SCIENCE ▪ PASSION ▪ TECHNOLOGY

57th LCA Discussion Forum - Life Cycle Assessment in the Building Sector:
Analytical Tools, Environmental Information and Labels

Environmental assessment of buildings in Austria

Ass.Prof. Dr. Alexander Passer

Content

Stakeholder

DGNB

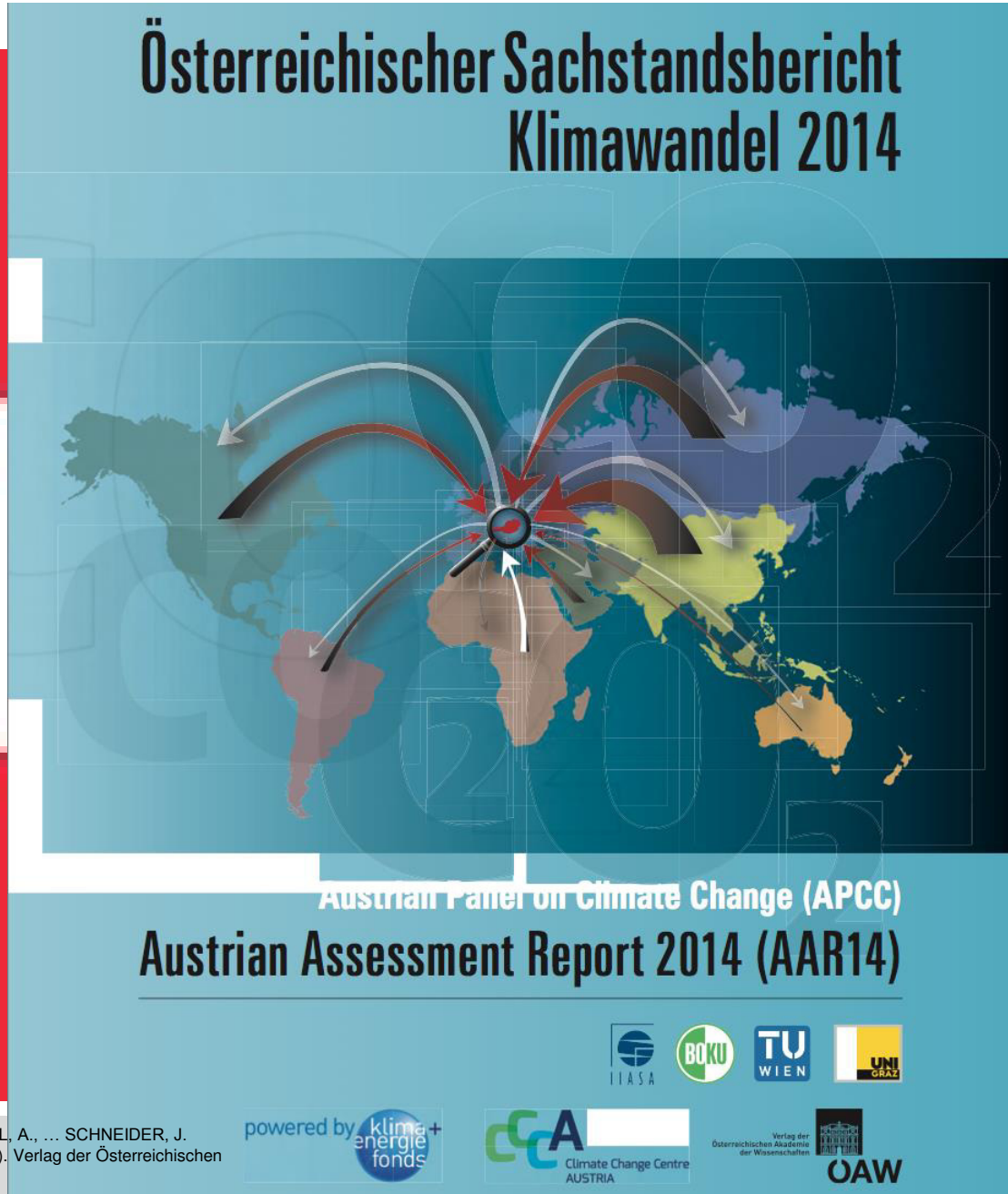
ÖGNI
AUSTRIAN SUSTAINABLE BUILDING COUNCIL

klima:aktiv

ÖGNB
Österreichische Gesellschaft für Nachhaltiges Bauen

Bau-EPD
Baustoffe mit Transparenz

Austria



KROMP-KOLB, H., NAKICENOVIC, N., STEININGER, K., GOBIET, A., FORMAYER, H., KÖPPL, A., … SCHNEIDER, J. (2014). Austrian Panel on Climate Change (APCC) - Austrian Assessment Report 2014 (AAR14). Verlag der Österreichischen Akademie der Wissenschaften. Retrieved from http://hw.oeaw.ac.at/7699-2

What is the right approach for a “sustainable building”?

