Training Course on tox-free, circular and climate-neutral building projects and renovations

Developed under the NonHazCity 3 Project as deliverable D1.4. – June 2024

This training course was created specifically for municipalities in the Baltic Sea Region and their desk-officers who deal with construction and renovation projects, as well as Architects. The Programme consists of four training modules that each consist of several sub-modules.

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The NonHazCity Training Course

The NonHazCity Training Course on tox-free, circular and climate-neutral building projects and renovations is structured in 4 Modules:

Module one is an introduction to harmful substances in building material and those used during construction. In a health sub-modules the need for reduction is illustrated from a human health perspective.

Modules two and three are made specifically for the training of tendering desk-officers and other interested staff at municipalities, who seek to learn about means to steer their tendering activities towards this reduction, substitution and avoidance of harmful substances within their construction and renovation projects. While Module two introduces necessary concepts, ideas and tools that could will facilitate and served during implementation, Module three goes into everything related to Green Public Procurement GPP.

Module four is specifically meant for architects who seek to cater to these municipalities, support them in their effort and also learn how to keep and overview with the many different kinds and sources of information on toxics. Architects are managing a panoply of information from many different sources and these sub-modules suggests a path to interprete and navigate the information.

This collection of training material was produced by the project partners who collaborate in the Non Haz City 3 EU Interreg Project which is co-funded by the EUs Interreg Baltic Programme.

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Note: Architects will also particularly benefit from the following submodules:

2.2. Logbook, 2.3. Chemicals and EPDs, and 2.4. chemicals in construction products

Module 1

Introduction

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1.1. CONSTRUCTION SECTOR IS A SPECIAL CASE

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Introduction

- Public procurement in EU is around 2 trillion euro per year.
- Public procurement in the construction sector accounts about 50% of total EU public procurement, generating around 6.1% of GDP
- Public procurement is a powerful tool that, if used properly, could have a significant impact on society and the environment.

Green Public Procurement

Long-term **financial savings** through GPP:

In the construction sector adopting GPP practices can lead to significant **long-term** financial savings by reducing energy consumption, minimizing waste and enhancing resource efficiency. The benefits to human and environmental health are also very important.

CASE EXAMPLE

Procurement of Finland's first ecolabelled daycare center in Hyvinkää. Environmental requirements:

- The daycare centre must be constructed in accordance with the criteria of the Nordic Swan label.
- There must be a specific employee who approves and purchases the ecolabelled materials.
- Special requirements on energy-efficiency.
- The company must have a quality assurance system that considers the environmental management scheme.

Long-term financial savings

During consultations for designing of eco-labelled daycare center in Hyvinkää (Finland) were estimated that an eco-labelled daycare center would be approximately 25% more expensive than a standard daycare center.

However, due to the strict energy requirements, the operating costs of an eco-labelled building are lower, which compensates for any difference in construction costs.

Green Public Procurement

Benefits of reducing hazardous substances in public procurement **for municipalities**:

- Protection of human health
- Protection of environment
- Transformation of market
- Support innovations
- Increased awareness

Long-lasting impact

- Toxic chemicals used in buildings are essentially locked in and remain there for a long time and even after the building is demolished, the harmful impact on the environment can continue for an indefinite period.
- On the other hand, we also encounter VOCs in buildings, which are released and pollute the indoor air for a long time.
- Buildings, are important for climate targets, this sector has significant energy, water and GHG emissions saving potential.

Difference between regular procurement and procuring construction projects

procuring construction projects:

- multi-stakeholder involvement
- intricate planning
- long-term implications

To have a circular economy tomorrow, we need to build circular today

Three principles of circular economy:

- Eliminate waste and pollution
- Circulate products and materials (at their highest value)
- Regenerate nature

Responsible building design and construction can make a significant contribution to the circular economy

Where to look further

- https://interreg-baltic.eu/wp-content/uploads/2024/01/NHC3catalogue_E1_5_small.pdf
- https://interreg-baltic.eu/wp-content/uploads/2024/01/D1_2_Draft-strategic-solutions_December2023.pdf
- https://interreg-baltic.eu/wp-content/uploads/2024/01/NHC3_D1_3_Fact-sheets-for-professionals.pdf

1.2. THE THREE PILLAR APPROACH

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Sustainability in construction sector

Sustainability in the construction sector can be achieved through:

- Eliminating hazardous substances from buildings
- Enhancing circularity
- Promoting climate protection

Necessity to eliminate hazardous substances

In the realm of construction, the quest for innovation and efficiency often overshadows concerns about environmental impact. Yet, the materials and methods used in construction have profound consequences for the planet. The prevalence of toxins in construction materials poses a significant threat to environmental health, with ramifications reaching far beyond the construction site. Embracing tox-free construction isn't just a choice; it's a necessity for safeguarding our planet's delicate balance.

Understanding Toxins in Construction

Toxins pervade many conventional construction materials, from paints and sealants to adhesives and insulation.

These toxins, often derived from chemicals such as volatile organic compounds (VOCs), formaldehyde, and heavy metals, can leach into the environment over time, posing risks to ecosystems and human health alike.

Moreover, the production and disposal of these materials contribute to air and water pollution, exacerbating environmental degradation.

Environmental Impact

The environmental impact of tox-laden construction materials is multifaceted and far-reaching:

VOC emissions from paints and coatings contribute to air pollution, forming ground-level ozone and contributing to smog formation.

Formaldehyde emissions from composite wood products not only degrade indoor air quality but also leach into soil and waterways, posing risks to aquatic life.

Furthermore, the extraction and processing of raw materials for these toxic products deplete natural resources and often involve environmentally destructive practices.

Human Health Implications

Beyond environmental concerns, tox-laden construction materials also pose significant risks to human health.

Prolonged exposure to VOCs and other toxins can lead to respiratory issues, neurological disorders, and even cancer.

Vulnerable populations, such as children and the elderly, are particularly at risk.

Moreover, the widespread use of these materials in construction contributes to the proliferation of indoor air pollutants, exacerbating public health challenges.

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The Case for Tox-Free Construction

Transitioning to tox-free construction practices is imperative for mitigating environmental degradation and safeguarding public health.

By prioritizing non-toxic, sustainable materials and methods, construction projects can minimize their ecological footprint and contribute to a healthier built environment.

Alternative materials such as low-VOC paints, formaldehyde-free insulation, and reclaimed wood offer viable alternatives that prioritize both performance and sustainability.

Benefits of Tox-Free Construction

The benefits of embracing tox-free construction extend beyond environmental and health considerations.

Sustainable construction practices not only reduce greenhouse gas emissions and resource depletion but also promote innovation and economic resilience.

Investing in green building materials and technologies fosters job creation and stimulates market demand for environmentally friendly products.

Moreover, tox-free construction enhances the resilience of buildings and infrastructure, reducing vulnerability to climate change impacts such as extreme weather events and rising temperatures.

Challenges and Opportunities

Despite the clear imperative for tox-free construction, challenges remain in widespread adoption.

Cost considerations, lack of awareness, and entrenched industry practices pose barriers to change.

However, these challenges also present opportunities for innovation and collaboration.

Governments, industry stakeholders, and consumers alike can drive demand for tox-free construction through incentives, regulations, and education campaigns. And public procurement can play a crucial role here.

Green Public Procurement

- Constructing buildings free from toxic substances demands attention at every stage of the process.
- From design and procurement to construction and maintenance, each step presents an opportunity to prioritize non-toxic materials and methods.
- One crucial tool in achieving this goal is Green Public Procurement (GPP). Municipalities have an important role to play here.

Power of GPP

At the procurement stage, GPP becomes instrumental in selecting suppliers and materials that meet stringent environmental standards.

Municipalities can use their purchasing power to drive demand for non-toxic products, thereby incentivizing manufacturers to innovate and produce greener alternatives.

By incorporating criteria such as low VOC emissions, absence of hazardous chemicals and recyclability into procurement guidelines, GPP promotes the adoption of tox-free materials and fosters market transformation.

GPP in Construction

Integrating GPP into construction projects enhances resource efficiency, reduces life cycle costs and fosters innovation.

However, realizing its full potential requires collaboration among stakeholders and capacity-building initiatives. By harnessing the power of GPP, we can create healthier, more sustainable built environments.

The NonHazCity 3 project

The project’s objective is to develop solutions for the climate-neutral, circular and non-toxic production of construction materials.

The main goal is to eliminate hazardous substances from buildings, preventing their entry into systems altogether and by that improving circularity as well as climate protection.

Solutions of NonHazCity 3

https://interreg-baltic.eu/project/nonhazcity-3/#output-1

- **a catalogue** with a comprehensive overview of different sustainable building materials
- **fact sheets** for professionals
- **a consumer app** helping with decision-making during renovation
- **DIY guide** to make sustainable choices when selecting construction materials
- **Draft strategic solutions** for managing procedures for construction materials and sites
- **Step-by-step guide** for the process management of toxfree, circular and climate-neutral construction at municipalities
- The BVB database of assessed construction products

1.3. HAZARDOUS SUBSTANCES, CIRCULAR ECONOMY AND CLIMATE – PART 1

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Hazardous substances and circular economy

Circular economy model

- materials are left in the utilization phase for as long as possible. There are 4 stages ordered in decreasing priority. In the circular economy model products are…

1. used for as long as possible
2. are reused wherever possible at the end of the intended utilization phase
3. are used for other purposes after the end of their repeated use, if reuse is no longer possible
4. are recycled (downcycling), i.e. the materials are used for the manufacture of new products if reuse or re-utilisation is no longer possible (downcycling)

Stage 1 Extending Life Time

How do hazardous substances affect stage 1?

- **Chemical Additives** Extend product service life but may pose hazards

  - E.g. **Anti-UV Chemicals**: Protect against UV damage, enhancing durability
  - **Oxidation Effects**: Interaction with air and oxygen can shorten lifespan
  - **Antioxidans**: Used to counter oxidation effects, prolonging durability

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Anti-UV-chemicals with hazardous properties

Hindered amine light stabilizers (HALS)

- Used in paints, coatings, sealants and adhesives

Benzotriazole

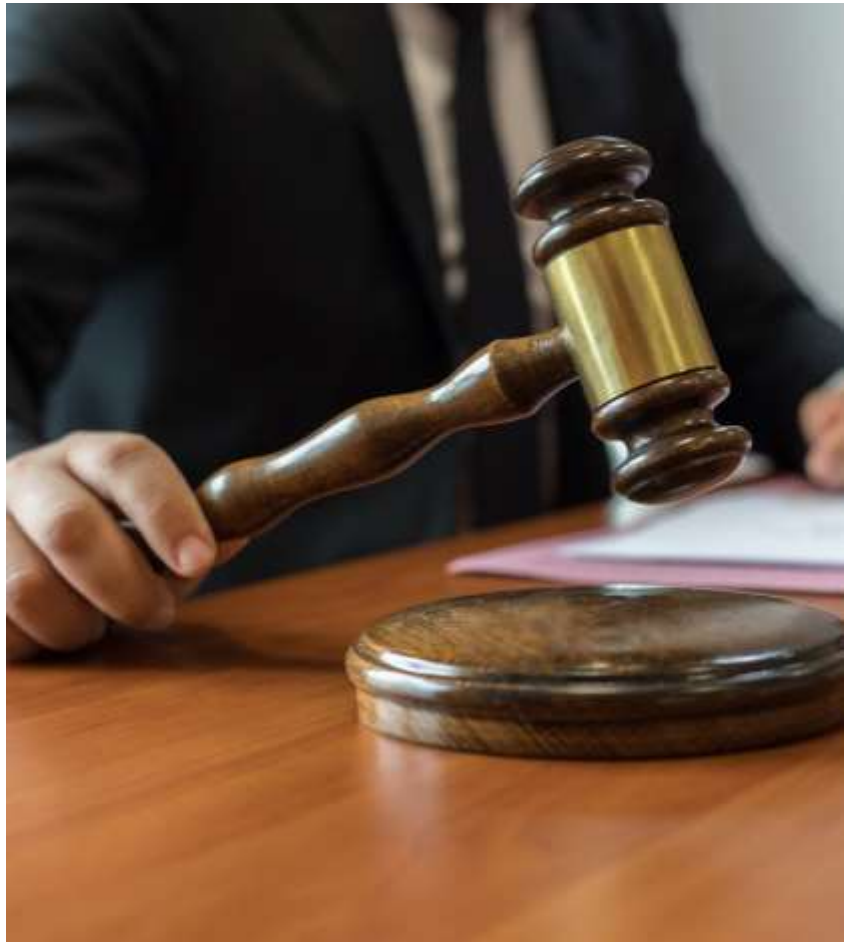
- Used in Paints, coatings, sealants and adhevives

Stage 2 and 3 Reuse

How do hazardous substances affect stage 2-3?

- **Chemical regulation** is slow
- New substances often take **10 years** to be regulated after their properties are known
- **240 substances** are on the REACH candidate list with high concern (SVHS), but are not yet regulated
- Products containing **SVHC** may face future restrictions, impacting their usability

➢ There is uncertainty about reusing products with chemical additives due to **evolving regulations**



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Stage 2 and 3 Reuse

How do hazardous substances affect stage 2-3?

