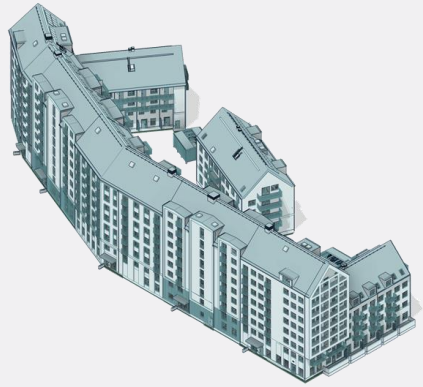
Klövervallensförskola

Location: Malmö, Sweden
Involvement: 2021-2022
GFA: ~ 2.000 m²
Use: Preschool



Neue Medizinisches Klinikum Tübingen

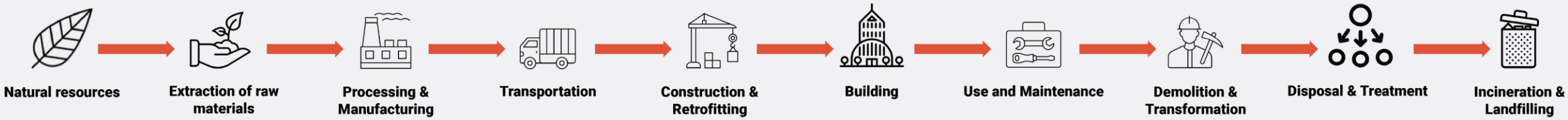
Location: Tübingen, Germany
Involvement: 2023-present
GFA: ~ 55.000 m²
Use: Hospital