Nearly zero-energy buildings

EBPD Target 2020

- **Nearly zero energy demand?**

LowEx buildings

Smart buildings

New and refurbished buildings

Green buildings

Carbon neutral buildings

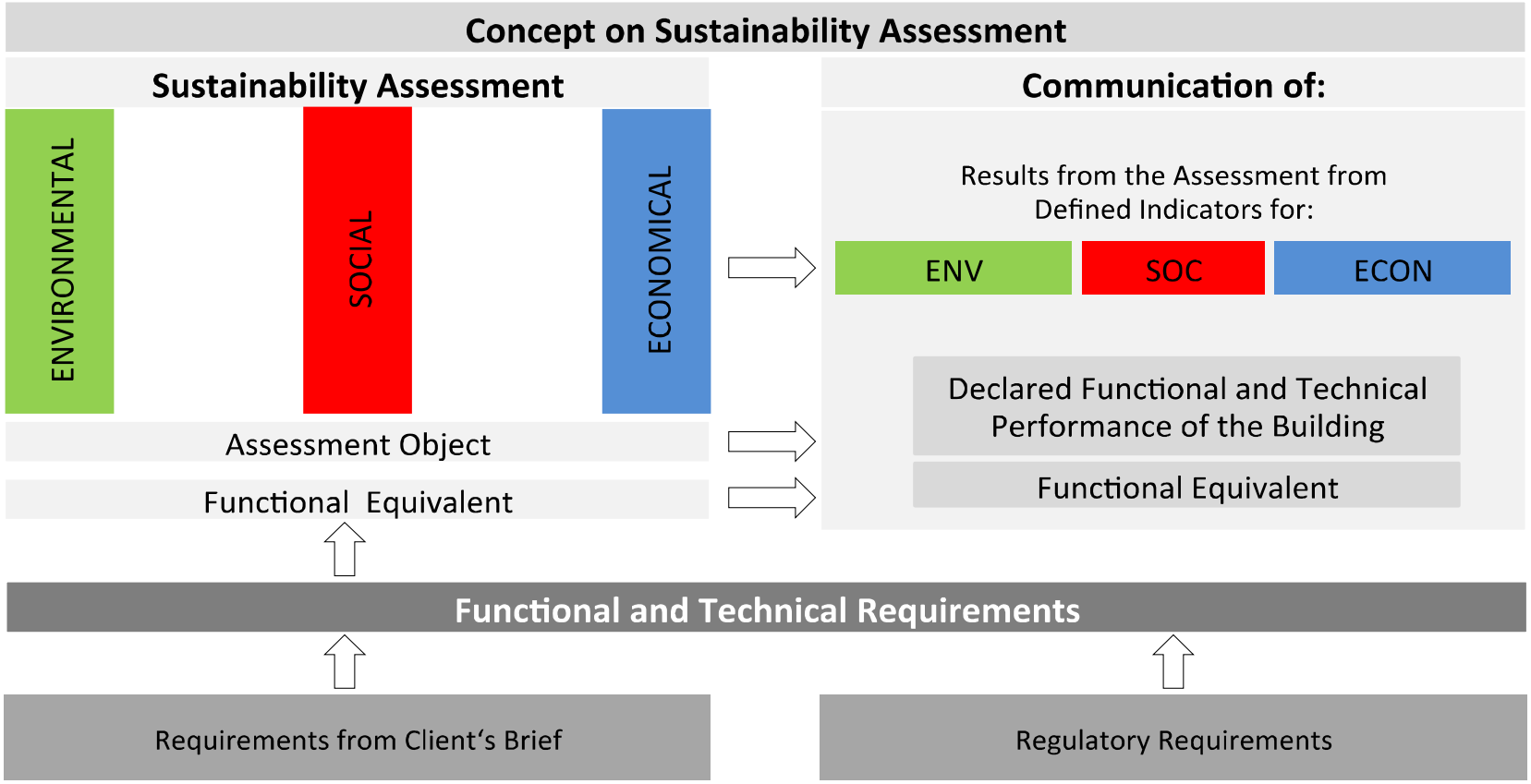
- No fossil fuels
- Use of renewable energy only
- **Reasonable energy demand?**

Source: Modification of Wallbaum H.

An excess of exuberance

"*This must have been a very nice scale model, but it is a silly building...*"
N. Larsson