Example Asbestos

- Asbestos was used in various building materials for its fire-resistant, insulating, and non-flammable properties
- Cause **severe health issues**, including lung diseases and lung cancer, breast, and peritoneal cancer
- Today many building elements **contain asbestos** e.g. windowsills. They could be easily reused in new buildings but it is prohibited
- **Banned** in new construction in 55 nations

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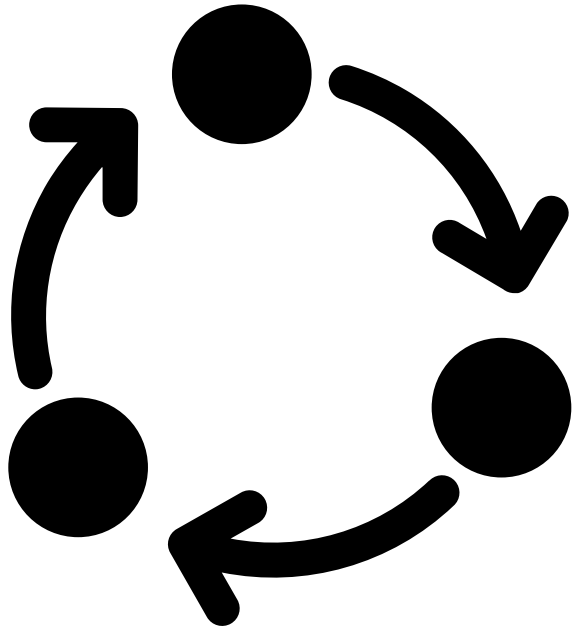
Stage 4: Recycling Recap

How do hazardous substances affect stage 4?

- **Material Purity** is essential for recycling processes
- Chemical additives are generally **not removed** in the recycling process
- Recylates thus contain an unknown **chemical cocktail**

➢ which can hinder their usability/ **Recyclability**



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Example for satisfactory Recycling: Untreated Solid Wood

Why is it good for Recycling?

Untreated solid wood is

- A Mono-material
- Free of hazardous substances

➢ Wood is shredded and processed into chipboard or wood fiber insulation

Example for unsatisfactory Recycling: Wood Polymere Composite

Why is it unsatisfactory for Recycling?

Wood Polymer Composite

- is Composite material (different components can't be separated)
- May contain hazardous substances (glue and polymer additives)

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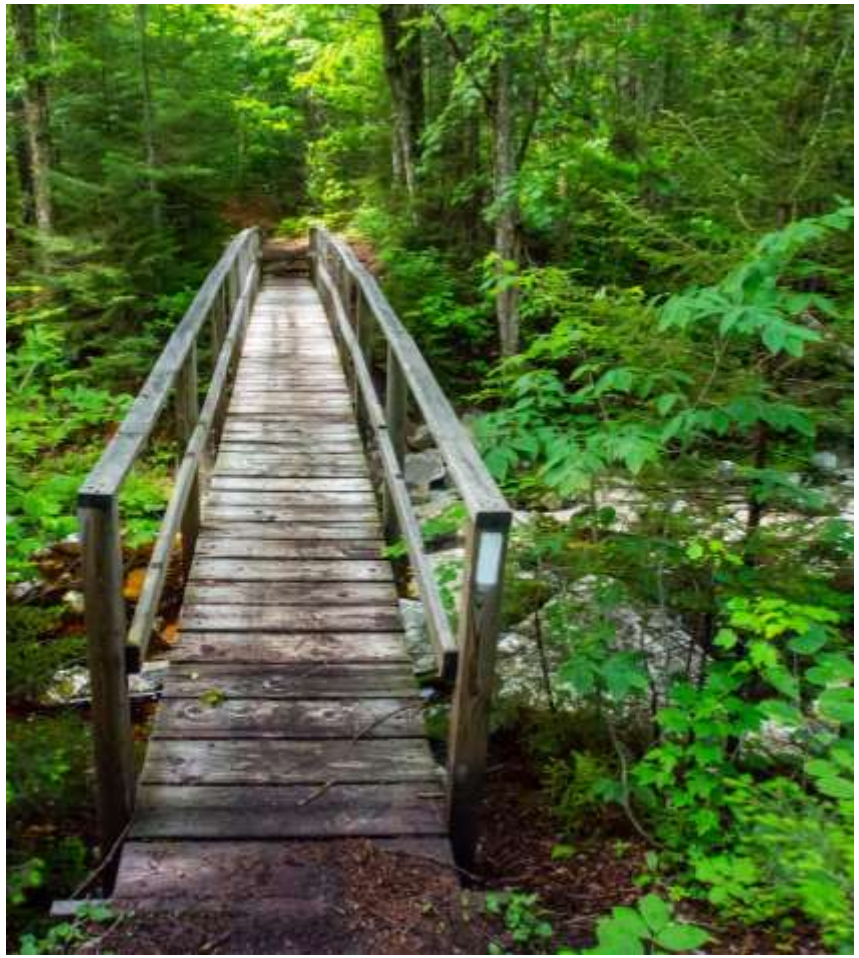
How Circular economy influence climate change mitigation

- Climate change results from the **clash** of Earth's natural system with human economic activity
- Addressing it requires **transforming** energy, food, cities, production, and consumption systems
- Addressing human-caused greenhouse gas emissions is essential **to stopping climate change**
- Achieving net zero emissions demands **transforming key economic systems,** not just energy

The way to Net Zero Emissions

- Transforming the global energy supply from fossil fuels to renewables will reduce emissions by 55% only
- Transforming the econmic system from linear to circular will reduce the remaining 45 %



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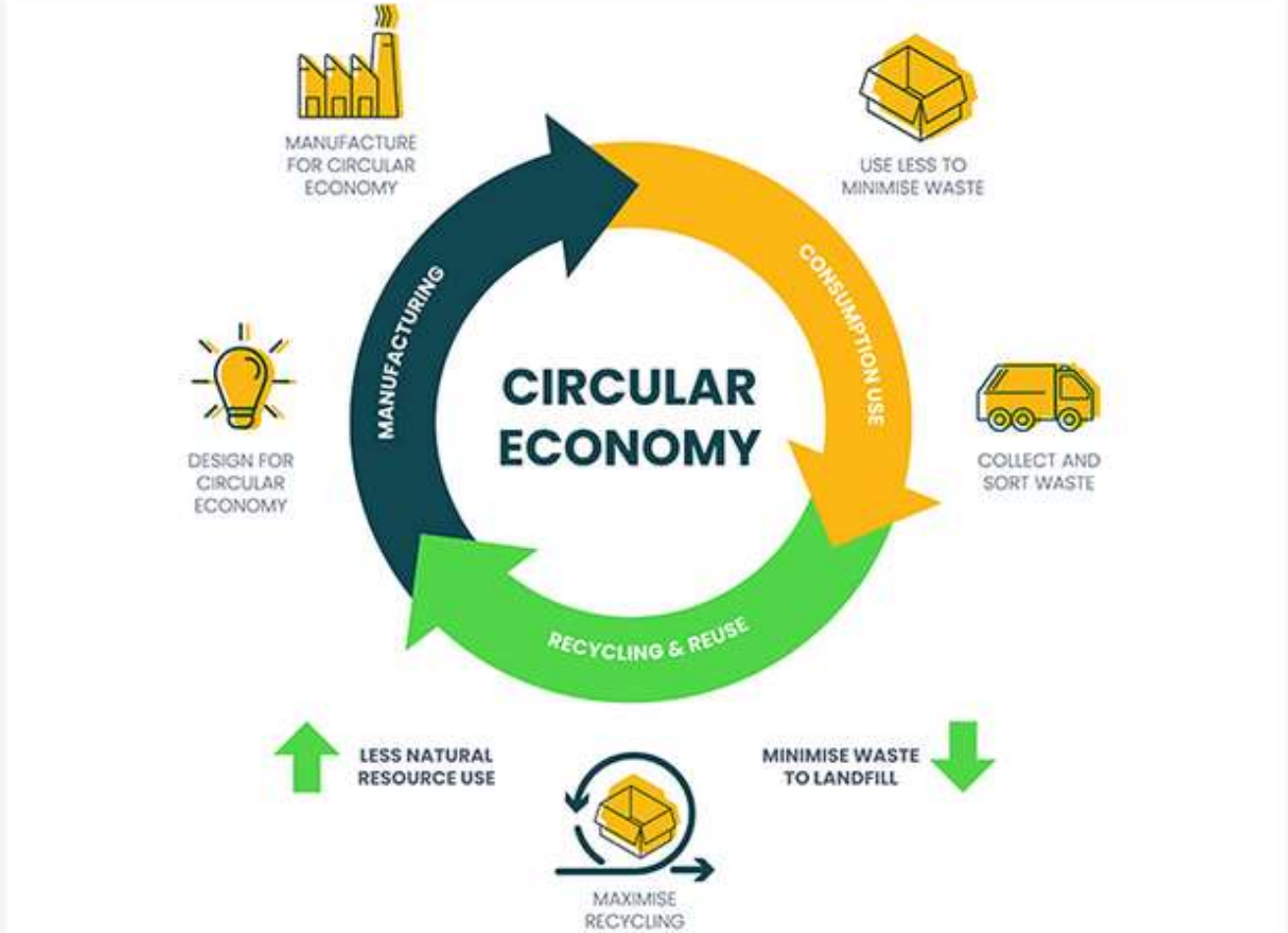

MANUFACTURE FOR CIRCULAR ECONOMY
USE LESS TO MINIMISE WASTE
MANUFACTURING
CONSUMPTION USE
CIRCULAR ECONOMY
DESIGN FOR CIRCULAR ECONOMY
COLLECT AND SORT WASTE
RECYCLING & REUSE
LESS NATURAL RESOURCE USE
MINIMISE WASTE TO LANDFILL
MAXIMISE RECYCLING

Hazardous substances and climate change

- Some hazardous substances can have an impact on **climate change**
- **VOCs** contriute to climate change

What are VOCs?

- VOCs stand for Volatile Organic Compounds
- They are chemicals that easily evaporate into the air at room temperature
- VOCs are emitted by a wide array of products and materials, such as paints, cleaning supplies, and building materials
- Common sources of VOCs include solvents, fuels, and industrial processes

The Role of Ozone and VOCs in Climate Dynamics

- Ozone is a strong greenhouse gas
- Ozone forms from nitrogen oxides (NOx) near ground level
- VOCs elevate nitrogen oxide levels, particularly NO2
- Increased NOx leads to heightened ozone levels
- Unsaturated organic compounds in particular, such as olefins or aromatics, contribute strongly to ozone formation.

Development of Ozone

How do VOCs affect the climate?

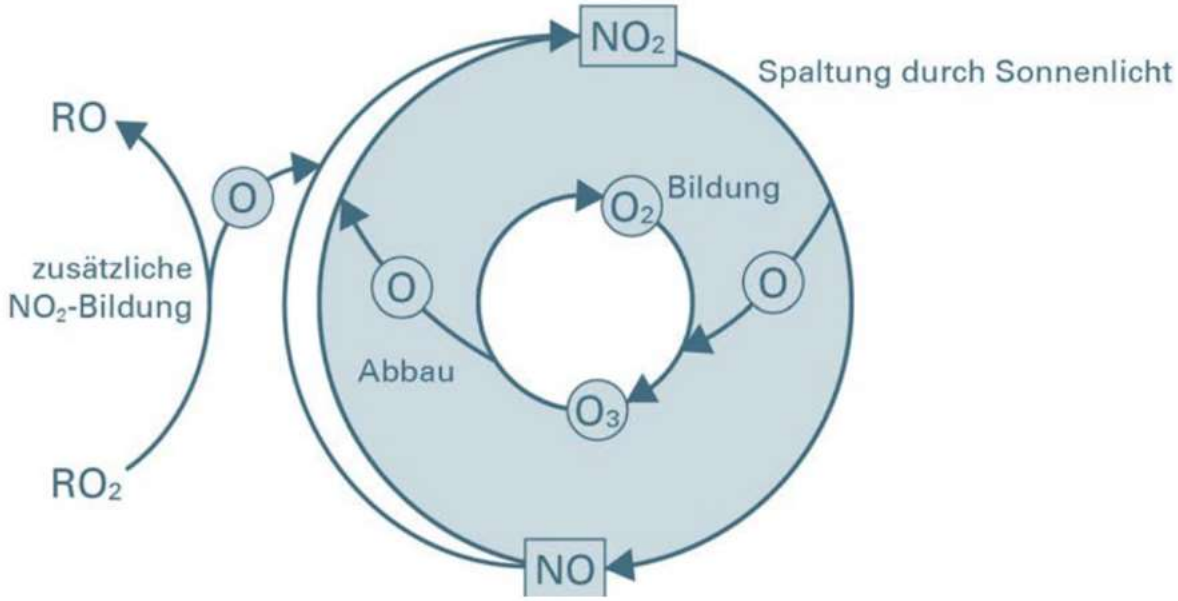


Figure 1: evelopment of Ozone. R refers to various VOCs from which an oxygen atom given away and introduced into the cycle of ozon development. Figure from Bayrisches Landesamt für Umwelt (2004)

Impact of VOCs on Ozone formation

Role of VOCs

- VOCs shift the balance, increasing ozone levels
- VOCs contain oxygen, converting NO to NO2
- Higher concentration lead to increased ozone
- Reduced NO presence decrease ozone decomposition

Sources of VOCs

- Approximately 60% of VOCs in the troposphere come from paints and varnishes (LFU Bayern, 2004)
- Choosing VOC-free products in construction can significantly reduce ozone formation

F-gases and Global Warming

- F-gases include HFCs, SF6 and NF3
- Up to 23,500 times more potent than CO2
- Specially produced for use in various industrial applications as working fluids
- Unlike classic greenhouse gases that are often released unintentionally, F-gases are produced and used intentionally
- Similar role to CFCs, which were known for depleting the stratospheric ozone layer

Managing F-Gas Emissions

Regulatory Action

- Due to high global warming potential they were included in the Montreal Protocol in 2016
- Industrialized countries agreed to begin reducing HFC emissions starting in 2019, aiming for an 85% reduction by 2036

