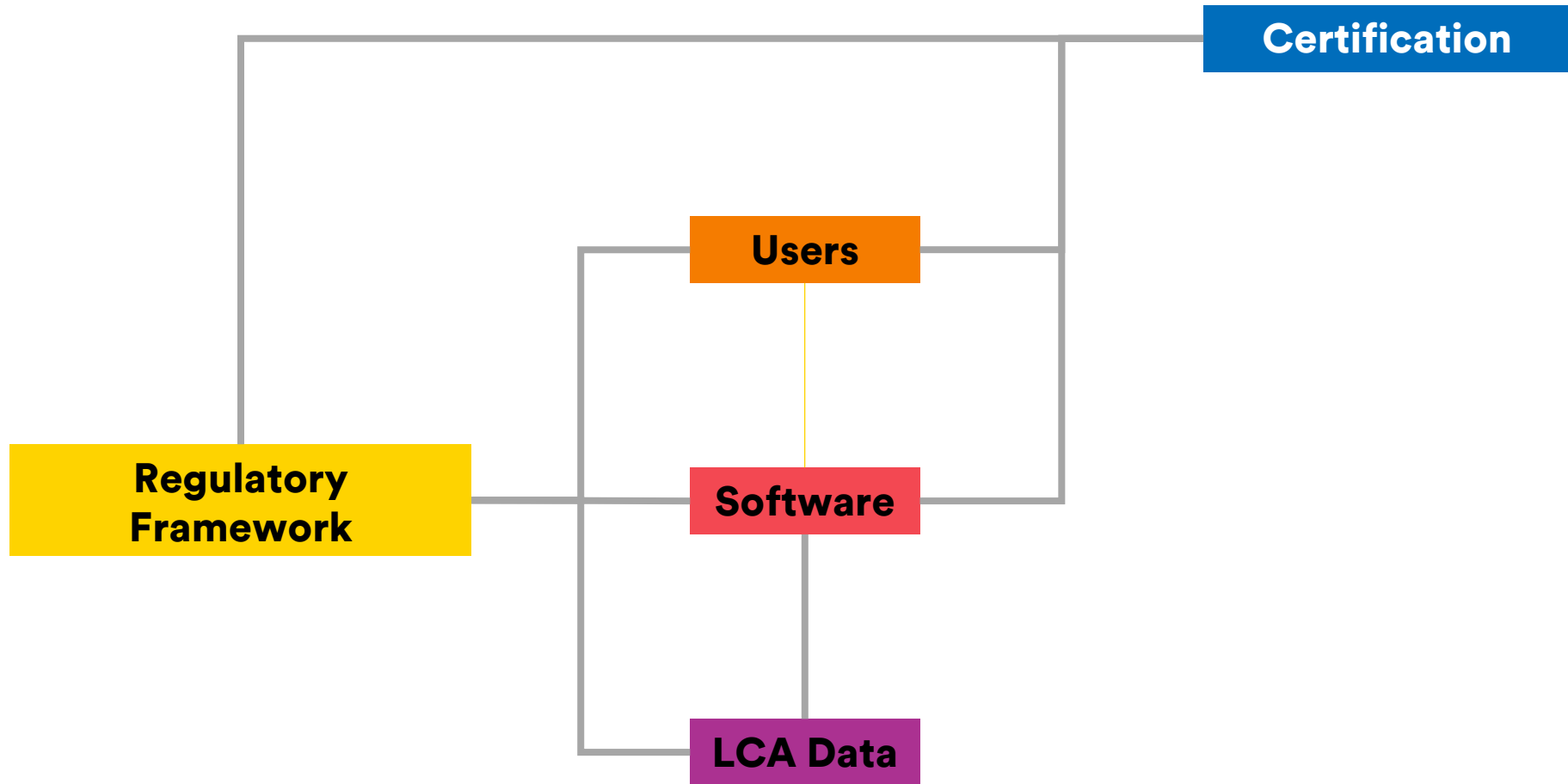


# Quality Control in LCA

Implementation in the swiss building  
labels Minergie-Eco and SNBS Hochbau

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# Topology



# Regulatory Framework

## SIA Leaflet 2032:2020

- Defines the system boundaries
- Defines the reference values
- Defines the cutoff rules
- Defines the amortization period
- Defines the indicators
- Defines the data base (KBOB)