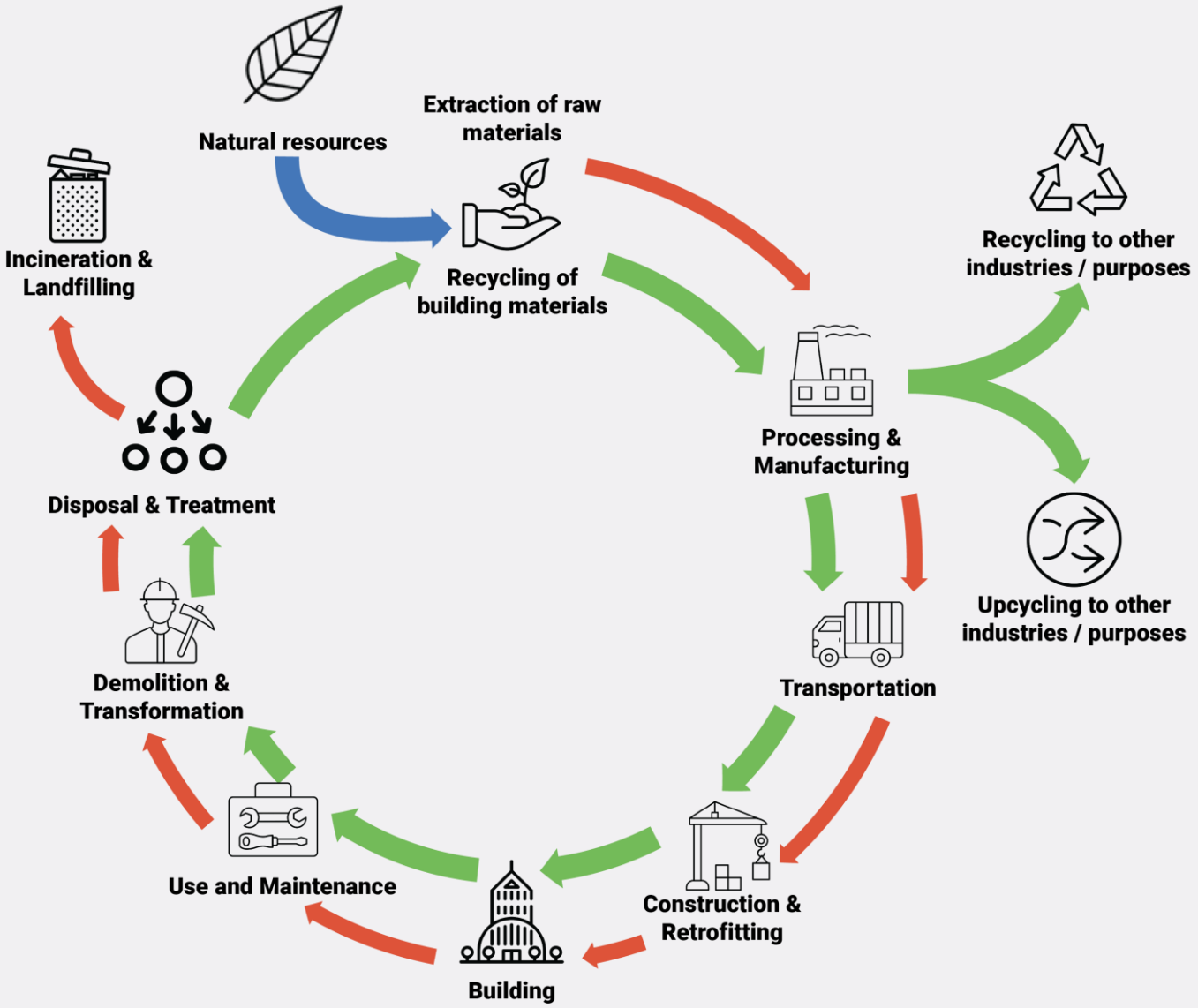


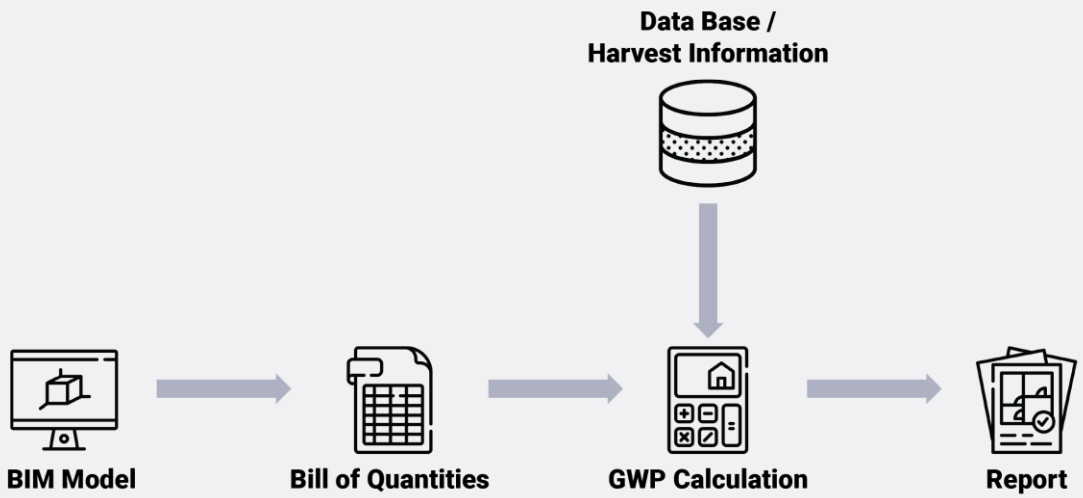
Ellstorp

Location: Malmö, Sweden
Involvement: 2024
GFA: ~ 19.000 m²
Use: Housing

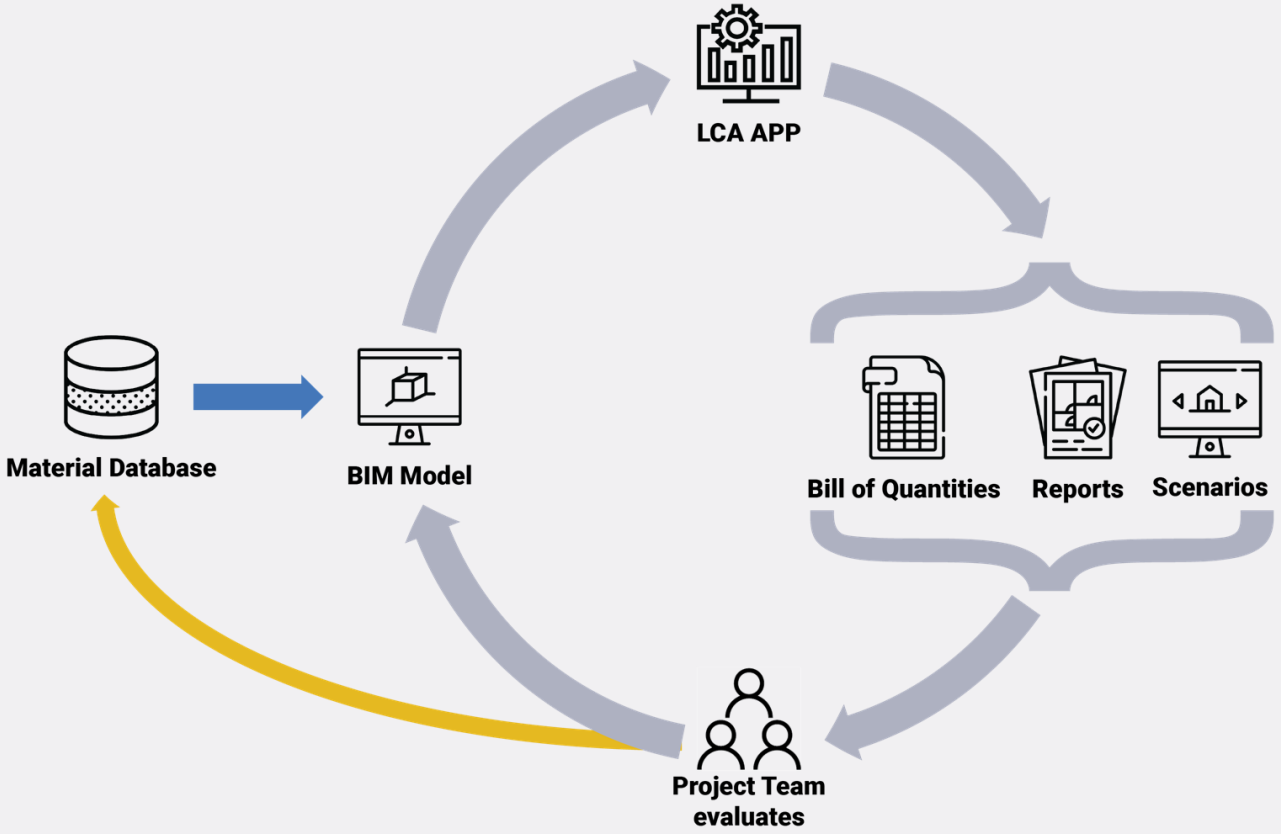
THE LINEAR BUILDING INDUSTRY




Natural resources
Extraction of raw materials
Recycling of building materials
Processing & Manufacturing
Recycling to other industries / purposes
Upcycling to other industries / purposes
Transportation
Construction & Retrofitting
Building
Use and Maintenance
Demolition & Transformation
Disposal & Treatment
Incineration & Landfilling



Linear Data Management



Circular Data Management

MODEL PROGRESSION: MODEL MATURITY (MM) OR LEVEL OF DEVELOPMENT (LOD)