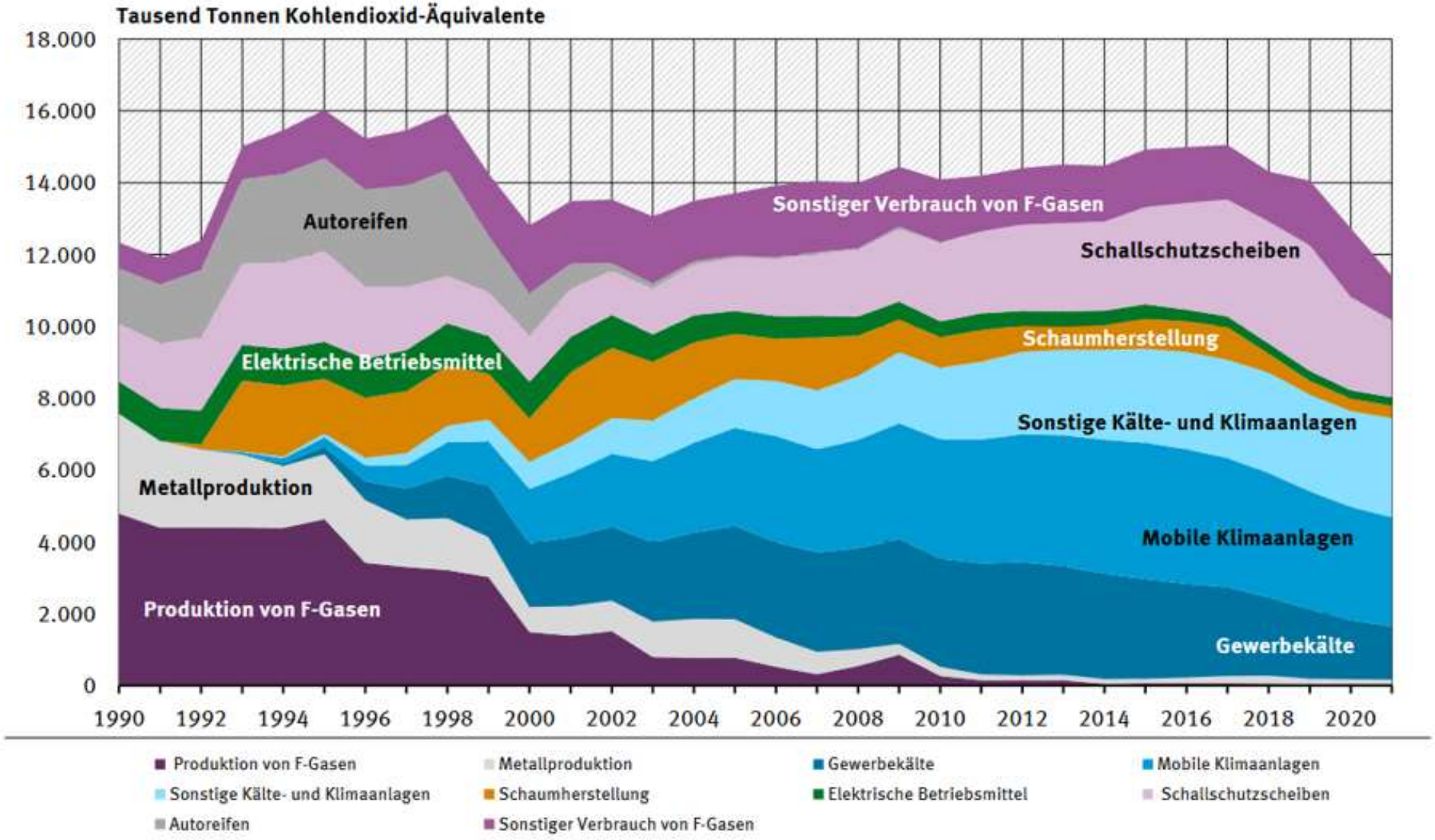
Current Emission trends

- F-gas emissions in Germany declining since 2016
- Altough Rising demand for refrigerants, e.g., for heat pumps

➢ Over the next 10 to 20 years, balancing these competing priorities will be critical

Quellen der Emissionen fluorierter Treibhausgase

F-Gas Emissionen differenziert nach verschiedenen Anwendungen und Produktionen



Quelle: Umweltbundesamt, Nationale Treibhausgas-Inventare 1990 bis 2021 (Stand 03/2023)

What should you have learned?

- Understand the circular economy model
- Understand why chemicals additives are added in products
- Understand how pollutants affect Reusability and Recyclability
- Understand how to achieve net zero emissions
- The role of ozone and VOCs in climate dynamics
- Understand the role of F-gases and global warming

1.4. HAZARDOUS SUBSTANCES, CIRCULAR ECONOMY AND CLIMATE – PART 2

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Why are Hazardous Substances Prevalent in Construction Materials

- **Chemical additives** are essential for desired properties in modern construction
- Buildings today must be **comfortable**, **durable**, easy to maintain, and **energy-efficient**
- Increased expectations lead to more complex material requirements
  - Additives ensure facades remain **clean** and aestheically pleasing
  - Surfaces must be **dirt repellent** and easy to clean
  - **Fire protection** requirements are met through specific chemicals
  - To achieve these properies addtives such as biocides, PFAS, bisphenols, and brominated flame retardants are added

Easy-to Clean Kitchen Surfaces with Additives

- Additives are incorporated into surfaces and paints to **improve** their cleaning and maintenance **properties**
- For example Kitchen wall paint with **Teflon** (polytetrafluoroethylene) additives

Environmental and Health Impacts of Chemical Additives in Construction materials

Advantages vs. Disadvantages

- Enhance material Properties but can harm the environment and health

Containment and Purpose

Long Term Leakage

- Chemical additives are generally unproblematic as long as they are safely contained in the building material
- In reality Substances can leak over years and decades

Kitchen wall Paint with Teflon

Benefits

- Creates non-stick surface, preventing grease and grime buildup
- Makes cleaning spills and stains easy with just damp cloth

Critical considerations

- Additives like Teflon can release harmful chemicals, especially when heated
- Teflon and similar compounds do not break down easily, contributing to environmental pollution
- Some additives may emit VOCs which can cause various health issues

Hotspots for Hazardous Substances

- **Mono Material Surfaces**: Large quantities of harmful substances
- **Painting and Coatings**: VOCs in indoor air
- **Floor coverings**: Carpets and PVC contain harmful chemicals
- **Adhesices and Sealants**: Release harmful chemicals locally
- **Wet/ventilation Areas**: High risk of substance release

How to reduce harmful substances in Construction

- ✓ Identify the largest **Mono-materia**l surfaces per room, prioritize non-or low-toxicity materials
- ✓ Choose flooring, wall, and ceiling finishes that don‘t require adhesives
- ✓ Opt for **natural** alternatives when available
- ✓ Check material **specifications** for toxicity information **or contact distributors**
- ✓ **Minimize** unnecessary treatments of materials and finishes
- ✓ Prioritize **mechanical connections** between building elements

Overview of typical hazardous substances in construction material

- PFAS
- Brominated flame retardants
- ORFRs
- Biocides
- VOCs

PFAS

Overview

- **Composition**: over 10,000 compounds
- **Properties**: Heat, radiation, weather resistant, chemically inert, stain repellent

Applications

- **Uses**: surface treatments, textiles, wood products, lineleum, plastic piping, insulation, paints, coatings, sealants

Health and Environment

- **Persistence**: Extremly resistant to degradadation
- **Mobility**: can reach groundwater, globally transported
- **Bioaccumulation**: Build up in organisms, contanimate food chains
- **Toxicity**: some are endocrine disruptors, reproductive toxins, cardinogens

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Brominated flame retardents

Overview

- **Composition**: Organic compounds with at least one bromine atom
- **Purpose**: Reduce flammability and slow fire spread

Applications

- Treated materials: Polystyrene, foams, insulation, linoleum, laminate, wood, sealants, paints

Health and Environment

- **Properties**: Persistent, mobile, bioaccumulate, toxic
- **Health risks**: Carcinogenic, mutagenic, endocrine disruptors
- **Exposure**: Dust and inhalation
- **Environmental impact**: found globally, including remote areas

ORFRs

Overview

- **Properties**: Flame retardants and plasticizers
- **Purpose**: Substitutes for restricted brominated flame retardants

Applications

- **Treated materials**: PVC plastics, polyurethane, PIR materials, poluethane foams

Health and Environment

- **Health risks**: Neurotoxicity, developmental toxicity, reproductive damage, endocrine disruption, carcinogenicity, bioaccumulation, persistence
- **Exposure**: Skin contact: ingestion, inhalation
- **Environmental impact**: found in air, water, dust, sediments, soil and biological matrices

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Biocides

Overview

- **Function**: prevent microbiological degradation and protect materials from microorganisms like mosses, fungi, bacteria, algae, and lichens.
- **Usage**: commonly applied in construction to enhance durability and longevity

Applications

- **Treated materials**: paints, coatings , sealants, adhesives, wood, natural fiber insulation, other biodegradable materials

Health and Environment

- **Toxicity**: Designed to affect biota, thus hazardous to humans and the environment
- **Environmental impact**: Hazardous to aquatic life
- **Regulations**: often restricted due to their toxic properties

Votatile Organic Compounds (VOCs)

Overview

- **Properties**: not a unified chemical group but share volatility at room temperature
- **Usage**: commonly found in construction materials

Applications

- **Treated materials:** Various construction materials as coatings, adhesives, sealants, wood, stains, insulation and boards

Health and Environment

- **Adverse effects**: Respiratory issues, sensitization, cardiovascular and nervous system damage, and even cardiogenic effects
- **Environmental impact**: continuous contamination of air, water, dust, sediments, soil and biological matrices
- **Exposure**: Skin contact, ingestion, inhalation

Building Elements

Determinants of Sustainability	• Embedded polluntants • Circularity • Climate impact
Material selection factors	• Application-specific considerations • Prioritization of environmental concern • Collaboration of Construction experts
Vernacular Construction	• Utilizes low-impact materials • Require proactive maintenance planning
Considerations for key elemets	• Walls and Slabs: Vital for load-bearing

Steel

Strength of Steel

- Excellent strength properties making it a top choice
- Innert and safe during construction use

Recyclability

- Steel is 100 % recyclable
- Great contribution to circular economy

Environmental Impact

- Climate impact from iron ore extraction
- Energy-intensive production leading to Co2 emissions
- Potential Groundwater and ecosytem effects

Toxfree “+”, circularity “+”, climate neutrality “-“

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Concrete

Strength of Concrete

- Durable, strong, generally innert, and non toxic

Recyclability

- Difficult to reuse due to disassembly challenges
- Often leads to downcycling rather than true recycling

Environmental Impact

- Acts as thermal mass in buildings
- Concrete is a major contributor to Co2 emissions
- Accounts for 8% of global Co2 emissions

Toxfree “+”, circularity “-”, climate neutrality “-“

Rammed Earth

Strength of Application

- Suitable for constructing load-bearing walls
- Utilized to form durable walls from layers of rammed soil

Circulaity

- Reusable in new construction
- Naturally returns to the environment at the end of life

Environmental Impact

- Low embodied carbon
- Energy-efficient: Balances indoor humidity, acts as thermal mass
- Alternatives: Straw/flax mixed with clay for load bearing-walls

Toxfree “+”, circularity “+”, climate neutrality “+“

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What should you have learned?

- Understand the prevalence of hazardous substances in construction materials
- Identify common hotspots for hazardous substances
- Recognize and describe properties of typical hazardous substances in construction materials
- List key factors for sustainable building practices

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Introduction

1.5. 10 FACTS ABOUT CONSTRUCTION MATERIALS AND ADVERSE HEALTH EFFECTS

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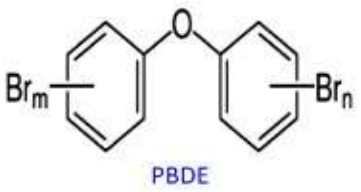
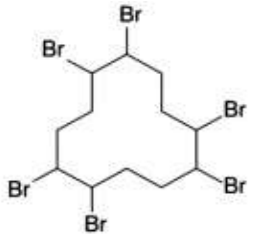
Fact 1:

We spend 80% of our time indoors.

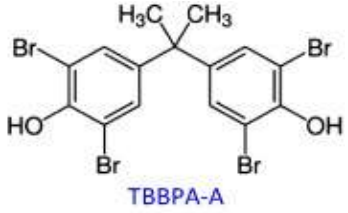
Fact 2: We are exposed to various hazardous substances (HS) indoor.