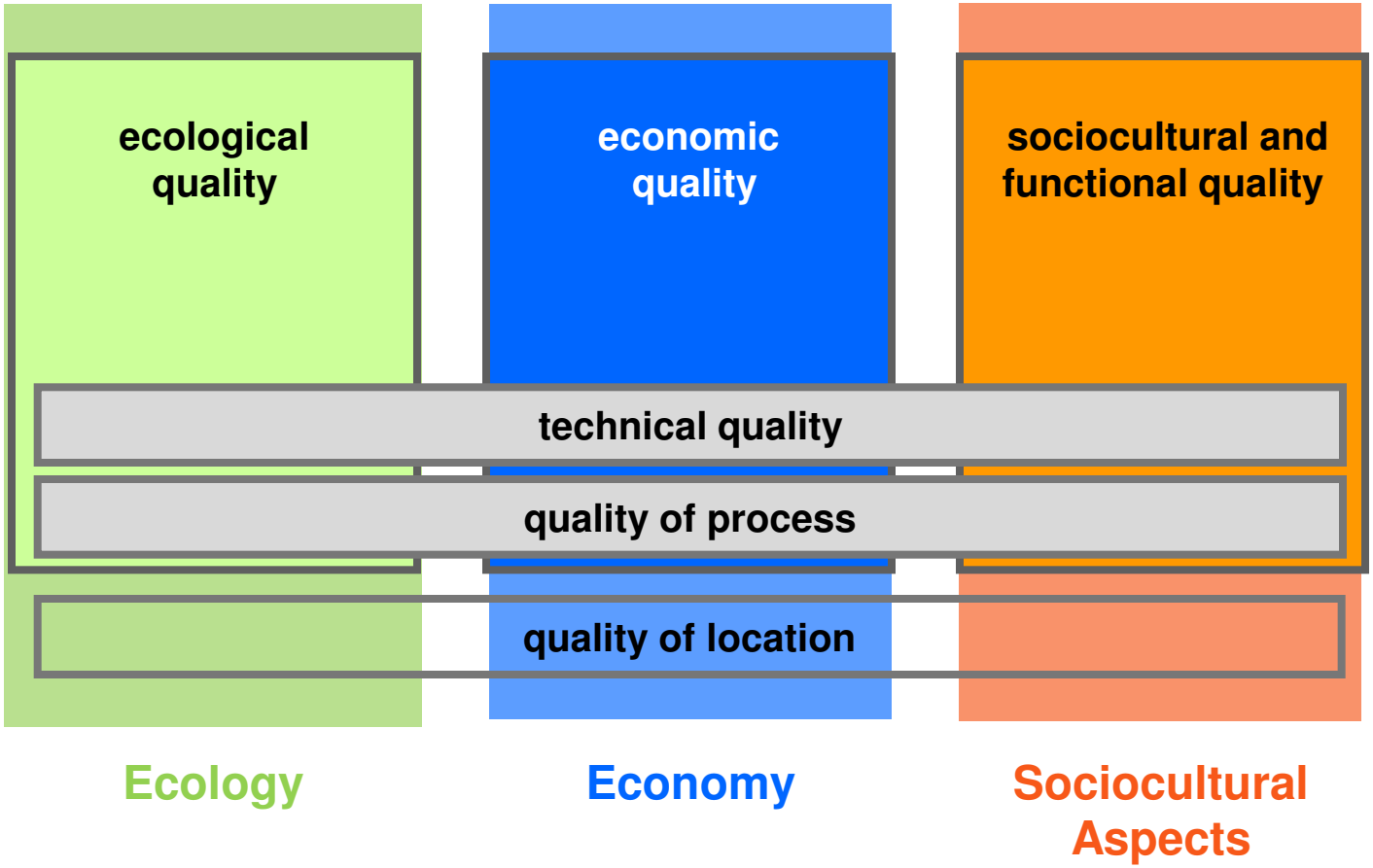
Sustainability assessment of buildings



Source: own Graphic acc. to EN 15643/15978:2012 – Sustainability of construction works

ÖGNI

The systematics: 5 + 1



Environmental Quality

- Life Cycle Assessment
- Local Environmental Impact
- Environmentally Friendly Material Production
- Primary Energy Demand
- Drinking Water Demand and Wastewater Volume
- Land Use

Economic Quality

- Building-Related Lifecycle Costs
- Value Retention, Suitability for Third Party Use

Sociocultural and Functional Quality

- Thermal Comfort
- Indoor Air Quality
- Acoustic Comfort
- Visual Comfort
- User Influence on Building Operation
- Quality of Outdoor Spaces
- Safety and Security
- Handicapped Accessibility
- Efficient Use of Floor Area
- Suitability for Conversion
- Public Access
- Cycling Convenience
- Design and Urban Planning Quality through Competition
- Integration of Public Art
- Site Features

Technical Quality

- Fire Prevention
- Indoor Acoustics and Sound Insulation
- Building Envelope Quality
- Backup Capacity of Technical Building Systems
- Ease of Cleaning and Maintenance
- Resistance to Hail, Storms, and Flooding
- Ease of Dismantling and Recycling
- Pollution Control
- Noise Emission Control

Process Quality

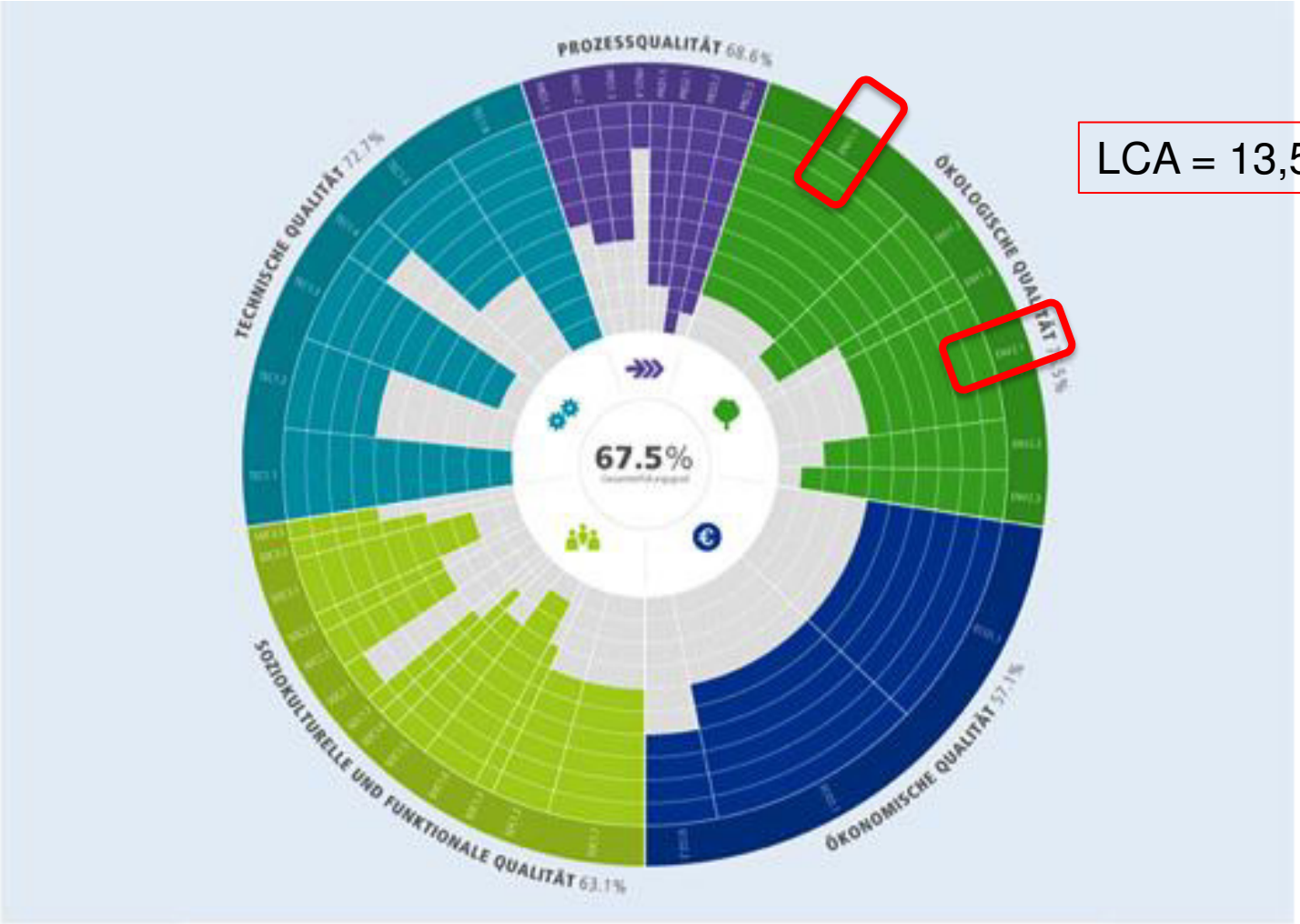
- Comprehensive Project Definition
- Integrated Planning
- Comprehensive Building Design
- Sustainability Aspects in Tender Phase
- Documentation for Facility Management
- Environmental Impact of Construction Site / Construction Process
- Construction Quality Assurance / Quality Control Measures
- Systematic Commissioning