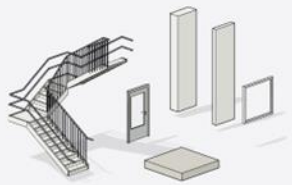
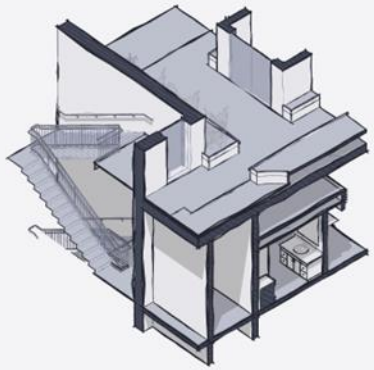
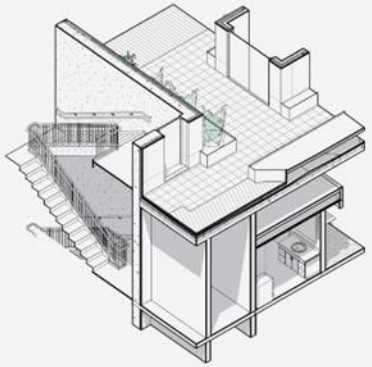
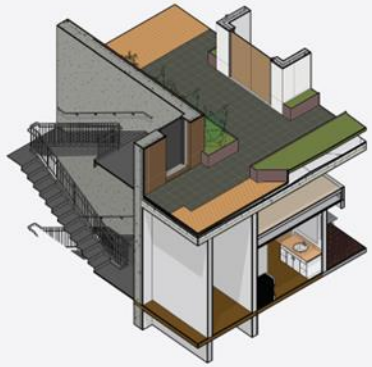
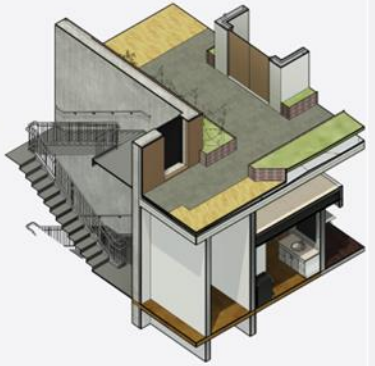
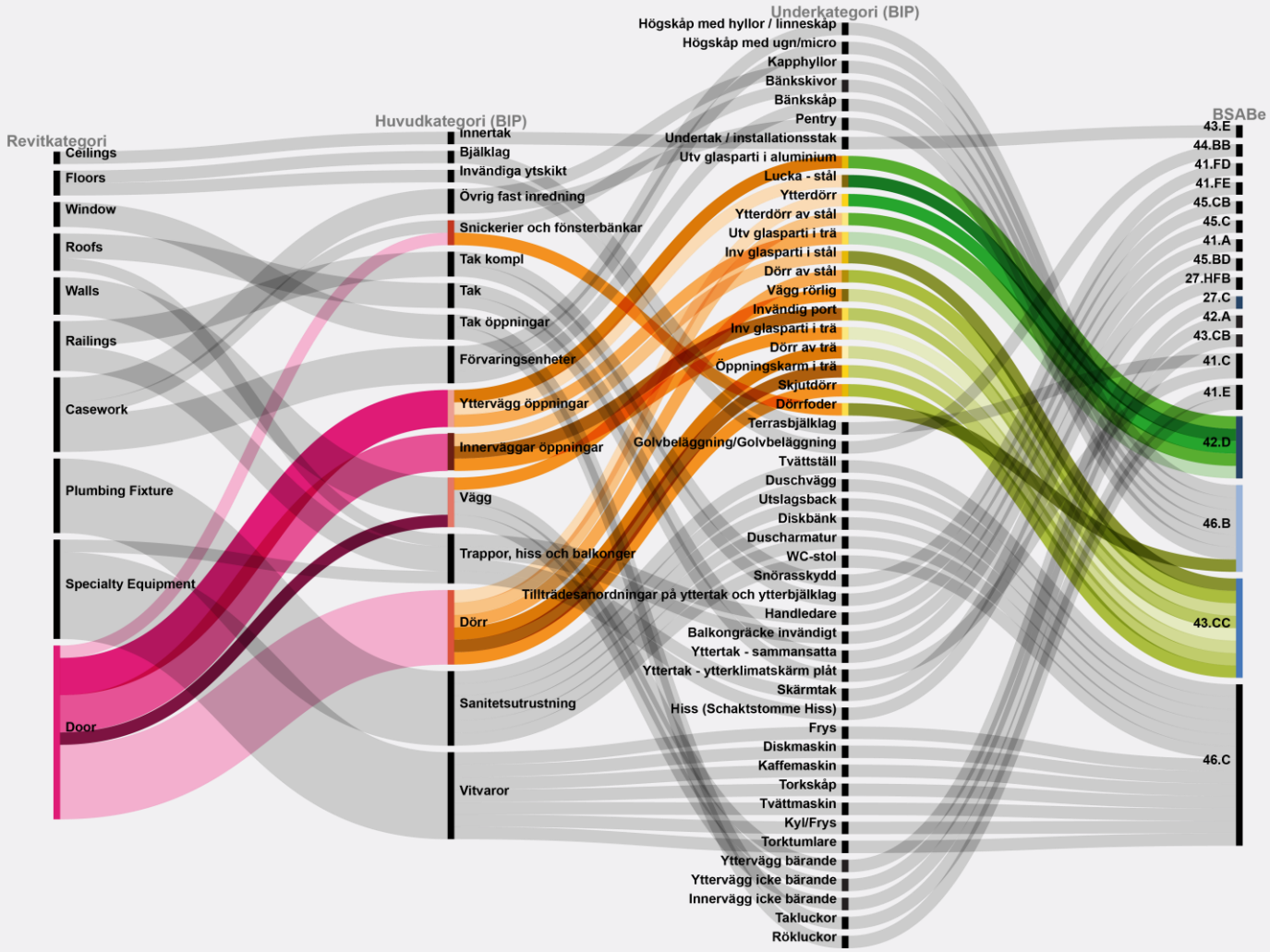
LOD Service Phase	Pre-LOD Concept	LOD 100 Detailed Design	LOD 200 Production Design	LOD 300 Procure	LOD 400 Construction	LOD 500 Occupancy
LOG						
LOI	**Component Group**	**Component**	**Sub-Component**	**Material (As-Planned)**	**Material (As-Built)**	**Material (RSL)** **Reference Service Life**
LOIN	Building Elements or components are identified and organised into groups	The model is built using Building Elements and they are mapped with the Component Groups.	Sub-Components that are part of the Building Elements are identified and accesible in the model.	The Building Elements' Sub-Components are mapped with Materials and Product Placeholders	Materials and Product Placeholders are mapped with actual Materials and Products used in the Construction	Building Elements, Sub-Components, Material and Products are mapped with technical Data, Information and Metadata required for the Occupation Phase.

Illustration based on Anita Naneva's figure 2 in the conference paper "greenBIM, a BIM-based LCA integration using a circular approach based on the example of the Swiss sustainability standard Minergie-ECO". Rework: Aksel Alvarez, 2024

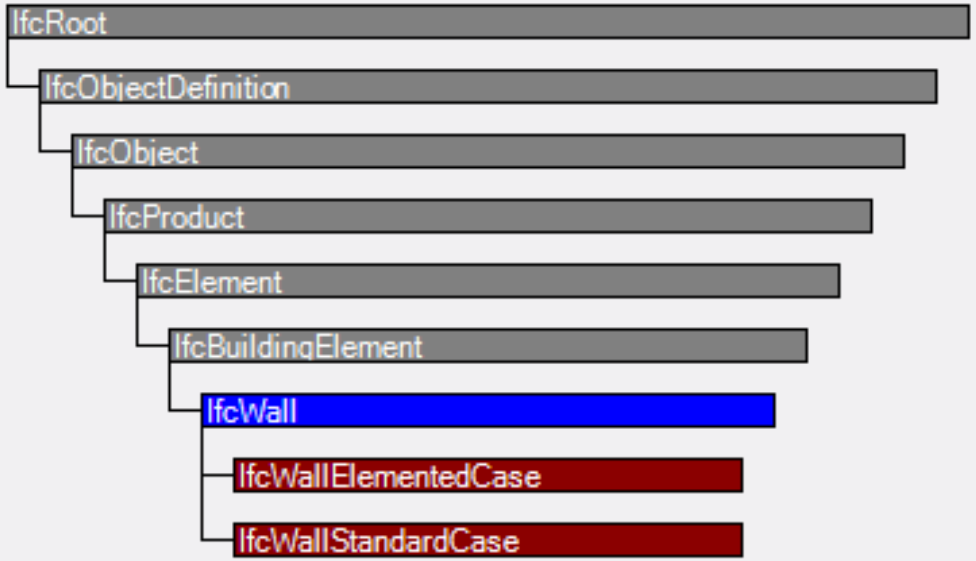
GWP AND DATA MANAGEMENT THROUGH SERVICE PHASES