PBDE

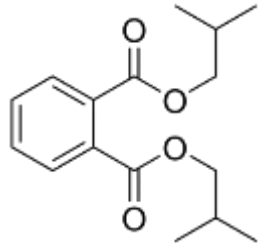


HBCD

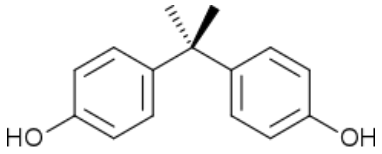


TBBPA-A

Brominated flame retardants (BFRs)

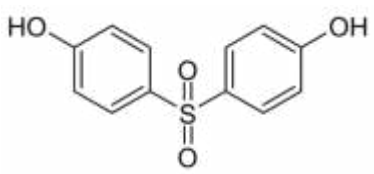


phthalates



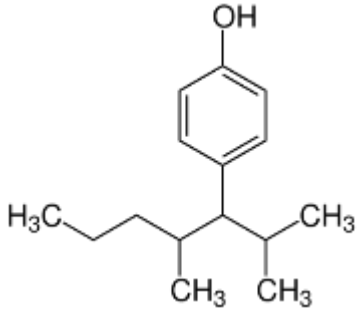
bisphenol A

(BPA)



bisphenol S

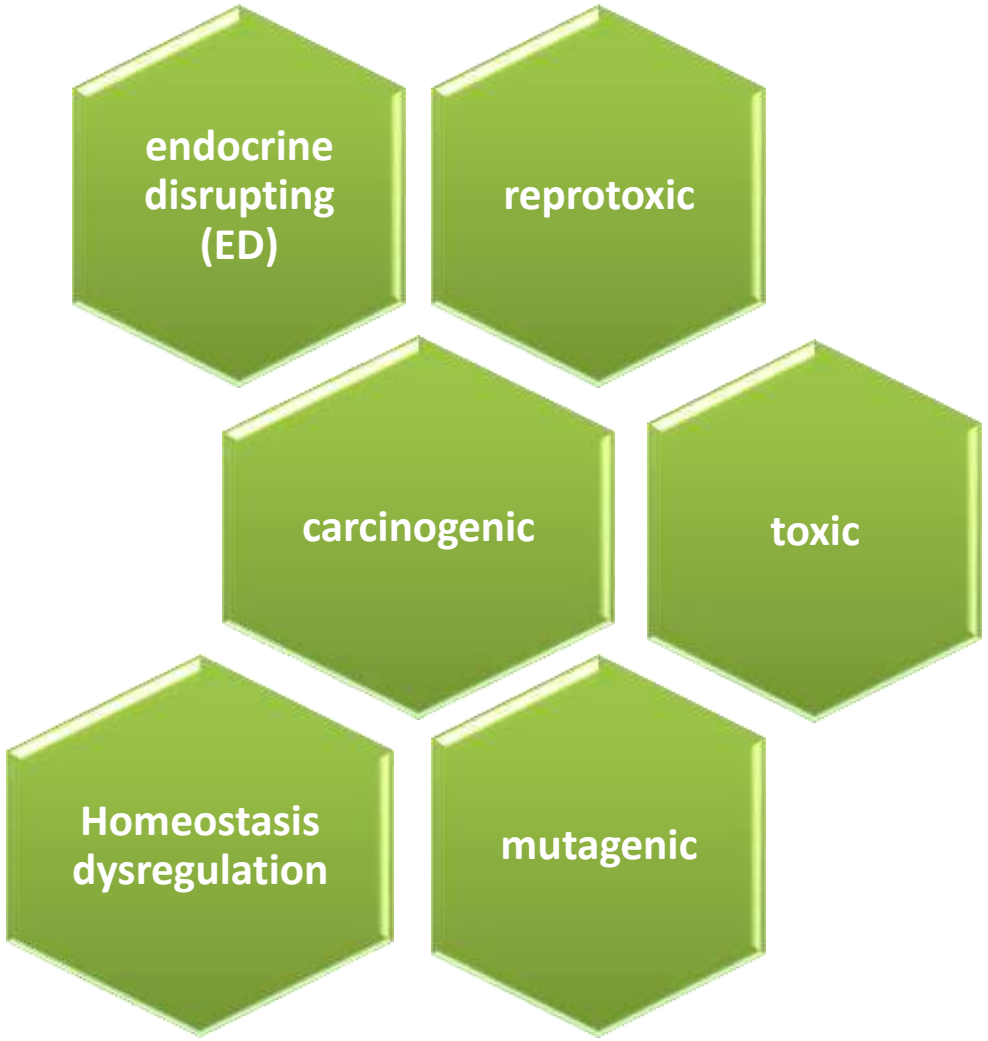
(BPS)



nonylphenol

Rovira J.; Environmental Research; 2019

Fact 3: Hazardous substances (HS) – different adverse health effects



Fact 4: Dose of HS and the effects

- Dose is crucial for toxic substances
- EDs - dose as in the action of hormones (very, very low, effects not related to dose change)
- The significance of HS dose changes in the mixture of various compounds
- Age: infants and children may have a higher EDC burden for a given dose compared to adults

Fact 5: EDs can exert effects either as unchanged substances or after their biotransformation into metabolites that may be more potent than the parent compounds.

(Diamanti-Kandarakis et al., 2009)

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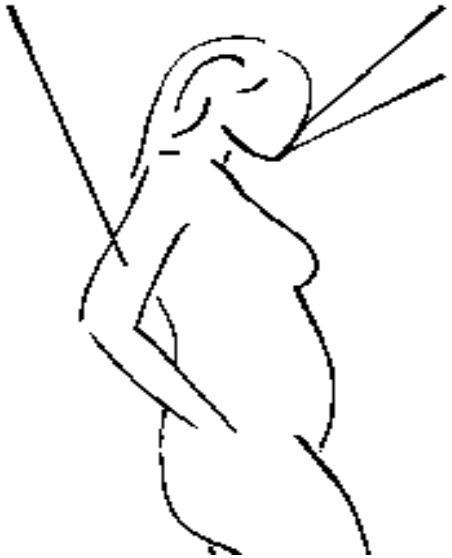
Fact 6: We are exposed to a mixture of substances with various potential of adverse health effects!

Fact 7: The route of exposure can affect the bioavailability of EDs

Transdermal

Inhalation

Ingestion



(Lehle and McCarrey, 2020)

Fact 8: Hazardous substances emitted from construction materials have a lot of adverse health effects.

Adverse health effects of HS exposure

Hormone dependent cancers
Obesity, diabetes, and insulin resistance
Fertility disorders in men and women

Developmental disorders
Cardiovascular diseases
ADHD, autism

Premature puberty
Allergy and asthma
Thyroid disorders

Metabolic disorders
Endometriosis
Low birth weight (...)

HAZARDOUS SUBSTANCES FROM CONSTRUCTION MATERIALS

ENDOCRINE DISRUPTION

METABOLIC DISRUPTION

↑ ADIPOGENESIS
↑ OBESITY
↑ INSULIN RESISTANCE
↑ HYPERINSULINAEMIA
↑ OXIDATIVE STRESS
↑ INFLAMMATION

REPRODUCTIVE DISRUPTION

↑ OVARIAN STEROIDOGENESIS
↑ HYPERANDROGENISM
↓ OOCYTE DEVELOPMENT
↓ FOLLICULAR GROWTH

CANCER

DIABETES TYPE 2
ATHEROSCLEROSIS

FERTILITY PROBLEMS

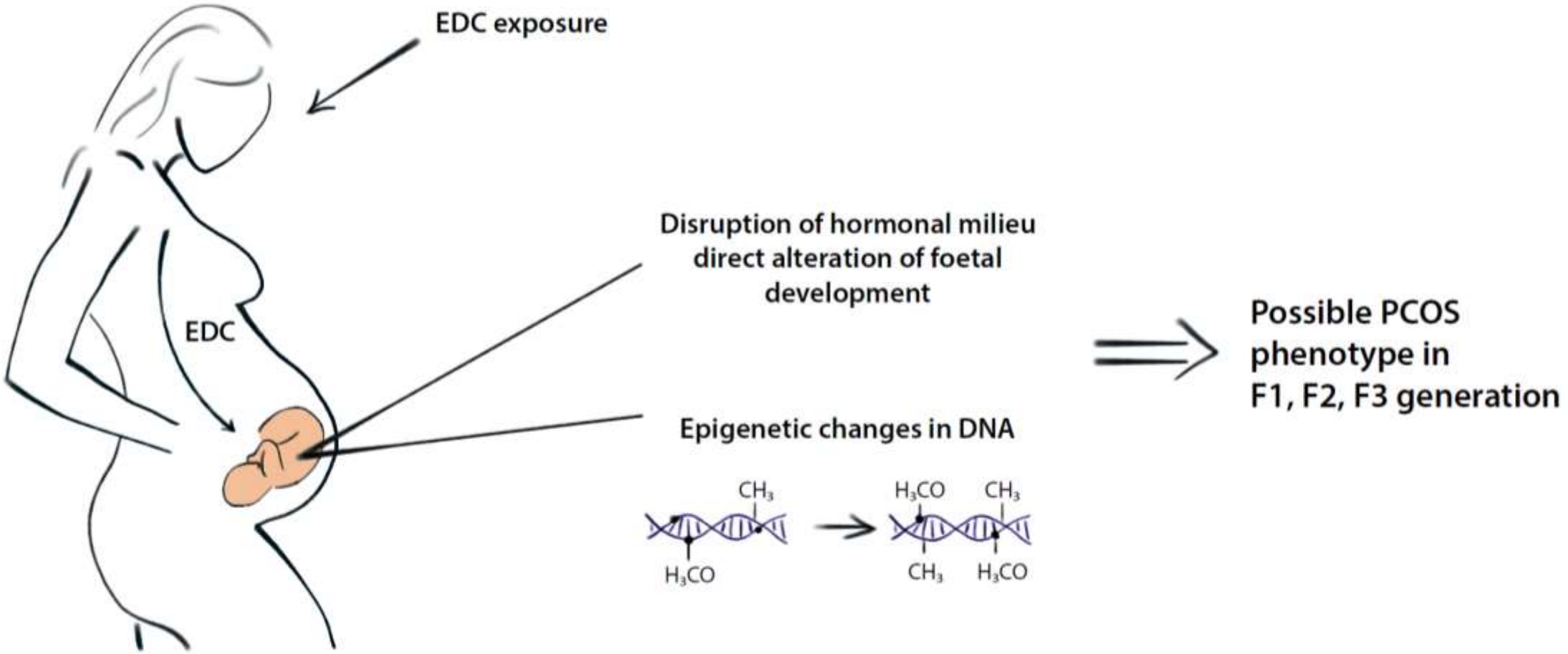
FACT 9: Timing/vulnerable groups/window of susceptibility

First trimester of pregnancy

Hand- or object-to-mouth activity

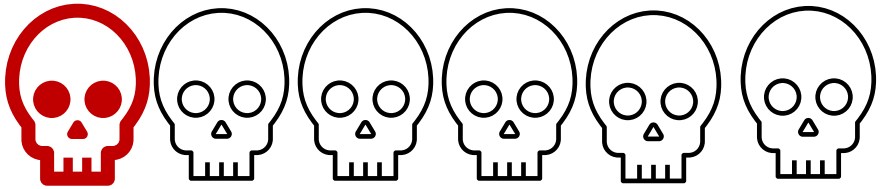
Growing organism is susceptible for HS

(Miller et al., 2002)



Rutkowska A., Diamanti-Kandarakis E., Fertility and Sterility, 2016

Fact 10: HS (also from home) and pollution – we have a choice!



9 million deaths per year = one in six deaths worldwide

Time is now!

What are you changing at home today?

Module 2

Municipal Processes and Tools

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Framework conditions, level of ambition

Municipal Processes and Tools

2.1. STRATEGIC PLANNING

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About this Module

The well-defined framework at the strategic planning phase is of support to back-up initiatives for going beyond the conventional construction practices.

The underlaying NHC3 context is built on consideration for an **increased level of ambition** defined *by the degree of setting higher demands than required by the national legislation* at the municipal construction practices.

Very often **higher level of ambition** calls for a change in conventional daily routine and searching for new products, process, organization of work or approaches to a market. Here the **innovation** would involve successfully incorporating new ideas to **generate changes** that help to solve the needs for sustainable construction and the three aspects of toxicity, climate, and circularity considerations.

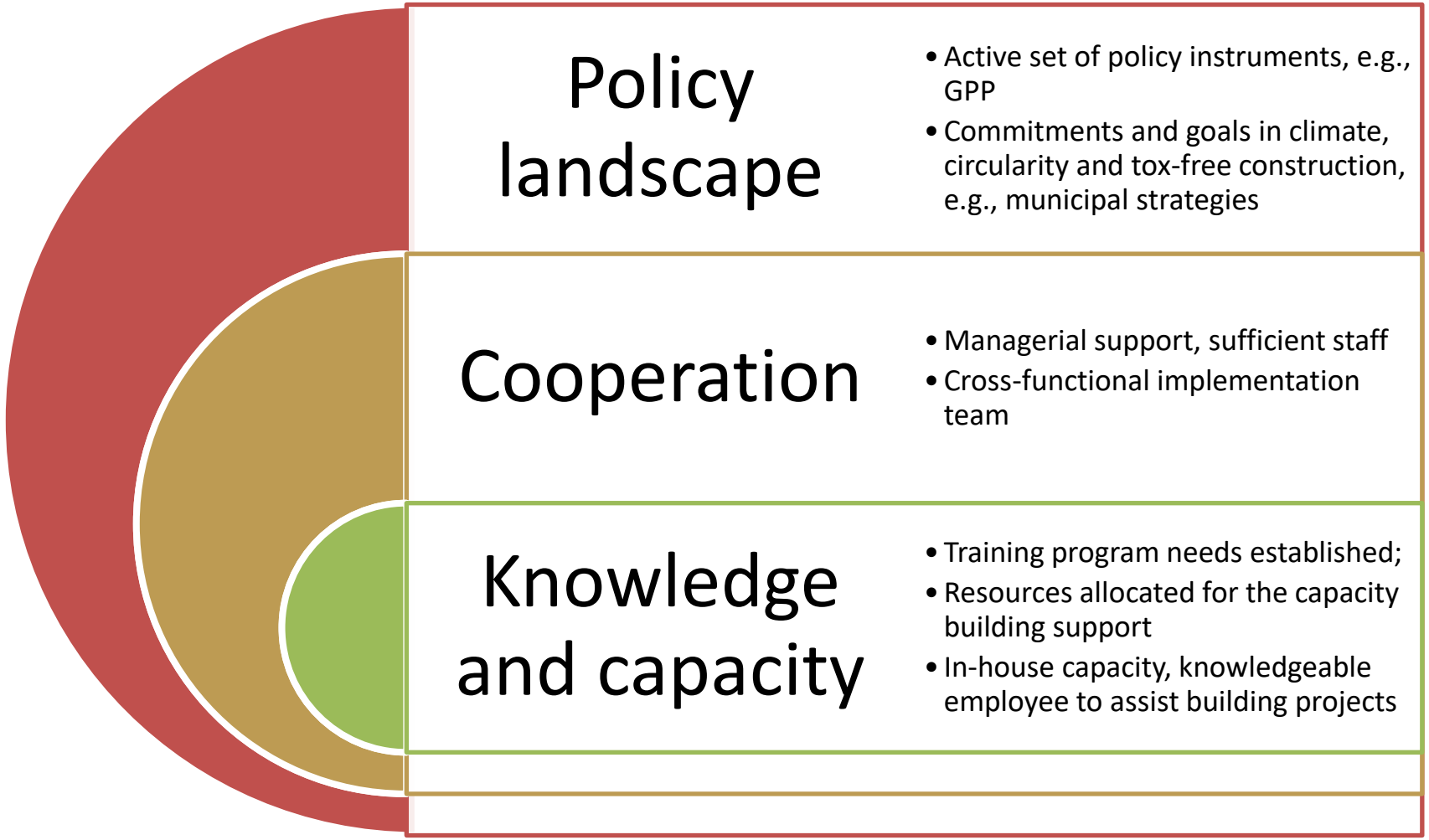
Promoting the innovation in construction calls for new approaches in organizing the work at municipalities.