Site Quality

- Site Location Risks
- Site Location Conditions
- Public Image and Social Conditions
- Access to Transportation
- Access to Specific-Use Facilities
- Connections to Utilities

Reference: DGNB

Overall results



LCA = 13,5%

Reference: DGNB

Performance rating

Total Performance Index	Nominal Performance Index	Awards
from 80%	65%	Gold
from 65%	50%	Silver
from 50%	35%	Bronze

Reference: DGNB

DGNB Scheme overview

© Martin Duckek, Ulm

- **Industrial buildings**
- **Office and administrative buildings**
- **Retail buildings**
- **Residential buildings**

© Rendering von screen ID digital, Entwurf Universität Lüneburg Prof. Daniel Libeskind

- **Assembly buildings**
- **Educational facilities**
- **Hospitals**
- **Industrial buildings**
- **Laboratory buildings**
- **Mixed use**
- **Office and administrative buildings**
- **Office and administrative buildings (with modernization measures)**

© Studio A, Florian Bauer

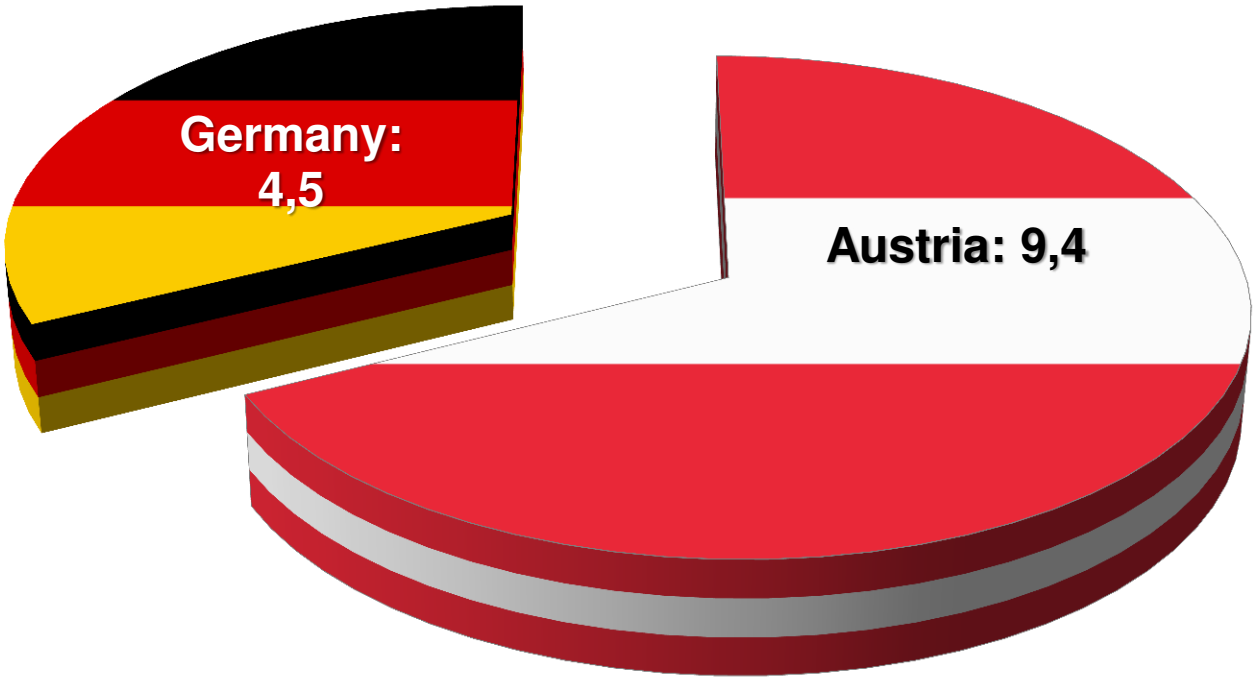
Business districts

Industrial locations

- **Urban districts**

Reference: DGNB

DGNB projects / 1 Mio. (2013)