	Feasibility	Concept	Detailed Design	Production Design	Procure	Construction	Close-out	Occupancy
GWP Management	**Sustainability Analisys** Define Sustainability Goals SWOT	**Climate Budget Step 1** Create a budget based on the project design	**Climate Budget Step 2** Specific Sustainability Concept	**Climate Budget Step 3** Specify sustainability requirements for systems and products	**Climate Budget Management** Evaluate best options and identify alternatives to optimize construction and financial processes		**Climate Declaration** Register and Control "As-Built" Data of Products and Systems	**Sustainable FM** Use, updating and replacement of Products and Systems
Data Management	**Project Information Requirement (PIR)** Define data Management Strategy	**Exchange Information Requirement (EIR)** Define & identify Attributes and Pipelines	**Data Warehouse + Model Progression & Maturity** Creation and maintenance of a Data Warehouse. Data complexity and maturity will be developed during the project phases to match required Levels of Information and Detail.				**Asset Information Requirement (AIR)** Cleaning, updating and improving of the Dataset prior to deliver to Owner	**Dataset Integration & Use** Dataset is integrated to Owner's premises/services
Sweden	Programskiss / Byggnadsprogram	Förslagshandling / Kalkylunderlag	**Systemhandling**	**Bygghandling** *(In Sweden the Procurement takes place before the Production Design, this may be influenced by the model of execution chosen)*	**Förfrågningshandling**	**Uppföljning**	**Relationshandling**	
Germany	**First Consultation** (LPH 1)	**Preliminary Design** (LPH 2)	**Systems Design** (LPH 3) / **Building Warrant** (LPH 4)	**Construction Documents** (LPH 5)	**Bid Preparation** (LPH 6) / **Tender** (LPH 7)	**Site Inspection** (LPH 8)	**As-Built Documentation** (LPH 9)	
UK	**Strategic Definition** (0)	**Preparation and Brief** (1) / **Concept Design** (2)	**Developed Design** (3)	**Technical Design** (4)	**Construction** (5)		**Handover & Closeout** (6)	**In Use** (7)
USA	**Predesign** (PD)	**Schematic Design** (SD)	**Design Development** (DD)	**Construction Documents** (CD)	**Bid** (PR)	**Construction Administration** (CA)	**Comission** (CO)	
Japan	**Kikaku** (Planning)	**Kihon Sekkei** (Schematic Design)		**Jissei Sekkei** (Detail Design)	(Reconcile)	**Gemba** (Construction)		

Illustration based on Phil Berstein's illustration "Phases of service". Rework: Aksel Alvarez, 2024

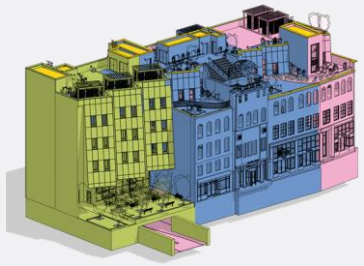


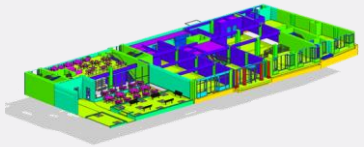
Example of how a Revit Category can be classified into several levels using BIP and ending in BSABe. Source: Lars Årstrand with rework by Aksel Alvarez 2024