This training module on Strategic planning consists of several sub-modules:

Why strategic planning is of value

- Municipalities have a power to take decisions to invest in sustainable construction
- Strategies to incentivize innovative solutions at municipalities
- The strategic planning activities are not part of the actual tender of the construction project → contribute to understanding and defining specifications at the further steps
- **Aim of the strategic planning is to ensure commitment to a certain level of ambition in a construction project!**

Framework supporting the implementation of strategic planning:



Cross-functional implementation team

Competence	Assigned: yes/no	He role
Project manager		
Top level management		aimed to support the team with their decisions and commitments to implementation of the solution(s).
Medium level management		
End-user representative		
Experts from the municipality departments:		
Architect		
Construction expert		
Engineering expert		
Environmental expert		
Chemicals expert		
A procurement expert		
Other……		

Cross-functional implementation team

- **Top level management** aimed to support the team with their decisions and commitments to implementation of the solution(s).
- **Medium level management** representing, e.g., the project owner, head(s) of the respective department(s) related to the envisaged construction project.
- **Experts from the municipality departments** that are related to the envisaged construction project. An employee with knowledge and education in sustainability, who can assist all building projects.
- **End-user level** can be represented by respective construction project end-user organization or department.
- **A technology [architect, construction] expert(s)** with deep knowledge of the technological state of the art in the innovative construction project.
- **A chemicals/ environmental expert** with knowledge on the toxicity, circularity and climate aspects related to the construction project.
- **A procurement expert** who understands the process and legal requirements of the procurement at the municipality. Involvement of the procurement expert from an early implementation step will give an inside overview of the construction project. This will be useful for organizing a procurement at the technical implementation phase.
- **Project manager** with expertise in innovation and knowledge management.

Strategic planning phase…

Strategic planning phase precedes the actual construction project with preparation and clarification of:

- **The background**, i.e., needs of the construction
- **The level of ambition**, i.e., going **above the current legal requirements** towards the three pillars – tox-free, circular aspects and climate neutral aspects **to a building** & non-toxicity of **construction materials**
- **Stakeholders** mapped and relevant lists prepared
- **Market dialogue** conducted (if applicable)

The needs, priorities, objectives

- Needs of the municipality in construction can be well linked to other areas, e.g., social, health, well-being
- New needs in construction may arise from policy objectives, standards, regulations municipalities are obliged to comply
- The user needs mapping in communication with departments, end-users
- Reality check
- Methods to employ:
  - Focus group discussions (with external experts, key SH)
  - Senior management workshops at municipality
  - Interviews with key service users (house managers, end-users)
- Prioritization, verification, integration in the new development concepts!

Level of ambition drives solutions

The **level of ambition** is defined *by setting higher demands than those required by the national legislation*

On construction materials:

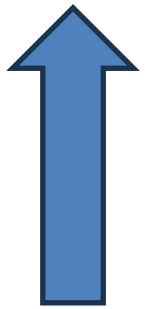
- Type 1: Nordic Swan (Nordic), the EU Ecolabel, and the Blue Angel (DE)
- Assessed materials
- For various categories of materials: load bearing, non-load bearing, finishing materials

On buildings:

- Intention for an Eco-certification
- Eco-certification – BREEAM (UK), LEED (US), DGNB (DE), Milio Byggnad (SE), Nordic Swan Ecolabel buildings (Nordic)
- Intended objectives on **tox-free, circular** and **climate neutral** aspects

Financial capacity

Legal prescription, political decision, participation in projects, financial incentives



Political support

Commitment from the top-level management, front-runner role, election promises

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Market stakeholders

- Needs of the municipality in construction can be well linked to other areas, e.g., social, health, well-being
- New needs in construction may arise from policy objectives, standards, regulations municipalities are obliged to comply
- The user needs mapping in communication with departments, end-users
- Methods to employ:
  - Focus group discussions (with external experts, key SH)
  - Senior management workshops at municipality
  - Interviews with key service users (house managers, end-users)
- Prioritization, verification, integration in the new development concepts!

Market dialogue

- Sequential steps of the market dialogue event:
  - Define range of issues for discussion
  - Prepare the event details
  - Pre-event announcements
  - Elaborated agenda
  - Implemented post-event activities
- Prioritization, verification, integration in the new development concepts!

Setting the goal to support implementation for municipalities. When the level of ambition is determined upfront the little decisions on the way become easier andas several suppliers may be seeking to comply, that can also come handy.

Municipal Processes and Tools

2.2. LEVEL OF AMBITION

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Setting the goal

- The more public the goal is set
  the easier the impementation for the municipality gets.

- When the goal is transparent and made official, then stakeholders become aware of the goal of the municipality.
- Their focus will automatically shift towards implementation and compliance (rather then questioning the requirement).
- Stakeholders realize, that the level of ambition does not target or burden them specifically, but is uniform for all suppliers and service-providers
- Stakeholders will be aware of any issues they might have as well as potential solutions for those issues.
- Stakeholders who already comply will feel recognized and valued.
- Ambition should be clear and understandable.

Level of ambition

Why set a level of ambition?

- renders decision-making more effective
- helps to prioritize what is most impactfull
- helps with equal minimum ambition with different materials
- Equal ambition across projects? > Suppliers recognize the requirements or are already familiar with requirements
- Reliable ambition for a given time-span

Find support from political level:

- Communicate committment
- Adjust the level of ambition to match existing political committment

How about compromises?

Any compromise will:

- Erode compliance of stakeholders
- Stakeholders share experience and realize that implementation is not stringent
- Stakeholders might try to renegotiate
- Stakeholders who comply with stringent demands do not get their expected ROI
- It is ok to become more stringent as time goes by, but loosen stringency would be detrimental.
- Suppliers exchange about implementation, also if implementation is less stringent or has certain leniency

Recommendation:

Do set your level of ambition carefully but with courrage and committment, do not move backwards (else you destroy credibility).

Example: Västerås/SE

Policy
Handlingsplan
Riktlinje

Västerås stads handlingsplan för kemikalier 2020-2025

Antagen av kommunfullmäktige den 1 oktober 2020

DNR: 2019/01067

Source:
Västerås stads handlingsplan för kemikalier 2020-2025.pdf (vasteras.se)

How to set your Level of Ambition

- What do you want to achieve? (roughly)
- Define your scope (as large as possible and within your organisational power
- benefit from common approach by joint forces

Do you share your goals with fellow municipalities, find other allys or start a joint approach?

- Define your target: Specify your goal more precisely. In case your goal would be **substitution** or phase-out of a substance, how can you **prevent regrettable substition**?
- Do you have a realistic idea about additional costs? For prototype and how that will evens out at larger scale? Would this require a **market consultation**?

Money, money, money (2)
How prevent „too expensive“?

- Higher ambition can require initial investment from suppliers such as changing processes or material and identifying substitutes
- If your requirement is not a short-term fling, then suppliers will calculate their return on investment over a time, not with the first project and delivery.

Money, money, money (1)
Is there a cost of inacton?

- What is the cost of pollution?
- Where and when?
- Who pays the price?
- Can we afford to delay?
- Can my municipality be affected? (Water-treatment, drinking-water, health-cost…)
- What cost when innovation is not incentivised?

Read more about „Cost of inaction“

From Bill of Materials (BoM) to logbook

Municipal Processes and Tools

2.3. DOCUMENTATION & TRACEABILITY

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About this Module

In order to really know what is happening regarding chemicals used in your municipal buildings, our central recommendation is to establish a record keeping system. Internationally this is oftentimes called Bill of Materials, while in the Nordics it is kwon as log-book do reflect no the living nature of the documentation.

Logbook

- In order to know and keep track and ultimately manage chemicals in construction project, a **logbook** is created during **planning and design phase** by the architect/construction engineer and updated throughout.
- Municipality has to take decision on requirement on logbook and include it in technical specification
- Plan and document intended product and material choices, amend with reality as choices are being made.
- Central place to store and assess supplier information on products e.g: SDS, EPDs, eco-labels etc.
  - Ideal: complete content declaration ("full declaration")
  - Verify legal requirements (e.g. REACH, SDS..)
  - Supplier's declaration of conformity

Need for up-to-date documentation

- **Know what you are doing and documenting it for future use**
- Recording of material choices and their changes
- Verify conformity
- Record deviations in material/product choices
- **Trace back materials later when refurbishment/dismantling is needed**
- **Owner has information about the building**

Types of logbooks

- Simple excel-type documentation

Space for:

Solutions and creative ideas
own data-bases,
own evaluation programms

- Ready-made IT database systems that include assessments (BVB logbook)

Minimum requirements for logbook

- Name of the product
- Type of product
- Name of producer/importer
- The location of the product in the building (e.g. ceilings, walls, floor, roof etc)
- Available information (reference, link, upload)

Example: excell-logbook

#	Location of product (in the building)	Type of product	Product name & specification	Name of producer/importer	amount [unit]	available information
1	walls	indoor-paint	waterbased snow-white 123AB	Rainbow	20l	link to SDS http full content declaration
2	walls	wood	local planks 2400x 200x25 mm	Sawpoint	15m³	link to EPD http full content declaration indicating preserving agent
3	roof	solar-panel	sunroof 3000, 120x 80cm	Sunlink	16 pieces	Link to EPD REACH conformity
4						
5	Add stages : dummy by architect,		Add name of person who entered informtation			

Example from levels

Bill of Quantities/ Materials (for lifetime)								
Breakdown by material type			**Building floor area (m^2)**	**2500**	**Totals check (should =0)**	**0**		
			Breakdown by building aspect					
	Material total (t)	**Material total (%)**	**Shell**	**Core**	**External**	**Total**	**Units**	
Combined total	**5869**	**100,0%**	**5794**	**75**	**0**	**5869**	**tonnes**	
Concrete, brick, tile, natural stone, ceramic	5295,2	90,2%	98,7%	1,3%	0,0%	**100,0%**	**mass %**	
Wood	71,25	1,2%	768,625	120	0	**888,625**	**000 €**	
Glass	128,04	2,2%	86,5%	13,5%	0,0%	**100,0%**	**€ %**	
Plastic	3,75	0,1%	**Normalised cost (€/m2)**		**Normalised cost (€/t)**			
Bituminous mixtures	0	0,0%	**355,5**		**151,4**			
Metals	370,76	6,3%	**Normalised mass (kg/m2)**					
Insulation materials	0	0,0%	**2348**					
Gypsum	0	0,0%						
Mixed	0	0,0%						
Electrical and Electronic Equipment	0	0,0%						

Source: EU levels

Construction waste

Simplified estimate for Construction Waste (from EU levels)				
	Assumed wastage/ over-ordering rate	Assumed waste type	Assumed LoW code	Total CW (t)
Concrete, brick, tile, natural stone, ceramic	15,0%	Inert	17 01 01	452,43
Wood	20,0%	Non-haz	17 02 01	3,56
Glass	15,0%	Inert	17 02 02	9,60
Plastic	10,0%	Non-haz	17 02 03	0,09
Bituminous mixtures	5,0%	Non-haz	17 03 02	0,00
Metals	8,0%	Non-haz	17 04 07	16,38
Insulation materials	20,0%	Hazardous	17 06 05	0,00
Gypsum	22,5%	Non-haz	17 08 02	0,00
Mixed	10,0%	Non-haz	17 09 04	0,00
Electrical and Electronic Equipment	10,0%	Hazardous	16 02 XX or 20 01 XX	0,00

	Inert	Non-haz	Hazardous	Total
Tonnes	462,03	20,04	0,00	482,07
% split	95,8%	4,2%	0,0%	100,0%

Source: EU levels

Example: Evaluation by BVB

goto: https://interreg-baltic.eu/wp-content/uploads/2024/01/BVB-text-NonHaz.pdf

Benefits of BVB database/logbook

- Central storage and overview
- Avoid both missing and conflicting information
- Producers could enter their own information and manage access/confidentiality
- Assessments and documentation are in one place
- You can create your own projects and compare products with ready assessments
- Living document
- NHC3 partners can use BVB system for free