	Deutschland	Österreich
Einwohner (Mio.)	80,5	8,5
Projekte	364	80

The Systematics of the Adaptation

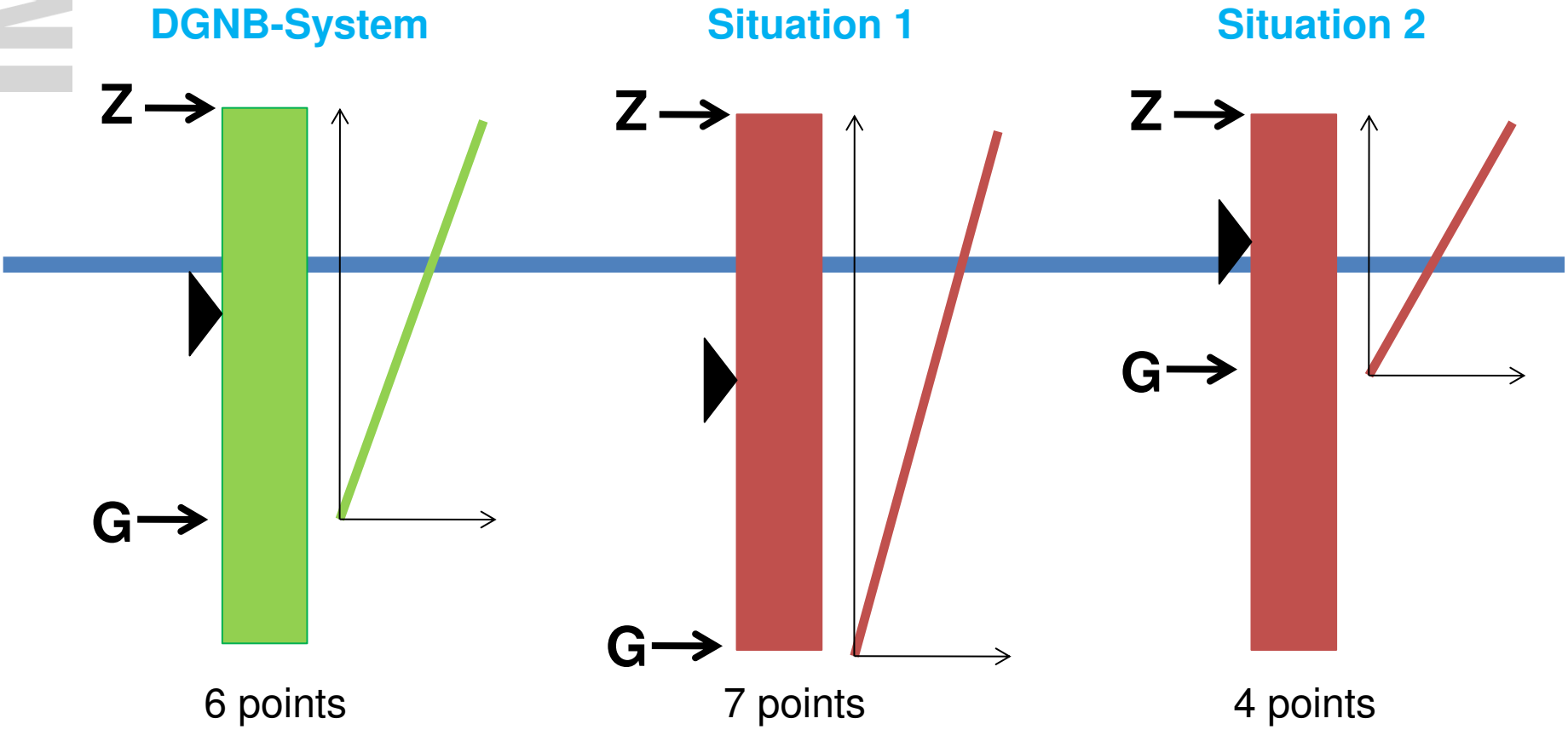
Identification of different (national) standards and building regulations

Identification of design limits and definition reference values on the basis of national standards and regulations

Definition of target values and definition of minimum requirements

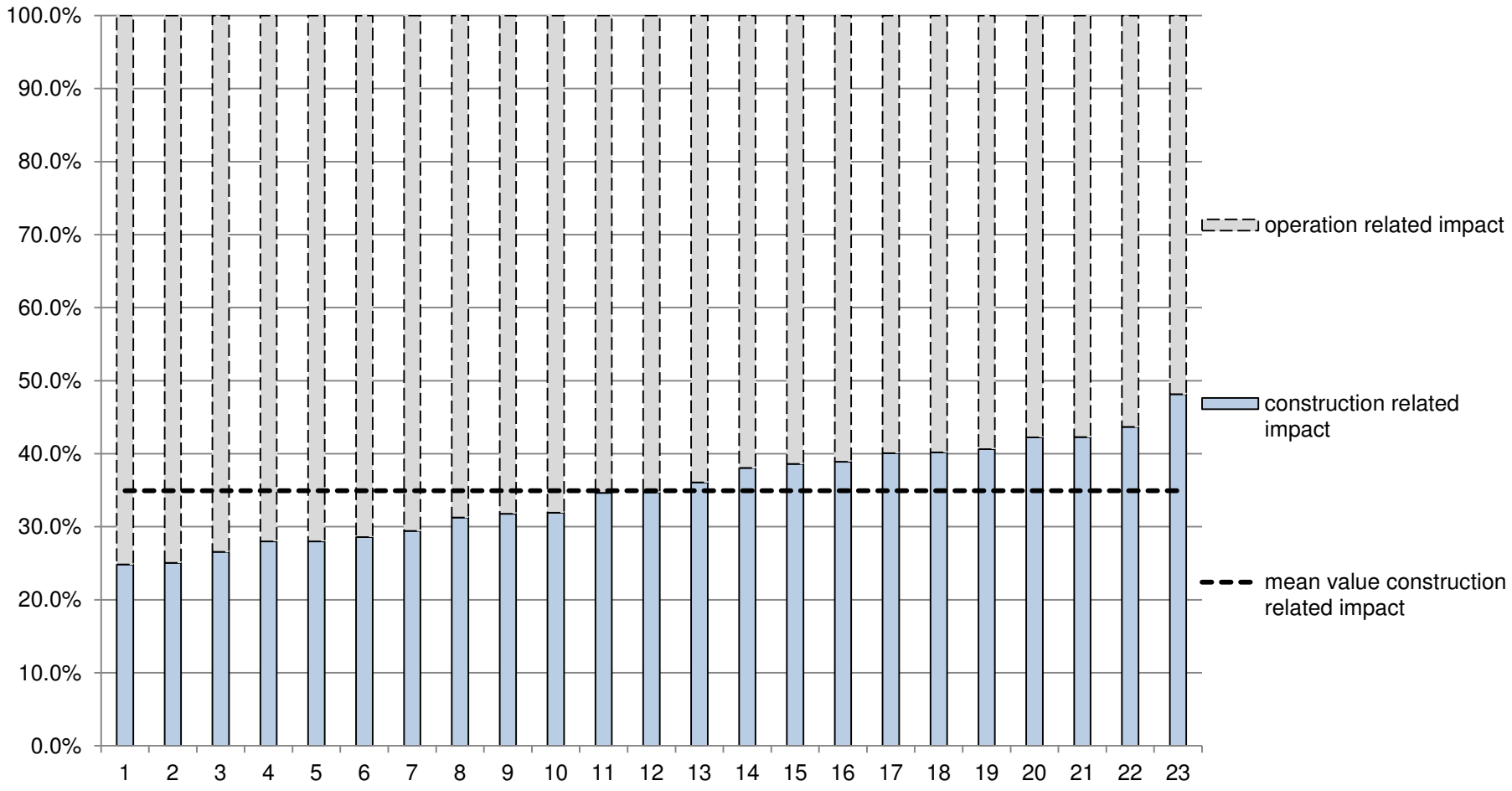
Definition of relevance factors and country-specific factors