## Rules for the LCA of building materials and products in Switzerland

- Defines the rules for calculating new datasets for KBOB LCA Data

## Produktreglement Minergie-Eco 2020

- Defines the threshold values for certifications

## Anwendungshilfe Graue Energie und Treibhausgasemissionen

- Gives advice for the users



# LCA Data

## KBOB Ökobilanzdaten im Baubereich

- Dataset of widely used building materials, building systems and building components in Switzerland
- Generic and product specific datasets, derived from ecoinvent database v2.2
- Indicators for primary energy (total, non-renewable), GHG Emissions and UBP (pollution points)
- Issued by platform LCA data in the building sector, with representatives from public sector, industry, service sector etc.
- Quality control is ensured through members of platform
- For the calculation of product specific datasets, the rules are defined and publicly available

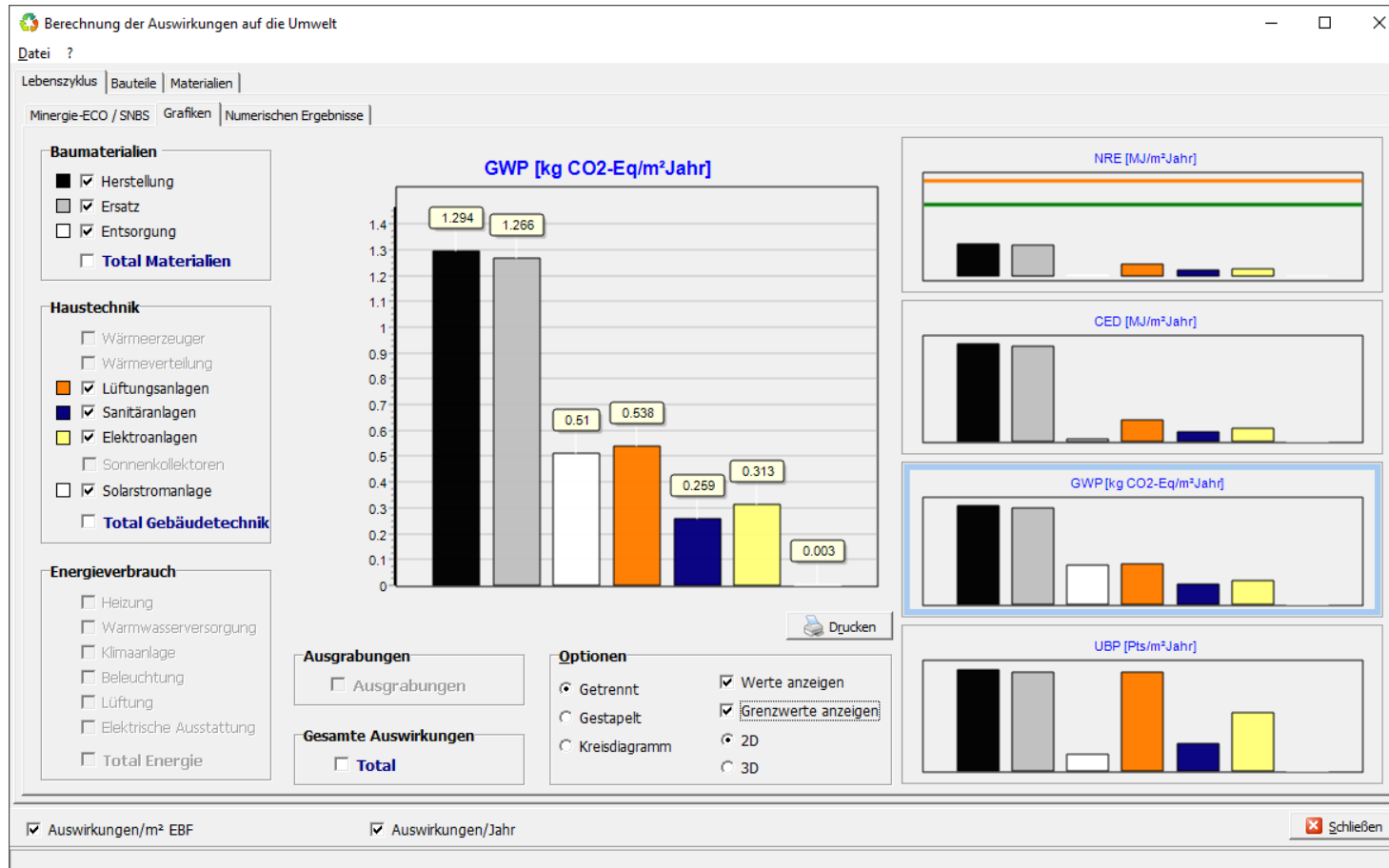
# KBOB LCA Data

Ökobilanzdaten im Baubereich														KBOB / eco-bau / IPB 2009/1:2016					
ID-Nummer No d'identification	<b>BAUMATERIALIEN</b> <i>[Bibliographie treeze, version 2.2:2016]</i>  <b>Hinweis:</b> Anzeigen der herstellerspezifischen und herstellerregionenspezifischen Daten durch Anklicken der '+' am linken Rand.	Rohdichte/ Flächen- masse  Masse volumique/ surface	Bezug Référence	UBP'13			Primärenergie Energie primaire						Treibhaus- gasemissionen Emissions de gaz à effet de serre						
				UBP			erneuerbar renouvelable			nicht erneuerbar (Graue Energie) non renouvelable (énergie grise)									
				Total	Herstellung	Entsorgung	Total	Herstellung	Entsorgung	Total	Herstellung	Entsorgung	Total	Herstellung	Entsorgung				
				Total	Fabrication	Elimination	Total	Fabrication	Elimination	Total	Fabrication	Elimination	Total	Fabrication	Elimination				
				UBP	UBP	UBP	kWh oil-eq	kWh oil-eq	kWh oil-eq	kWh oil-eq	kWh oil-eq	kWh oil-eq	kg CO <sub>2</sub> -eq	kg CO <sub>2</sub> -eq	kg CO <sub>2</sub> -eq				
<b>00</b>	<b>Vorbereitungsarbeiten</b>	-																	
00.001	Baugrubensicherung, Bohrpfahlwand, gespriesst	-	m <sup>2</sup>	1'010'000	877'000	130'000	110	101	9.57	2'280	2'020	258	828	778	50.2				
00.002	Baugrubensicherung, Bohrpfahlwand, unverankert	-	m <sup>2</sup>	952'000	822'000	130'000	94.3	84.8	9.57	2'090	1'830	258	788	738	50.2				
00.003	Baugrubensicherung, Bohrpfahlwand, verankert	-	m <sup>2</sup>	778'000	692'000	86'200	82.8	76.4	6.32	1'510	1'340	170	512	478	33.1				
00.004	Baugrubensicherung, Nagelwand	-	m <sup>2</sup>	171'000	152'000	18'900	17.9	16.6	1.39	324	286	37.5	116	109	7.28				
00.005	Baugrubensicherung, Rühlwand, auskragend	-	m <sup>2</sup>	332'000	302'000	30'100	108	106	2.20	934	874	59.5	266	254	11.6				