Options for construction material

Municipal Processes and Tools

2.4. CHECKING HAZARDOUS CHEMICALS FROM CONTENT DECLARATION

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Introduction

- As a municipal procurer, it is crucial to be aware of the content of construction materials regarding hazardous substances
- In order to perform the efficient conformity check of construction products within the supply chain the transparency and information sharing across all parties is necessary

➢ **We give you the basic literacy to obtain the information about the hazardous chemicals from Safety Data Sheets (SDS) or Environmental product declarations (EPD)**

Certain legal requirements exist

European chemicals regulation **REACH** (Registration, Evaluation, Authorization and Restriction of Chemicals)

- requires Safety Data Sheets (SDS) for hazardous chemicals or mixtures
- Article 33 of REACH stipulates that information about whether the material contains substances of very high concern (SVHC) in a concentration above 0.1% (weight by weight) must be shared by an upstream provider (producer, distributor, assembler) with downstream users
- Environmental product declarations (EPD) is one tool or possibility for producers to make the information on SVHC in construction materials available, they declare the content of SVHC

Construction chemicals with SDSs

- Legislation requires SDSs for **hazardous chemicals or mixtures**
- The relevant mixtures in construction that have SDS: adhesives, sealants, varnishes, paints, solvents, PU foams, wood preservatives, silicones, cement, concrete etc.
- An SDS is not provided for construction materials other than chemicals

Construction materials with EPD

- You can get information about **chemicals in construction materials** from the EPD
- The relevant materials: floor coverings, insulation plates, gypsum wallboards, glass wool boards, MDF wall panels, plywood and a lot of others

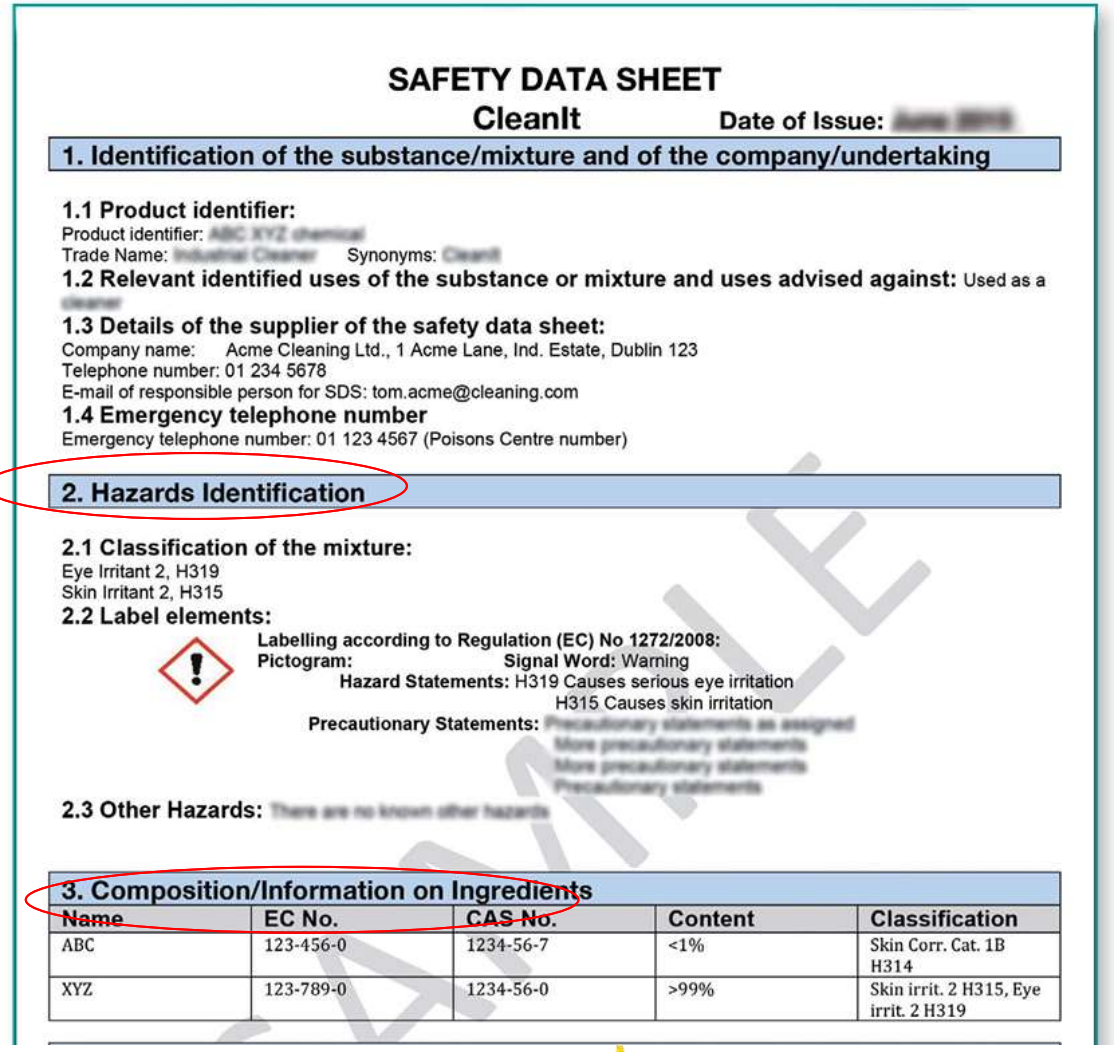
What information is important to know from SDS

The most important sections are:

Section 2. Hazards identification

Section 3 Composition/ information on ingredients

→ Check Sections 2 and 3 to find out about the hazards of mixture to users health and environment and about the content of hazardous substances



SAFETY DATA SHEET

CleanIt Date of Issue: [redacted]

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier:
Product identifier: [redacted]
Trade Name: [redacted] Synonyms: [redacted]
1.2 Relevant identified uses of the substance or mixture and uses advised against: Used as a [redacted]
1.3 Details of the supplier of the safety data sheet:
Company name: Acme Cleaning Ltd., 1 Acme Lane, Ind. Estate, Dublin 123
Telephone number: 01 234 5678
E-mail of responsible person for SDS: tom.acme@cleaning.com
1.4 Emergency telephone number
Emergency telephone number: 01 123 4567 (Poisons Centre number)

2. Hazards Identification

2.1 Classification of the mixture:
Eye Irritant 2, H319
Skin Irritant 2, H315
2.2 Label elements:
Labelling according to Regulation (EC) No 1272/2008:
Pictogram: **Signal Word:** Warning
Hazard Statements: H319 Causes serious eye irritation
H315 Causes skin irritation
Precautionary Statements: [redacted]

2.3 Other Hazards: [redacted]

3. Composition/Information on Ingredients

Name	EC No.	CAS No.	Content	Classification
ABC	123-456-0	1234-56-7	<1%	Skin Corr. Cat. 1B H314
XYZ	123-789-0	1234-56-0	>99%	Skin irrit. 2 H315, Eye irrit. 2 H319

SAMPLE

Section 2: you can check if it is a hazardous chemical

Section 2 enables you to judge if it is a hazardous construction chemical. It contains the hazard classification and the hazard communication elements. Classification includes hazard categories, hazard classes and hazard statements. The explanations could be easily found from UN webpage, https://unece.org/about-ghs

Pictograms alert users of the chemical hazards to which they may be exposed

Pictograms for Health Hazards

→ try **not** to choose construction chemicals, which classified for example as **Carcinogenic, Mutagenic, Reprotoxic,** which have severe acute toxicity or target organ toxicity

→ If possible, choose the alternatives, mixtures with the same function but with less classified hazards

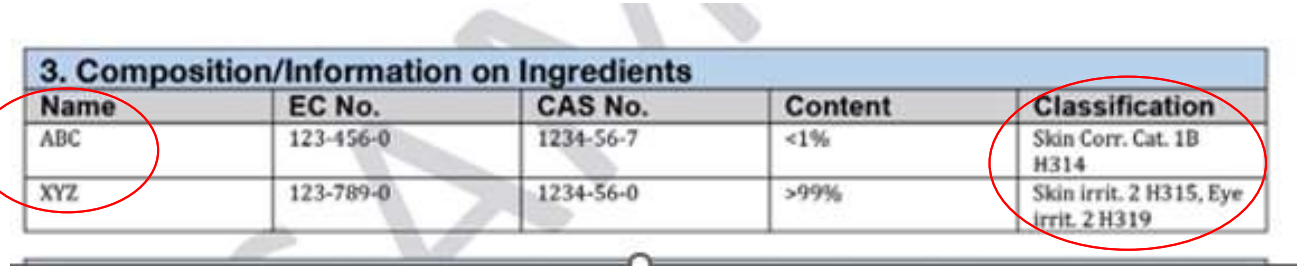
 Acute toxicity (severe)	 Corrosive (Skin corrosion/burns, eye damage)
 Carcinogenic Mutagenic Reprotoxic Respiratory Sensitization Target Organ Toxicity Aspiration Toxicity	 Irritant Dermal Sensitizer Acute toxicity (harmful) Narcotic Effects Respiratory Tract Irritation

Section 3: you can check the content of certain hazardous substances in the mixture

Section 3 enables you to check the **information about the ingredients and their classification**

- **You can judge if there are certain hazardous substances in the mixture that should be avoided**

- ✓ Certain concentrations of hazardous substances could be legally contained in different mixtures
- ✓ Although mixture may be chemically safe, it is still important to choose the mixtures with a low content of hazardous chemicals
- ✓ It is also appropriate to choose mixtures with less hazardous components



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XYZ	123-789-0	1234-56-0	>99%	Skin irrit. 2 H315, Eye irrit. 2 H319

The explanations of hazard categories, H-phrases could be found from the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS); https://unece.org/about-ghs

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Substances to be avoided in construction chemicals (1)

- **Volatile organic compounds (VOCs):** acetone, toluene, benzene, xylene, ethane-1,2-dithiol, n-butyl acetate etc

✓ used as solvents in paints or varnishes

✓ they are substances that evaporate during and after painting

✓ when inhaling paint or varnish fumes health effects like nausea, fatigue, headaches, skin and eye irritation might occur

→ Avoid VOCs, choose mixtures with low or no VOC (less than 10 g VOCs per liter)

→ Prefer water-based paints

Formalehyde is a VOC, that is used a such, but may also be formed during the use-phase:

Substances to be avoided in construction chemicals (2)

- **Formaldehyde and the formaldehyde-releasing preservatives:** quaternium-15, DMDM hydantoin, imidazolidinyl urea, diazolidinyl urea, polyoxymethylene urea etc

✓ formaldehyde-releasers are added to prevent microbial growth and extend shelf life; they slowly release formaldehyde

✓ formaldehyde is used in pressed-wood products, such as particleboard, plywood, fiberboard; formaldehyde releasers is used in paints, glues, adhesives, certain insulation materials and load-bearing (OSB particle board).

✓ formaldehyde is the contact allergen; it causes cancer, irritates the nose, eyes and throat; these irritations can happen even when exposed to low levels of formaldehyde. It makes those exposed prone to allergies.

→ Avoid formaldehyde or formaldehyde-releasing agents and preservatives

Substances to be avoided in construction chemicals

- **Isocyanates:** toluene diisocyanate, methylene diphenyl diisocyanate etc

✓ used in foams, adhesives, sealants, paints, coating products, flooring

✓ classified as potential human carcinogens and known to cause cancer, skin irritation; they may cause an allergic skin reaction, may cause allergy or asthma symptoms or breathing difficulties if inhaled and may cause respiratory irritation

✓ certain tasks, such as spraying, can produce very high exposure to isocyanates

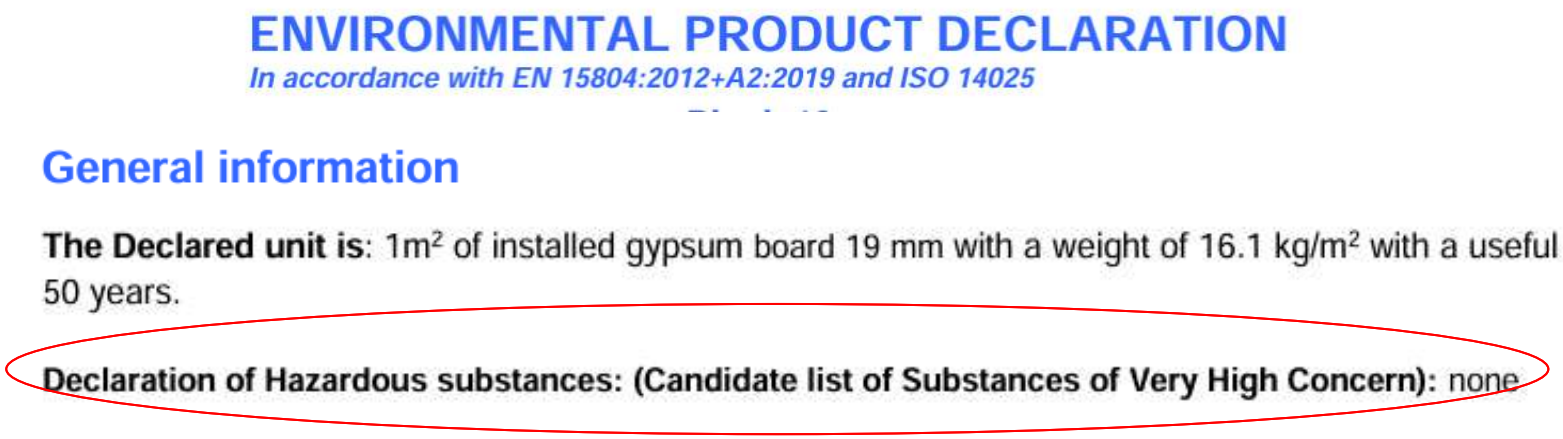
→ Avoid health-harming ingredients isocyanates