Standard of evaluation



Z … target value, G … limit value, black triangle … reference values, blue line … building performance

Critical review and evaluation of the LCAs practical feasibility ->Update NBV14



Source: Neururer,C., Smutny R., Passer A.; Life cycle analysis as tool for environmental assessment of office and administration buildings – a critical review and evaluation of the LCAs practical feasibility for a future roadmap, World Sustainable Building Conference 2014

Example of certification

MED Campus Graz

Neubau mischgenutzte Gebäude

New mixed-use Buildings

ÖGNI
AUSTRIAN SUSTAINABLE BUILDING COUNCIL

Mariahilfer Straße 123/3
1060 Wien/Vienna
Tel +43.1.599 99 8083
office@oegnb.net
www.oegnb.net

ÖGNB und TQB werden gefördert von

Development of ÖGNB assessment Tool: Total Quality Building (TQB)

1st Step (1998): GBC (Green Building Challenge) project in Austria GBC-Handbook of the D-A-CH (German–Austrian–Swiss) Brick and Tile Industry, published 2000

2nd Step (2003): Development of the Austrian TQ (Total Quality) Information Package and Assessment Tool, resulting in a certificate

3rd Step (2009): Further development and relaunch: TQB – Total Quality Building Assessment, and foundation of the ÖGNB – Österreichische Gesellschaft für Nachhaltiges Bauen (Austrian Sustainable Building Council)

Internet-based tool free of charge: www.oegnb.net

ÖGNB (Austrian Sustainable Building Council) provides the internet-based tool for assessment, a discussion-platform for further developing the assessment scheme together with the members, and runs the certification procedure based on the TQB-tool.

ÖGNB assessment criteria (TQB-Tool)

	Category and criteria (German original)	English translation
A	**Standort und Ausstattung**	**Location and amenities**
A.1	Infrastruktur	Infrastructure
A.2	Standortsicherheit und Baulandqualität	Security
A.3	Ausstattungsqualität	Amenities
A.4	Barrierefreiheit	Accessibility
B	**Wirtschaftlich und technische Qualität**	**Economical and technical quality**
B.1	Wirtschaftlichkeit im Lebenszyklus	Life cycle cost assessment
B.2	Baustellenabwicklung	Construction site management
B.3	Flexibilität und Dauerhaftigkeit	Flexibility and longevity
B.4	Brandschutz	Fire prevention
C	**Energie und Versorgung**	**Energy and water**
C.1	Energiebedarf	Energy consumption
C.2	Energieaufbringung	Energy production
C.3	Wasserbedarf und Wasserqualität	Water consumption and water quality
D	**Gesundheit und Komfort**	**Health and comfort**
D.1	Thermischer Komfort	Thermal comfort
D.2	Raumluftqualität	Indoor air quality
D.3	Schallschutz	Noise protection
D.4	Tageslicht und Besonnung	Daylight and sun
E	**Ressourceneffizienz**	**Resource efficiency**
E.1	Vermeidung kritischer Stoffe	Avoidance of harmful substances
E.2	Regionalität, Recyclinganteil, zertifizierte Produkte	Quality of products (local production, recycling material, certified products)
E.3	Ökoeffizienz des Gesamtgebäudes	Eco-efficiency of the entire building
E.4	Entsorgung	Demolition and disposal

C	2.		Energy supply	max. 75
C	2.	1	Primary energy (140 - 40 or less kWh/m^2.a (gross area)	max. 50
C	2.	2	Photovoltaic system (1-5 or more W_{peak}/m^2.a (gross area)	max. 20
C	2.	3	Energy efficient ventilation	max. 10
C	2.	4	CO2-Emissions from building operation (27 – 4 or less $kgCO_2/m^2$.a (gross area)	max. 50

Module B

E	3.		Ecoefficiency of the building (life cycle view)	max. 60
E	3.	1	Ecological index OI3 (PE non ren., GWP, AP)	max. 60
E	4.		Waste Disposal	max. 60
E	4.	1	Disposal index	max. 60

Module A

LCA = (75+60)/1000=13,5%

TQB online oegnb.net

	Wohnbau: Demo-Projekt	1000	0
	Gebäudedaten		
A	Standort & Ausstattung	200	0
B	Wirtschaft & techn. Qualität	200	0
B.1	Wirtschaftlichkeit im Lebenszyklus [mehr Informationen]	100	0
B.2	Baustellenabwicklung [mehr Informationen]	30	0
B.3	Flexibilität und Dauerhaftigkeit [mehr Informationen]	40	0
B.4	Brandschutz	30	0
C	Energie & Versorgung	200	0
D	Gesundheit & Komfort	200	0
E	Ressourceneffizienz	200	0


lebensministerium.at
klima:aktiv
Dieses Gebäude wurde im
klima:aktiv GOLD Standard errichtet.

Dissemination pogram to accelerate market uptake: klima:aktiv building standard

- Criteria system (1000pt.)
  - **A Design and Construction (130 pt.)**
  - **B Energy and Supply (650 pt.)**
  - **C Materials and Structure (100 pt.)**
  - **D Comfort and Indoor Air Quality (120 pt.)**
- Categories A B C D are the same for residential buildings and all types of non residential buildings; subcriteria are different.

Two in one
TQB & klima:aktiv

ÖGNB
Österreichische Gesellschaft für Nachhaltiges Bauen

klima:aktiv
Die Klimaschutzinitiative des Lebensministeriums

Johann-Böhm-Straße, Kapfenberg

Architektur: Nussmüller Architekten ZT GbmH
Bauphysik :Rosenfelder & Höfler GmbH & Co KG
Begleitung: ARGE Nachhaltigkeits-bewertung der TU Graz
Bauherr: Siedlungsgenossenschaft Ennstal

Objektadresse: 8605 Kapfenberg, Johann-Böhmstraße 34 - 36

In Kapfenberg entsteht gegenwärtig die erste Plus-Energie-Sanierung eines Wohnbaus in Österreich. Das architektonisch und energetisch extrem ambitionierte Bauvorhaben wird als Leuchtturmprojekt beispielgebend für die Sanierung von Geschosswohnbauten sein. Der als Plusenergiegebäude konzipierte Wohnbau setzt sich eine Reduktion um 80 % des Energieverbrauchs, 80% Anteil erneuerbarer Energie an der Energieversorgung und um zumindest 80% geringere CO2-Emissionen im Betrieb als Ziel. Das Gebäude aus den 50er Jahren wird gezielt mit Modulbausystemen erweitert, welche auch für andere Bauwerke zur Verfügung stehen.