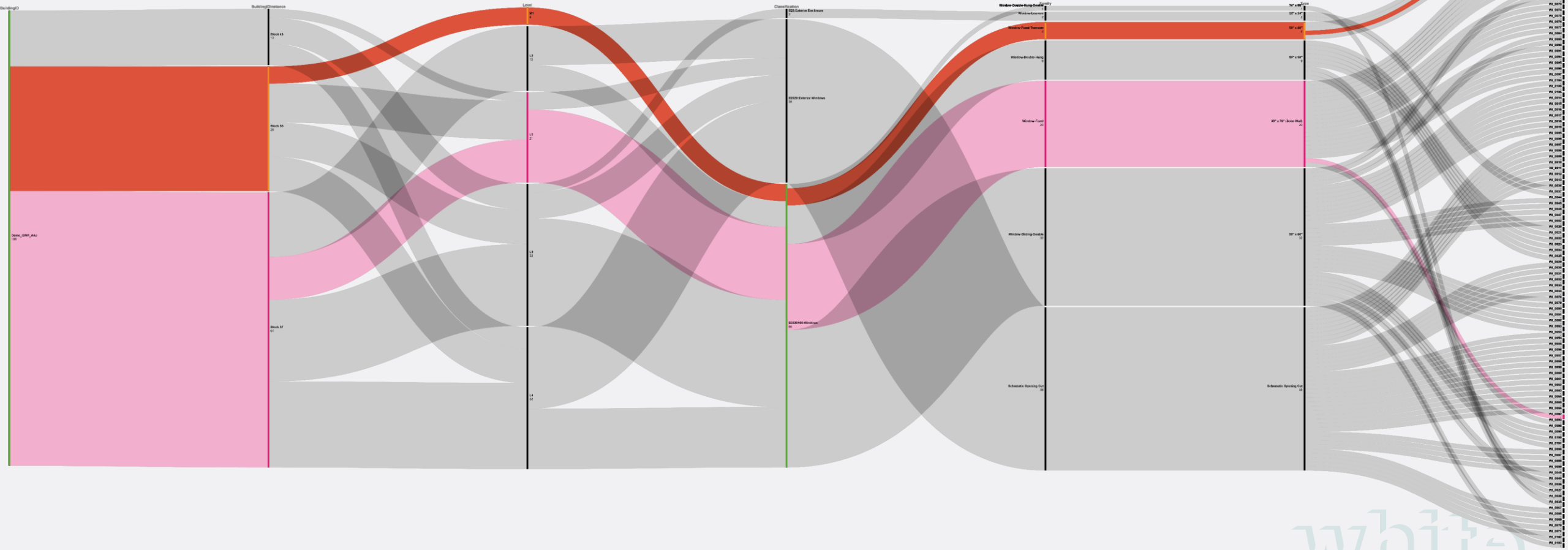


Attribute Inheritance of an IfcWall instance. Source: Wiki Osarch

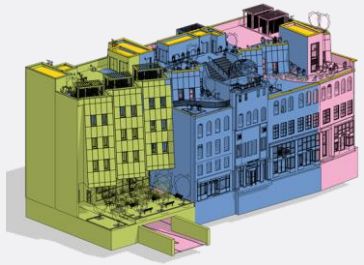
DECOMPOSING A BUILDING IN ITS COMPONENTS