Environmental product declaration (EPD)

The overall goal of an EPD is to provide relevant and verified information to meet the producers' various communication obligations:

- EPDs are based on principles inherent in the ISO standard for Type III environmental declarations (ISO 14025)
- EPD providing declarations based on life cycle assessment of the respective construction product; in addition information on technical and functional properties of the product are included

- According to standard EPD shall include a content declaration with a list of materials and chemical substances including information on their hazardous properties
- declaration of material content of the product shall list as a minimum substances contained in the product that are listed in the Candidate List of **Substances of Very High Concern (SVHC)** for authorisation when their **content exceeds 0.1 %** of the weight of the product



ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804:2012+A2:2019 and ISO 14025

General information

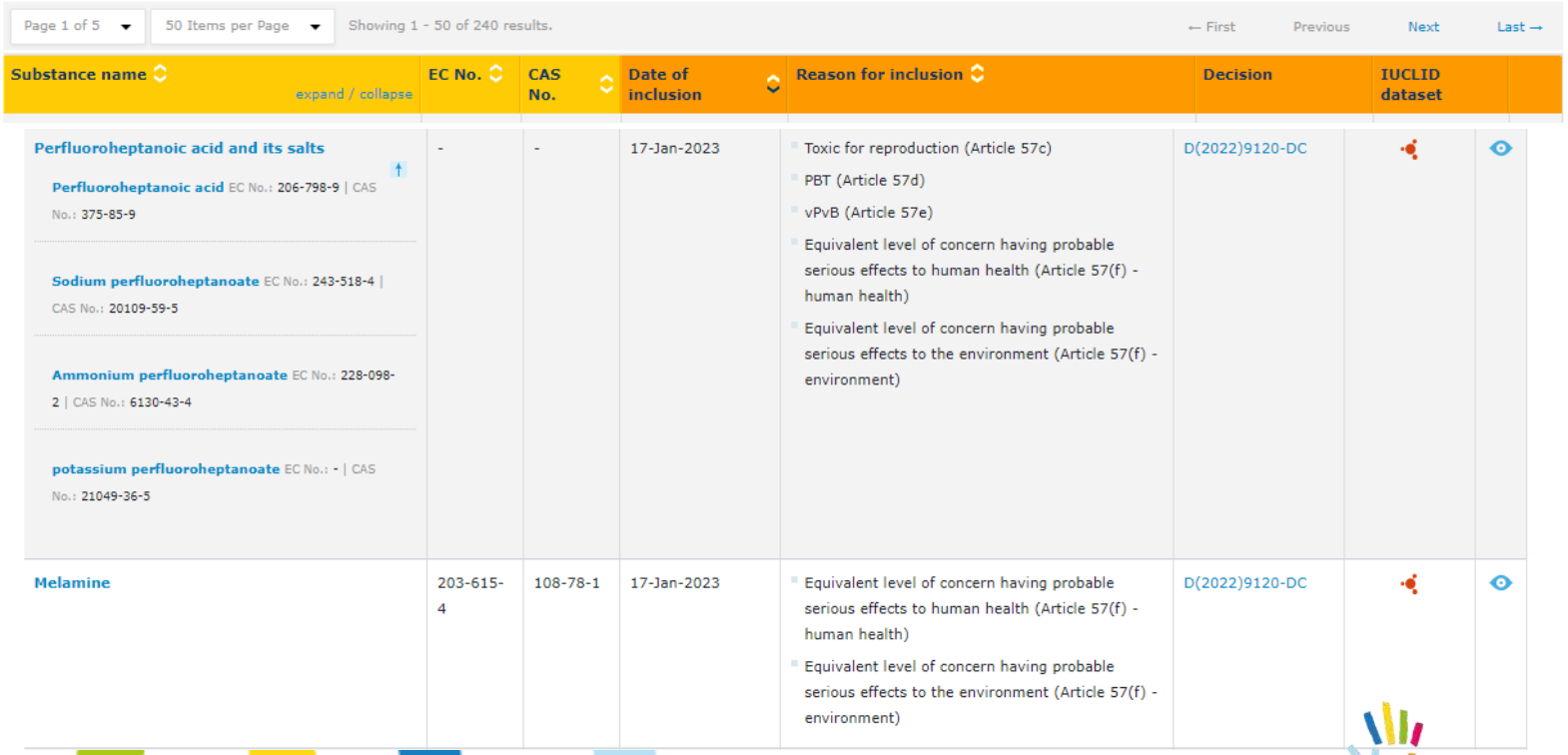
The Declared unit is: 1m² of installed gypsum board 19 mm with a weight of 16.1 kg/m² with a useful life of 50 years.

Declaration of Hazardous substances: (Candidate list of Substances of Very High Concern): none

Substances of Very High Concern (SVHC)

- Substances meeting the criteria for classification as **carcinogenic, mutagenic or toxic** for reproduction (CMR) category 1A or 1B
- Substances which are **persistent, bioaccumulative and toxic** (PBT) or very persistent and very bioaccumulative (vPvB)
- Substances on a case-by-case basis, that cause an equivalent level of concern (e.g. **endocrine disrupting substances)**

Candidate List of Substances of Very High Concern can be found on the European Chemicals Agencys web-page: https://echa.europa.eu/candidate-list-table



Page 1 of 5 | 50 Items per Page | Showing 1 - 50 of 240 results. | ← First | Previous | Next | Last →

Substance name (expand / collapse)	EC No.	CAS No.	Date of inclusion	Reason for inclusion	Decision	IUCLID dataset
Perfluoroheptanoic acid and its salts Perfluoroheptanoic acid EC No.: 206-798-9 | CAS No.: 375-85-9 Sodium perfluoroheptanoate EC No.: 243-518-4 | CAS No.: 20109-59-5 Ammonium perfluoroheptanoate EC No.: 228-098-2 | CAS No.: 6130-43-4 potassium perfluoroheptanoate EC No.: - | CAS No.: 21049-36-5	-	-	17-Jan-2023	Toxic for reproduction (Article 57c) PBT (Article 57d) vPvB (Article 57e) Equivalent level of concern having probable serious effects to human health (Article 57(f) - human health) Equivalent level of concern having probable serious effects to the environment (Article 57(f) - environment)	D(2022)9120-DC	
Melamine	203-615-4	108-78-1	17-Jan-2023	Equivalent level of concern having probable serious effects to human health (Article 57(f) - human health) Equivalent level of concern having probable serious effects to the environment (Article 57(f) - environment)	D(2022)9120-DC	

Some examples of SVHC that could be found in construction materials

Phthalates	Bis (2-ethylhexyl)phthalate (DEHP) Dibutyl phthalate (DBP) Diisobutyl phthalate (DiP) Benzyl butyl phthalate (BBP) Dicyclohexyl phthalate (DCHP) etc	Plastic materials (PVC flooring, wallpaper etc) Rubber materials
Per- and polyfluoroalkylated substances (PFAS)	Perfluorooctanoic acid (PFOA)	Treatment of flooring (carpet) for stain, soil, water resistance
Chlorinated paraffins	Short-chain chlorinated paraffins Medium-chain chlorinated paraffins	Flame retardants in PVC floor coverings, insulation materials
Organophosphorus flame retardants	Tris(2-chloroethyl) phosphate 2,2',6,6'-tetrabromo-4,4'-isopropylidenediphenol (TBBPA)	Flame retardants in different materials, in polyurethane
Bisphenols	Bisphenol A	Component of epoxy resins

→ Avoid SVHC in construction materials

Checking potential before tendering

Municipal Processes and Tools

2.5. SDB EXERCISE

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About this Module

Both exercises are about practicing to read SDS, about comparing, taking relevant note, double-check and look into details.

The trainer shall decide, how to time the exercises. It is possible to have a homework and ask participants to look into selected SDSs and familiarize themselves and get a first feeling about the 10 chemical products – you could also ask participants to make a list and note potential health effects of each product, in that case, thinking about exposure of the worker who is using the product as recommended. With this preparation, part one of the exercise will take less time. Still, you should calculate at least 30 minutes for the exchange. Without preparation count 1 hour or more. Ofcourse, trainers are welcome to exchange the suggested construction chemicals/products with others you see fit.

For Part 2 you need to go into the BVB Standard. The trainer can prepare this, or the group can find out for themselves. You can use the SDS examples to better understand the BVB Standard.

Compared to exercise 1 where participants still had to agree or not agree, in Part 2 the standard solves these questions. Participants understand why the BVB Standard must go this much into detail, and why one needs to constantly re-read it.

This Is probably the most important part of the training – please do not rush through it. The trainers have to decide if they want to collect results and allow exchange between their participants. At this point it is also possible to expand to include fellow standards that have criteria for the evaluation of chemical products and even compare standards.

1rst SDS Exercise

Download or print MSDS listed on the next slide (links in comments).

Participants may try individually, or may examine the SDS in pairs or teams. Please sort the chemical products according to their level of harmfulnes and try to justify your decisions: Which ones would you recommend, which ones would you try to avoid and why - justify?

Discuss

Databases to doubble-check

Several databases are relevant and can be consulted for reference:
EU is collecting scientific information about chemicals in IUCLID, current version is IUCLID 6:
https://iuclid6.echa.europa.eu/

In the US another database is popular, though IUCLID is also used. ChemID Plus references medical data and sometimes even product names in several languages:
https://pubchem.ncbi.nlm.nih.gov/source/ChemIDplus

There is no official complete evaluation list to single out chemicals of concern used in construction yet.

REACH lists

Under the EU REACH legislation there is a process to identify substances of very high concern (SVHCs):

- https://www.echa.europa.eu/substances-of-very-high-concern-identification

Once political agreement has been reached, these substances are added to the candidate list:

- https://www.echa.europa.eu/candidate-list-table

From this identification, memberstates can chose between the two processes or even use both in parallel:

- https://www.echa.europa.eu/substances-restricted-under-reach
- https://www.echa.europa.eu/authorisation-list

more lists

ECHA created a very transparent process, which means there are lists about past decisions and the reasoning and current ongoing decision processes.

The Swedish NGO ChemSec have a scientific team and are constantly screening scientific publications to indentify chemicals that would fit the SVHC-criteria scientifically and have their SVHC list online too: https://sinlist.chemsec.org/

Checking the SDS (Exercises)

pre-selection of products

The trainer shall pre-select real products. Depending on the audicence, SDS could originate from local companies in the language you require. Take care that you do have a wide range of chemicals preset and different chemicals of concern, as well as safe alternatives.

We recommend trainers to pre-select SDSs from different products but for about the identical purpose.

In can be interesting to also look into the technical datasheets. And also you can take a look into how the products are marketed.

In our case we found interesting examples for three applications:

- Wood treatment for weather-resistance
- Sealants for gas-beton-walls, (sealands seem interesting also for different applications)
- Putty
- Water-barriere foiling material such as for roofing

2nd SDS / BVB Exercise

First you may rate with the product groups and also see if you can as a whole group discuss across the product groups. Compare your results.

For this part you need to look into the BVB critieria. Ideally you would have one print-out/table, or one computer with BVB chemicals criteria.

Would you like to try and apply the BVB chemicals criteria? For which products would you have sufficient information to suggest a BVB rating? Is the rating any different from you initial thinking? Can you see why?

Checking potential before tendering

Municipal Processes and Tools

2.6. MARKET DIALOGUE

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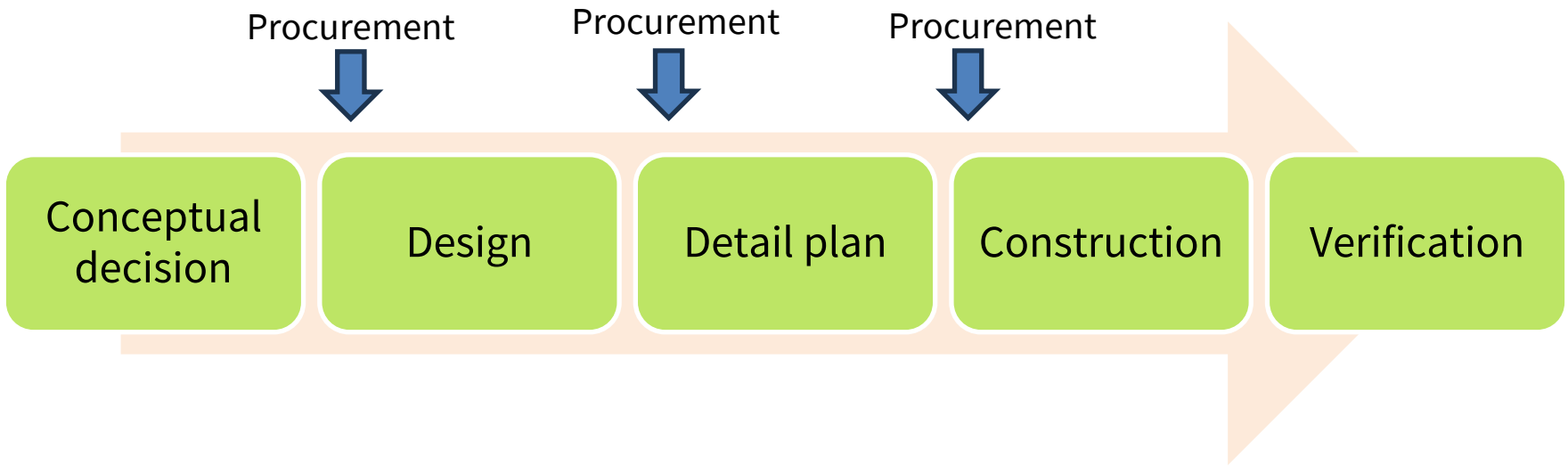
Market dialogue – when?