ÖGNB und TQB werden gefördert von:
HAUS der Zukunft
bmvit

Standort & Ausstattung	174
Wirtschaft & Techn. Qualität	170
Energie & Versorgung	192
Gesundheit & Komfort	174
Baustoffe & Konstruktion	157

867
von 1.000 möglichen Qualitätspunkten

Bewertungsstand: 03.10.2012

15,1
kWh / m².a Heizwärmebedarf HWB gemäß OIB RL6

klima:aktiv Gold
lebensministerium.at

943
von 1.000 möglichen Qualitätspunkten

15,1
kWh / m².a Heizwärmebedarf HWB gemäß OIB RL6

	Erreicht	Möglich
Planung + Ausführung	130	130
Energie + Versorgung	638	650
Baustoffe + Konstruktion	100	100
Gesundheit + Komfort	105	120

Environmental Product Declarations

Bau-EPD
Baustoffe mit Transparenz

ÖGNB
Österreichische Gesellschaft
für Nachhaltiges Bauen

Contact:
Bau EPD GmbH
DI DI DI(FH) Sarah Richter
email: sarah.richter@bau-epd.at
telephone: +43 699 15900500
www.bau-epd.at (under construction)

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BUILDING COUNCIL

Application of EPDs in Austria

Bau-EPD
Baustoffe mit Transparenz

ÖGNI (DGNB)

ÖGNI
AUSTRIAN SUSTAINABLE BUILDING COUNCIL

ÖGNB (TQB),

ÖGNB
Österreichische Gesellschaft für Nachhaltiges Bauen

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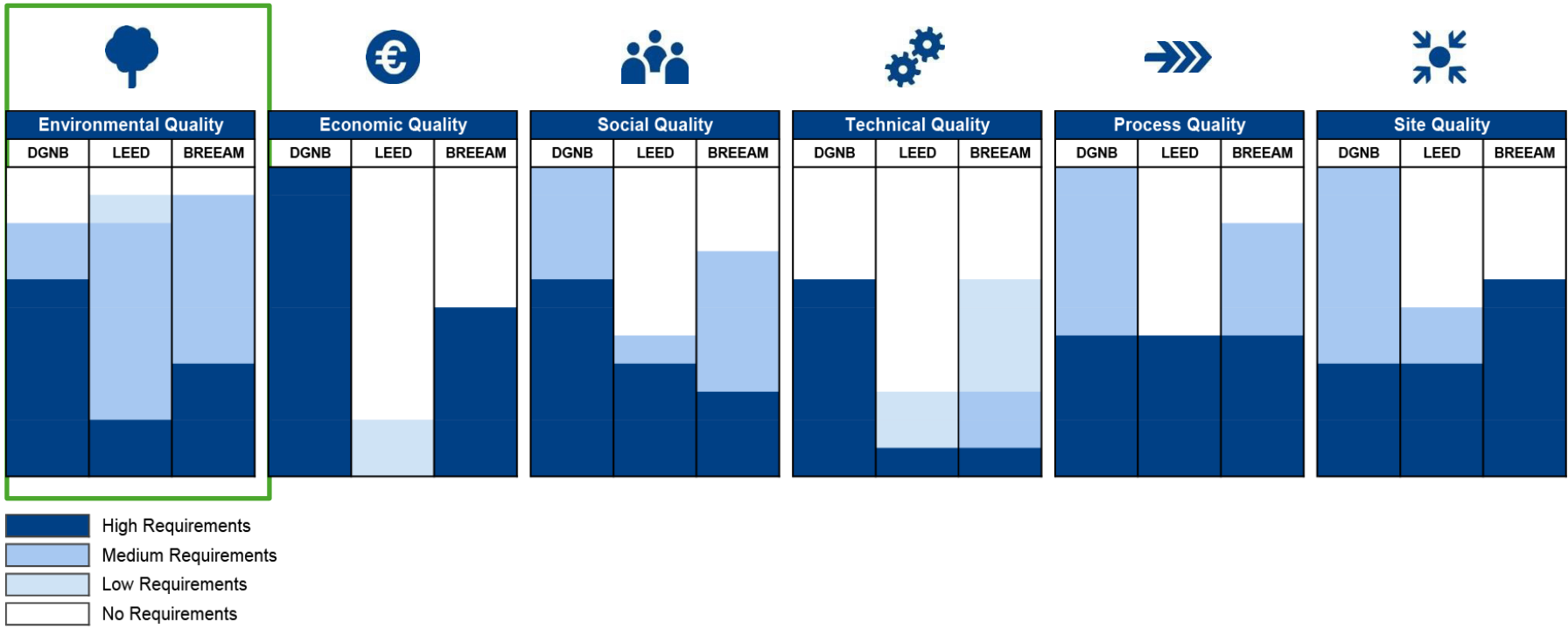
Wohnbau-Förderungen

(Subsidies for residential buildings)

Conclusions

Comparison DGNB, LEED, BREEAM



Use of EPD & LCA indicators

EPD = 26 environmental indicators

Building labels 3-7 indicators (ÖGNI: 7, TQB, k:a, WBF: 3 = OI3 Index):

TQB, k:a, WBF: 3 Indicators = OI3 Index (Ökoindex 3)

ÖGNB Österreichische Gesellschaft für Nachhaltiges Bauen

GWP	Global Warming Potential	(Treibhauspotenzial, Erderwärmung)
AP	Acidification Potential	(Versauerungspotenzial, Waldsterben)
PE	Primary Energy Demand	(Primärenergiebedarf, erneuerbar, nicht erneuerbar)