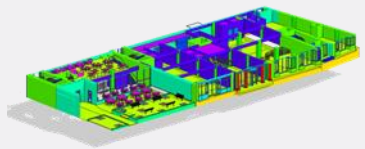


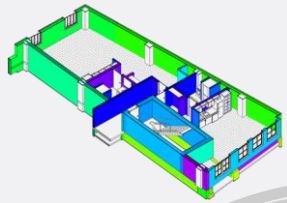


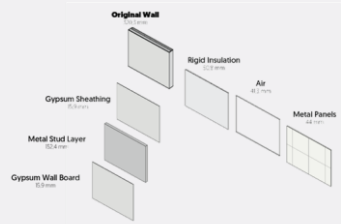


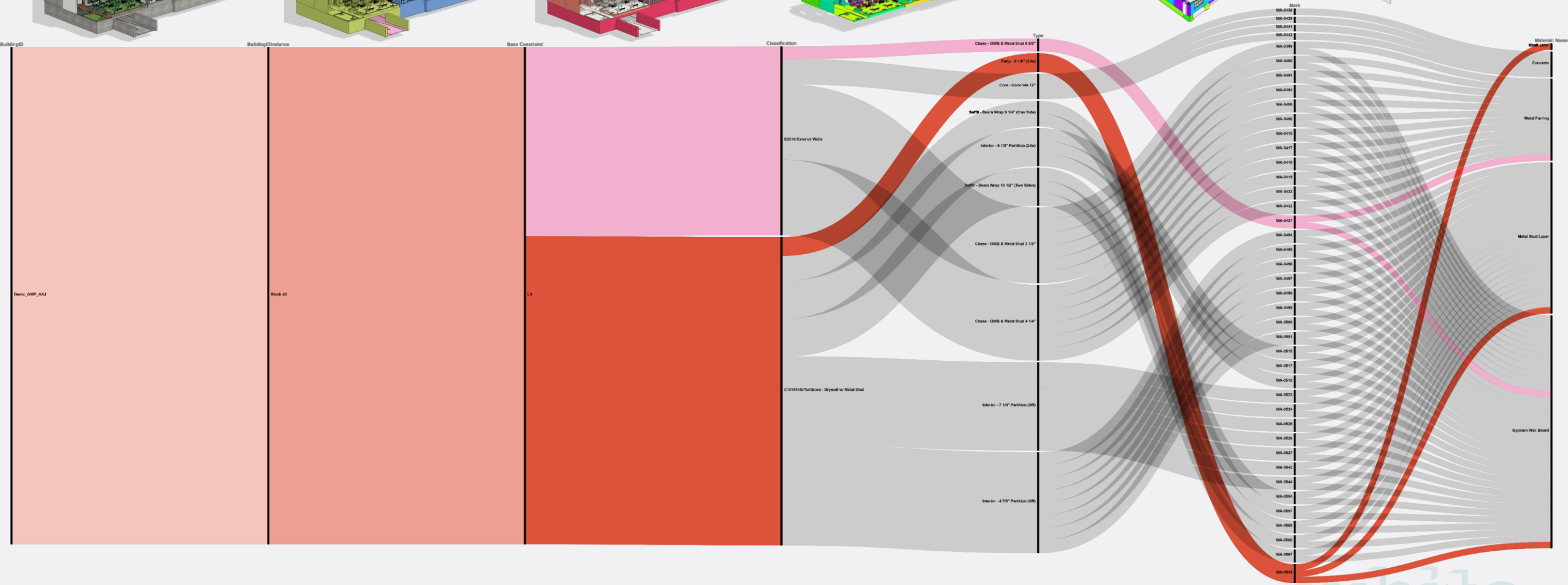
THERE ARE ALSO COMPOUND OBJECTS



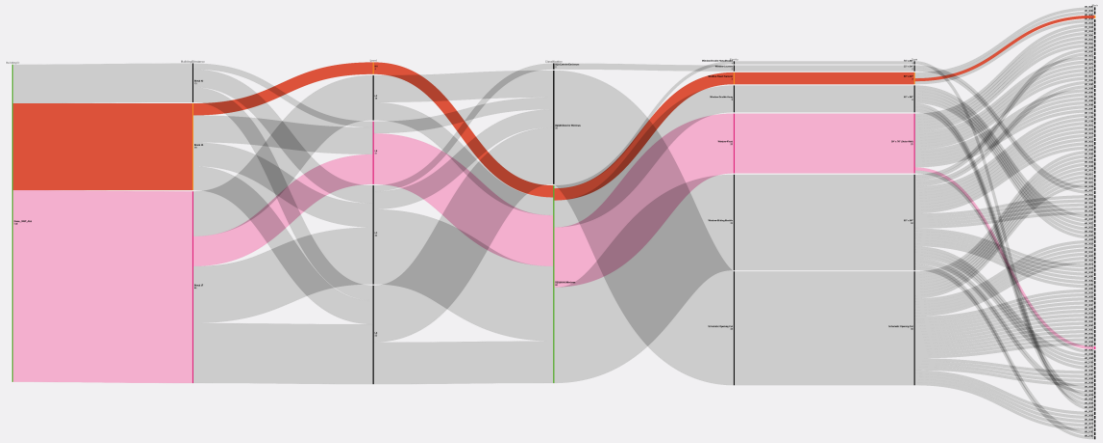




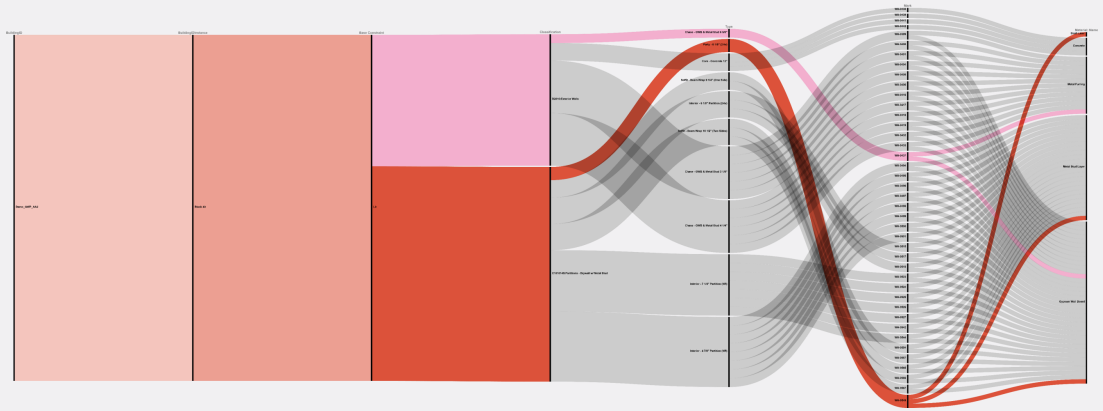




FROM MODEL DATA TO REPORT DATA



Building	Block	Level	Classification	Family	Type	Type Mark	Mark	Rough Height (mm)	Rough Width (mm)
Demo_GWP_AAJ	Block 35	M1	B2020100:Windows	Window-Fixed-Transom	50" x 80"	WFT_01	WI_0001	2045	1283
Demo_GWP_AAJ	Block 35	M1	B2020100:Windows	Window-Fixed-Transom	50" x 80"	WFT_01	WI_0002	2045	1283
Demo_GWP_AAJ	Block 35	M1	B2020100:Windows	Window-Fixed-Transom	50" x 80"	WFT_01	WI_0003	2045	1283
Demo_GWP_AAJ	Block 35	M1	B2020100:Windows	Window-Fixed-Transom	50" x 80"	WFT_01	WI_0004	2045	1283
Demo_GWP_AAJ	Block 35	L3	B2020100:Windows	Window-Fixed	39" x 76" (Solar Wall)	WF_01	WI_0038	1943	1003
Demo_GWP_AAJ	Block 35	L3	B2020100:Windows	Window-Fixed	39" x 76" (Solar Wall)	WF_01	WI_0039	1943	1003
Demo_GWP_AAJ	Block 35	L3	B2020100:Windows	Window-Fixed	39" x 76" (Solar Wall)	WF_01	WI_0040	1943	1003
Demo_GWP_AAJ	Block 35	L3	B2020100:Windows	Window-Fixed	39" x 76" (Solar Wall)	WF_01	WI_0041	1943	1003
Demo_GWP_AAJ	Block 35	L3	B2020100:Windows	Window-Fixed	39" x 76" (Solar Wall)	WF_01	WI_0042	1943	1003
Demo_GWP_AAJ	Block 35	L3	B2020100:Windows	Window-Fixed	39" x 76" (Solar Wall)	WF_01	WI_0043	1943	1003
Demo_GWP_AAJ	Block 35	L3	B2020100:Windows	Window-Sliding-Double	50" x 60"	WSD_01	WI_0050	1537	1283
Demo_GWP_AAJ	Block 35	L3	B2020100:Windows	Window-Sliding-Double	50" x 60"	WSD_01	WI_0051	1537	1283



Building	Block	Level	Classification	Type	Instance	Material: Name	Material: Area (m²)	Material: Volume (m³)
Demo_GWP_AAJ	Block 43	L3	B2010:Exterior Walls	Chase - GWB & Metal Stud 3 1/8"	WA-0399	Metal Furring	29	1.82
Demo_GWP_AAJ	Block 43	L3	B2010:Exterior Walls	Chase - GWB & Metal Stud 3 1/8"	WA-0399	Gypsum Wall Board	29	0.45
Demo_GWP_AAJ	Block 43	L3	B2010:Exterior Walls	Chase - GWB & Metal Stud 3 1/8"	WA-0400	Metal Furring	10	0.66