00.006	Baugrubensicherung, Rühlwand, gespriesst	-	m <sup>2</sup>	240'000	222'000	17'800	46.7	45.4	1.31	677	642	35.2	184	177	6.84				
00.007	Baugrubensicherung, Rühlwand, verankert	-	m <sup>2</sup>	259'000	238'000	20'600	43.9	42.4	1.51	681	640	40.7	192	184	7.90				
00.008	Baugrubensicherung, Schlitzwand, 400 mm	-	m <sup>2</sup>	648'000	583'000	65'500	73.3	68.6	4.76	1'250	1'120	130	407	382	25.2				
00.009	Baugrubensicherung, Schlitzwand, 800 mm	-	m <sup>2</sup>	1'230'000	1'100'000	129'000	136	126	9.43	2'270	2'010	256	777	728	49.6				
00.010	Baugrubensicherung, Spundwand, auskragend	-	m <sup>2</sup>	228'000	228'000	0	46.2	46.2	0	747	747	0	163	163	0				
00.011	Baugrubensicherung, Spundwand, gespriesst	-	m <sup>2</sup>	129'000	129'000	0	25.3	25.3	0	421	421	0	92.3	92.3	0				
00.012	Baugrubensicherung, Spundwand, verankert	-	m <sup>2</sup>	255'000	255'000	0	55.3	55.3	0	813	813	0	181	181	0				
00.013	Tiefgründung, Mikrobohrpfahl	-	m	48'600	48'600	0	7.74	7.74	0	116	116	0	30.6	30.6	0				
00.014	Tiefgründung, Ort betonbohrpfahl, 700 mm	-	m	229'000	229'000	0	22.4	22.4	0	404	404	0	159	159	0				
00.015	Tiefgründung, Ort betonbohrpfahl, 900 mm	-	m	331'000	331'000	0	35.0	35.0	0	566	566	0	239	239	0				
00.016	Tiefgründung, Ort betonbohrpfahl, 1200 mm	-	m	506'000	506'000	0	55.6	55.6	0	851	851	0	372	372	0				
00.017	Tiefgründung, Ort betonverdrängungspfahl 560/480 mm	-	m	122'000	122'000	0	9.87	9.87	0	226	226	0	72.2	72.2	0				
00.018	Tiefgründung, Ort betonverdrängungspfahl 660/580 mm	-	m	152'000	152'000	0	13.2	13.2	0	273	273	0	91.3	91.3	0				
00.019	Tiefgründung, Rüttelstopfsäule	-	m	29'900	29'900	0	1.10	1.10	0	30.9	30.9	0	6.45	6.45	0				
00.020	Tiefgründung, Vorgefertigter Betonpfahl	-	m	38'800	38'800	0	4.22	4.22	0	66.1	66.1	0	28.6	28.6	0				
00.021	Wasserhaltung, Pumphöhe 2.5 m	-	m <sup>3</sup>	14.4	14.4	0	0.020	0.020	0	0.101	0.101	0	0.004	0.004	0				
00.022	Wasserhaltung, Pumphöhe 5 m	-	m <sup>3</sup>	16.8	16.8	0	0.023	0.023	0	0.119	0.119	0	0.005	0.005	0				
00.023	Wasserhaltung, Pumphöhe 7.5 m	-	m <sup>3</sup>	19.6	19.6	0	0.027	0.027	0	0.138	0.138	0	0.006	0.006	0				
00.024	Wasserhaltung, Pumphöhe 10 m	-	m <sup>3</sup>	22.5	22.5	0	0.031	0.031	0	0.159	0.159	0	0.007	0.007	0				
<b>01</b>	<b>Beton</b>	kg/m <sup>3</sup>																	
01.001	Magerbeton (ohne Bewehrung)	2'150	kg	65.1	40.2	24.9	0.009	0.007	0.002	0.139	0.092	0.047	0.059	0.050	0.009				
01.002	Hochbaubeton (ohne Bewehrung)	2'300	kg	94.3	67.3	27.0	0.013	0.012	0.002	0.201	0.148	0.054	0.099	0.089	0.010				
01.003	Tiefbaubeton (ohne Bewehrung)	2'350	kg	99.9	72.9	27.0	0.014	0.013	0.002	0.217	0.164	0.053	0.107	0.096	0.010				
01.004	Bohrpfahlbeton (ohne Bewehrung)	2'325	kg	106	79.0	26.9	0.016	0.014	0.002	0.228	0.175	0.053	0.117	0.107	0.010				