} OI3 Index

ÖGNI: 7 Indicators

GWP, AP, PE +

ODP	Ozone Depletion Potential	(Ozonabbaupotenzial, Ozonloch)
POCP	Photochemical Ozone Creation Potential	(Bodennahes Ozonbildungspotential)
EP	Eutrophication Potential	(Überdüngungspotential)

DGNB

Austrian building certification systems – application of LCA

klima:aktiv	ÖGNB Österreichische Gesellschaft für Nachhaltiges Bauen	ÖGNI Austrian Sustainable Building Council
•For new construction of office buildings/dwellings	**•For all kinds of buildings**	**•Adoption of DGNB**
•Two LCA options •Whole building (BG4) •Building envelope	**•LCA considers all LC-phases** •Before-use phase •Use phase •End-of-life phase **•Technical equipment is not considered**	**•LCA considers all LC-phases** •Before-use phase •Use phase •End-of-life phase **•Simplified and complete LCA possible**
•Indicators •GWP, AP, nr-CED •Aggregated to OI3-Indicator **•Energy demand of use phase is not included**	**•Indicators** •GWP, AP, nr-CED •Aggregated to OI3-Indicator	**•Variety of indicators (CEN)** **•Comparison of results with defined benchmark**
•Max. achievement by LCA 350 points of 1000 (35%) **•Database: baubook**	**•Max. achievement by LCA 60 points of 1000 (6%)** **•Database: baubook**	**•Max. achievement by LCA (ecological quality) 22,5%** **•Database: oekobau.dat**

Austrian building certification systems – application of LCA

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- **Database: baubook**
- **All currently available validated software-products for calculating energy passes and construction physics in Austria are also connected with baubook datasets**

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- **Database: oekobau.dat**
- **Tools: e.g. LEGEP, …**
- **Third party verified Data like EPDs are accepted and preferred**

- **EPDs of Bau-EPD GmbH shall be transferred to baubook and oekobau.dat**

Bau-EPD
Baustoffe mit Transparenz

A race with unequal conditions

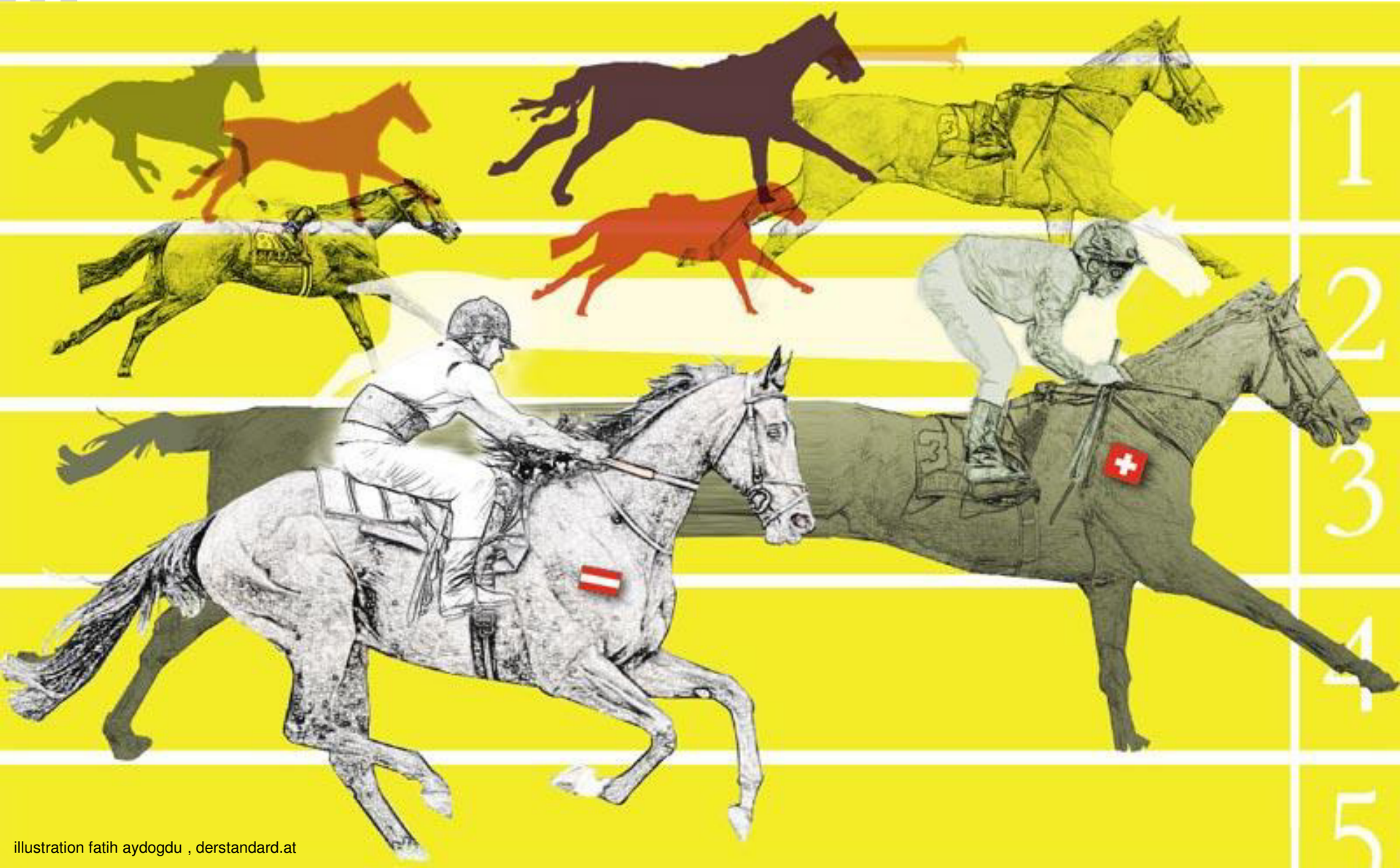

illustration fatih aydogdu , derstandard.at


Merci Vielmal