Demo_GWP_AAJ	Block 43	L3	B2010:Exterior Walls	Chase - GWB & Metal Stud 3 1/8"	WA-0400	Gypsum Wall Board	10	0.17
Demo_GWP_AAJ	Block 43	L3	B2010:Exterior Walls	Chase - GWB & Metal Stud 3 1/8"	WA-0401	Metal Furring	12	0.79
Demo_GWP_AAJ	Block 43	L3	B2010:Exterior Walls	Chase - GWB & Metal Stud 3 1/8"	WA-0401	Gypsum Wall Board	12	0.20

WHAT CAN WE DO WITH THIS DATA?

Environmental KPIs

- Energy Use Intensity (kWh/m²/Year)
- Water Use Intensity (m³/m²/Year)
- Greenhouse Gas Emissions Intensity ($kgCO_2e/m^2$)
- Use of Renewable Energy Sources (%)
- Recyclability Index (% of elements that can be upcycled and/or recycled)
- Added Value to Ecosystem Services (Rainfall Management, ecological diversity, microclimate impact, etc.)

Economic KPIs

- Life Cicle Cost (LCC)
- Payback Period
- Net Present Value (NPV)
- Operational and Maintenance Cost

Social KPIs

- Indoor Environmental Quality (Air, quality, thermal comfort, lighting, acoustics)
- Construction Site safety
- Accessibility for Disabled Persons

Benchmarking Methods and Systems

- If we can measure different dimensions of an Asset, then we can build systems to measure the portfolio performance.

Transparency and clear rules, which enable competition and access to financial means

- Check out the Adversarial Cooperation concept

ROUND-UP: TAKEAWAYS FROM THE PRESENTATION

- Data is a resource, therefore needs to be managed.
- BIM is a method, not a specific tool.
- The implementation of BIM requires the use of a clear data structure and management strategy.
- The goal of BIM is to structure and deliver the data in a way it can be leveraged and used in other processes.

- If we have structured data, we can measure.
- If we can measure, we can evaluate.
- If we can evaluate, we can benchmark.
- If we can benchmark, we can cooperate and compete at the same time.
- If we can create these conditions, we will enable the start of a circular economy that works.

THANKS FOR YOUR ATTENTION

Be curious and don’t forget that technology is a tool we control, use it humanly