# Software

- Most calculations for whole buildings are executed with specific software.
- There are two types of software:
  - For construction phase only (i.e. Tool Minergie-Eco, GREG)
  - For construction and use phase combined (with integrated calculation of heating energy demand, i.e. LESOSAI, Thermo, EnerWeb)
- For the use in building certifications, the software has to be accredited.
- The accreditation process is defined and available (currently in revision). It is effected through the association ecobau.
- For a successful accreditation, the software has to generate results for given buildings and building components that are in line with precalculated results.
- This applies for new buildings and refurbishments.

# Software – example LESOSAI



# Users

- The main task in calculating building LCA's falls to the user.
- In most software products, the user can define custom building components.
- In most calculations, the majority of the building components are user defined.
- The best Quality Control System has almost no effect if the user is not part of it.
- For Minergie-Eco, a guideline for the calculation of building LCA's exists.
- Additionally, ecobau and SIA offer courses for LCA calculations.





# Certification

## Minergie-Eco

- Minergie-Eco was the first swiss label which required a building LCA.
- There are 2 threshold values (satisfying, good) defined for
  - non renewable primary energy
  - greenhouse gas emissions
- The QC process comprises roughly the following steps:
  - Documents check: Are all documents (calculation, plans) available?
  - Results check: Are the results in the predicted range?
  - Completeness check: Are all relevant building components covered?
  - Area check: Is the total area of building components correct?
  - Random samples: Are the building components correctly built (Thicknesses, Amortisation, linkage to LCA dataset)?

## SNBS, SGNI, 2000-Watt-Areal

- All of the other swiss building labels use more or less the same methodology

# Identified Problems

## Regulatory Framework

- Insufficient understanding for the interrelationships between the stakeholders and their needs
- Too slow adaption to changes (i.e. threshold values)

## LCA Data

- KBOB LCA Data does not contain all necessary datasets to model a whole building
- Most data is available on the material level, but not ready for use in building components (i.e. there are datasets for bricks and mortar, but not for masonry) which leaves the correct „mixture“ to the users
- Update cycles too long (especially for product specific data)
- No automated software interface available

# Identified Problems

## Software

- No standardized completeness check available, many calculations incomplete
- No standardized layout for the calculation results makes an interpretation difficult
- Different versions of certification schemes and datasets lead to difficulties

## Users

- Too much effort and knowledge necessary for a correct calculation (BIM, where are you?)
- Too many calculations are outright faulty and require unnecessary loops between QC and applicants

## Certification

- Too short update cycles
- Requirements often buried in a pile of documents
- Insufficient resources and knowledge for in-depth QC



It is not the perfect, but the imperfect,  
who have need of love.

Oscar Wilde

**Thank you for your attention.**