- Pre-tender stage
- Tendering stage



Market dialogue before tender

- Early engagement is important
- Request for information
- Seek feedback, check feasibility
- Promote inovation
- Document everything.

Early engagement

- Early engagement allows municipalities to find architectural and engineering firms with specialized knowledge and experience.
- Assess potential service providers based on their portfolios, qualifications, and references as well as their ability to deliver sustainable tox-free and circular construction designs.
- May help identifying suitable service providers with a proven track record in sustainable design and experience in sustainable construction projects.
- Communicate project aspirations early on, e.g. (ecolabel certified building materials).
- Important to ensure transparency, equal standards and possibilities of engagement for all service providers.

Request for information

- Involves contacting service providers with brief description of your project with an aim for sustainable construction.
- Requesting for specific information on availability of tox-free materials, circular and low GHG footprint materials, design solutions, etc.
- Gather technical data and information on chemicals.
- Obtain preliminary **cost** information.
- Identify potential challenges in your project.

Seek feedback, check feasibility

- Share your draft specification with stakeholders (service providers) requesting feedback.
- Compile a questionnaire aiming to pin-point challenges, risks of the project, as well as to weigh the capabilities of service providers.
- Based on feedback, re-assess your project feasibility, address potential challenges and iterate the project specification.

Promote innovation

- Take the time to promote the importance of sustainable construction practices using tox-free, circular and low green-house-gas (GHG) footprint building materials and their benefits.

Document the process

- Document the process of engagement with stakeholders, incl. all communications, meeting records. (for transparency and legal reasons)
- Knowledge of stakeholders, their capabilities, experience as well as technical information on materials may be useful for future projects.
- Useful for transfer of experience.

Market dialogue during tender stage

- Less opportunities to engage compared to pre-tender.
- Establish a possibility of receiving queries regarding the tender and providing replies.
- Organise workshops for potential bidders, where tender details and project goals are discussed.
- Gather feedback.

What that is, what it is not

Municipal Processes and Tools

2.7. LCA IN CONSTRUCTION-MATERIAL

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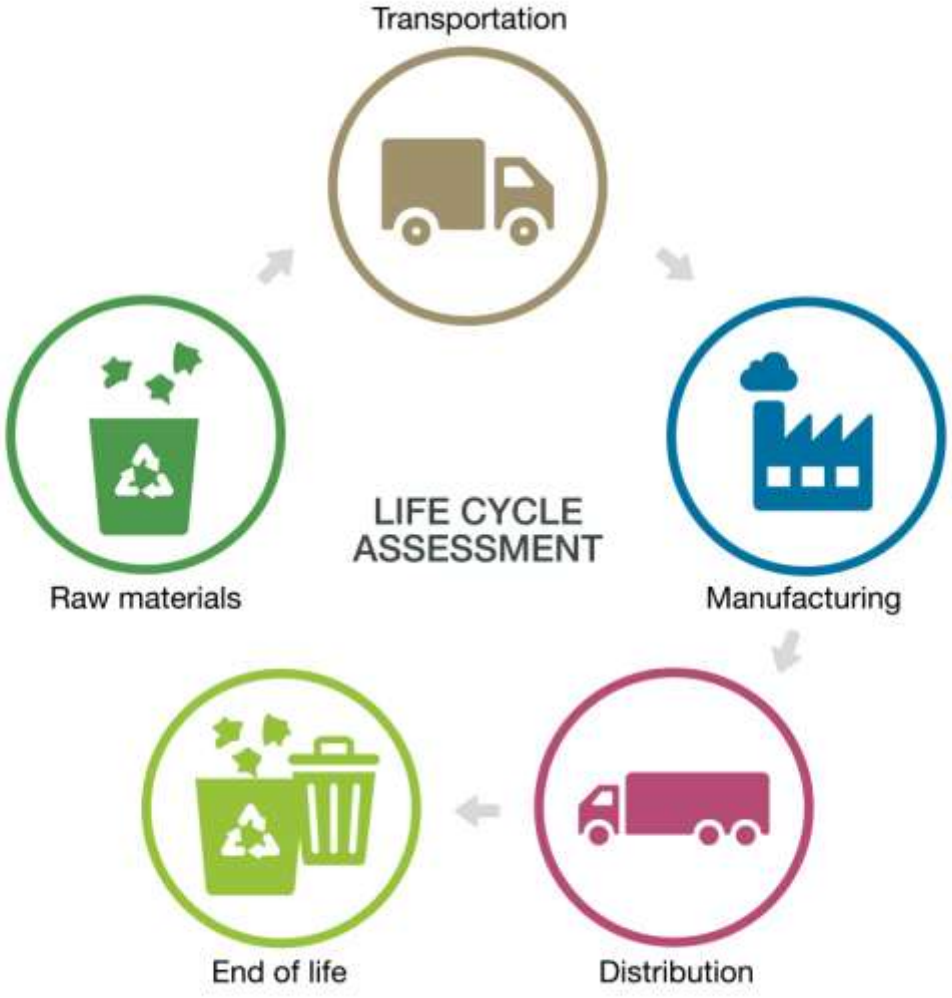
LifeCycle Assessment (LCA)

- What it is and when to use it
- How it is done
- What pitfalls to avoid
- reference the ISO norms
- LCA in tendering today (example Ireland)
- LCC in Latvia
- [way forward?]

What is LCA



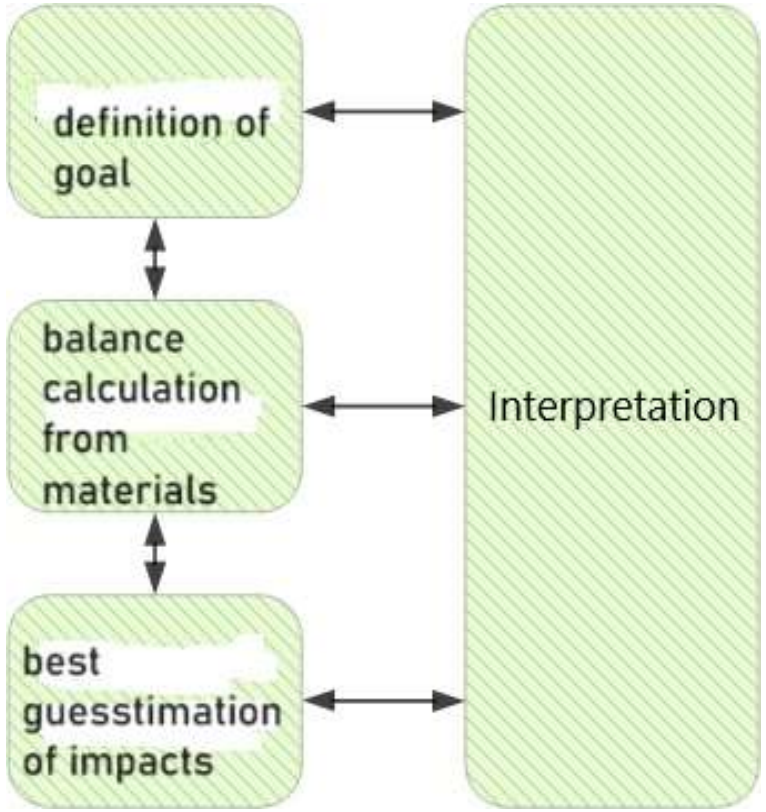
Life**c**ycle **a**ssessment seeks to account for *all environmental impacts*, starting with fuel for resource abstraction ending with dismanteling/ preparation for recycling or disposal.

Experts use **database-tools**. These contain a great deal of **generic data**, and for some special/local compontents experts collect additional specific data.

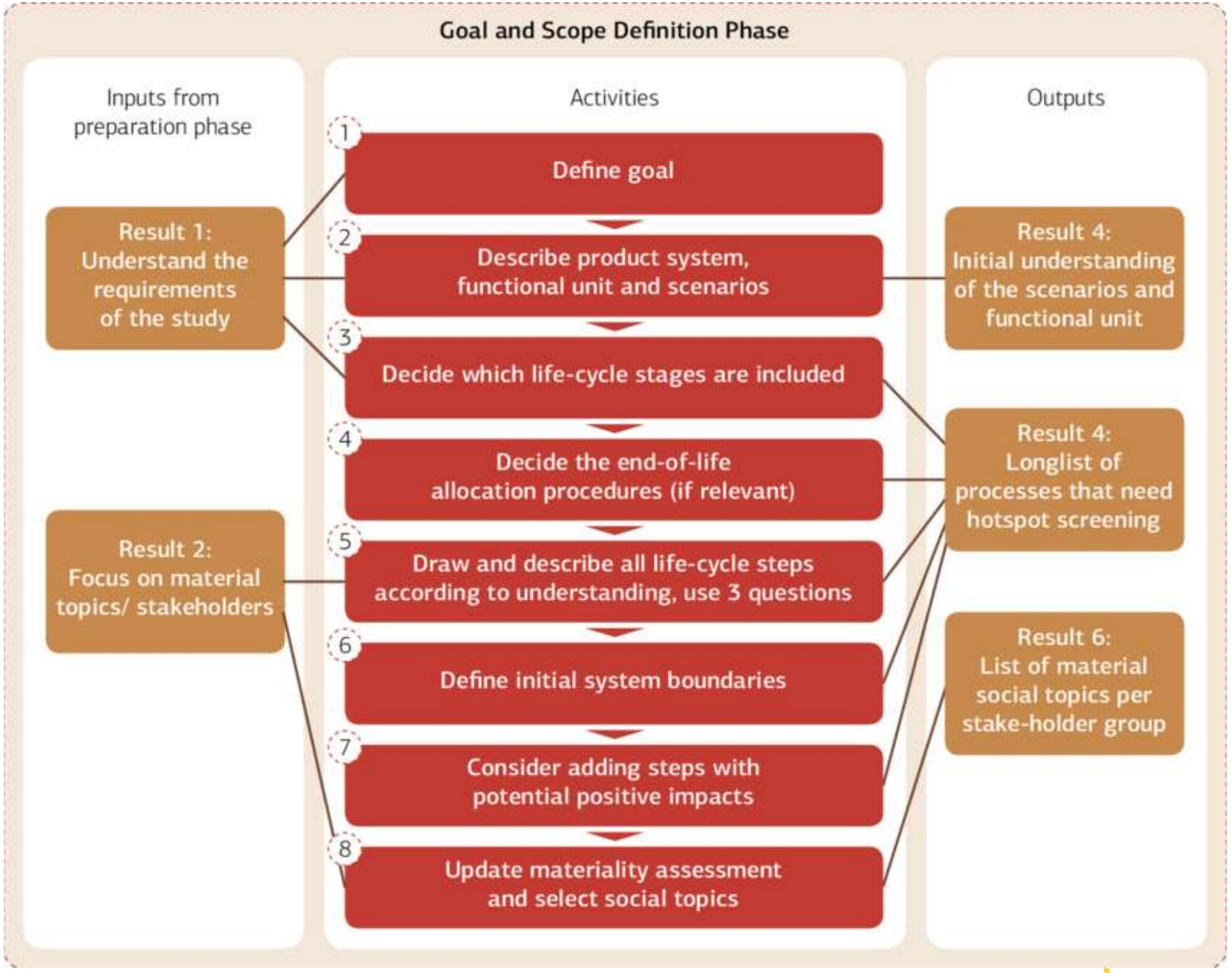
image: https://wiki.hslu.ch/images/controlling/LCA.jpg

What is LCA(2)

LCAs model the reality of the project /building process or material-footprint.



Source: AT Jack, many similar sources show these steps of the LCA process.


Goal and Scope Definition Phase
Inputs from preparation phase
Activities
Outputs
Result 1: Understand the requirements of the study
Result 2: Focus on material topics/ stakeholders
1 Define goal
2 Describe product system, functional unit and scenarios
3 Decide which life-cycle stages are included
4 Decide the end-of-life allocation procedures (if relevant)
5 Draw and describe all life-cycle steps according to understanding, use 3 questions
6 Define initial system boundaries
7 Consider adding steps with potential positive impacts
8 Update materiality assessment and select social topics
Result 4: Initial understanding of the scenarios and functional unit
Result 4: Longlist of processes that need hotspot screening
Result 6: List of material social topics per stake-holder group

What is LCA (4)

While you can leave the actual LCA to the experts, it is important to understand:

- which boundaries are set for the model „system-boundaries“, i.e. definition of scope, what is included and what is not
- How is the goal defined
- what assumptions were made

When using existing LCA results may not be comparable unless you ensure that system boundaries, goal and assumptions are aligned.

Meanwhile a number of partial LCA tools were developed on national level. These mainly serve to streamline a few of the most popilar aspects such as energy consumption and CO2-emisions and maybe the water-footprint, but omitting many aspects such as toxics, biodiverity or resources depletion or soil degradation to name some.

LCIA & lifecycle costing(LCC)

Definition:
Lifecycle Costing assembles all calculations used to transform
all present and future costs to a net present value.
[adapted from JRC/Pennington et all]

Reality today:

Based on an EU recommendation gouvernments provide LCC calculators. One example, the LCC calculator from Latvia takes into account

"- the capital costs of the construction project (capex),

- the technical costs of maintenance and
- upkeep of the building elements (opex) as well as
- the utility costs (utilities)."

[source: https://www.varam.gov.lv/lv/buvniecibas-dzivescikla-izmaksu-lcc-aprekina-kalkulators]

EPDs based on LCA

Environmental Product Declarations (EPDs) are a voluntary instrument that producers often chose to communicate environmental information about a specific product.

No rules but...Norms?

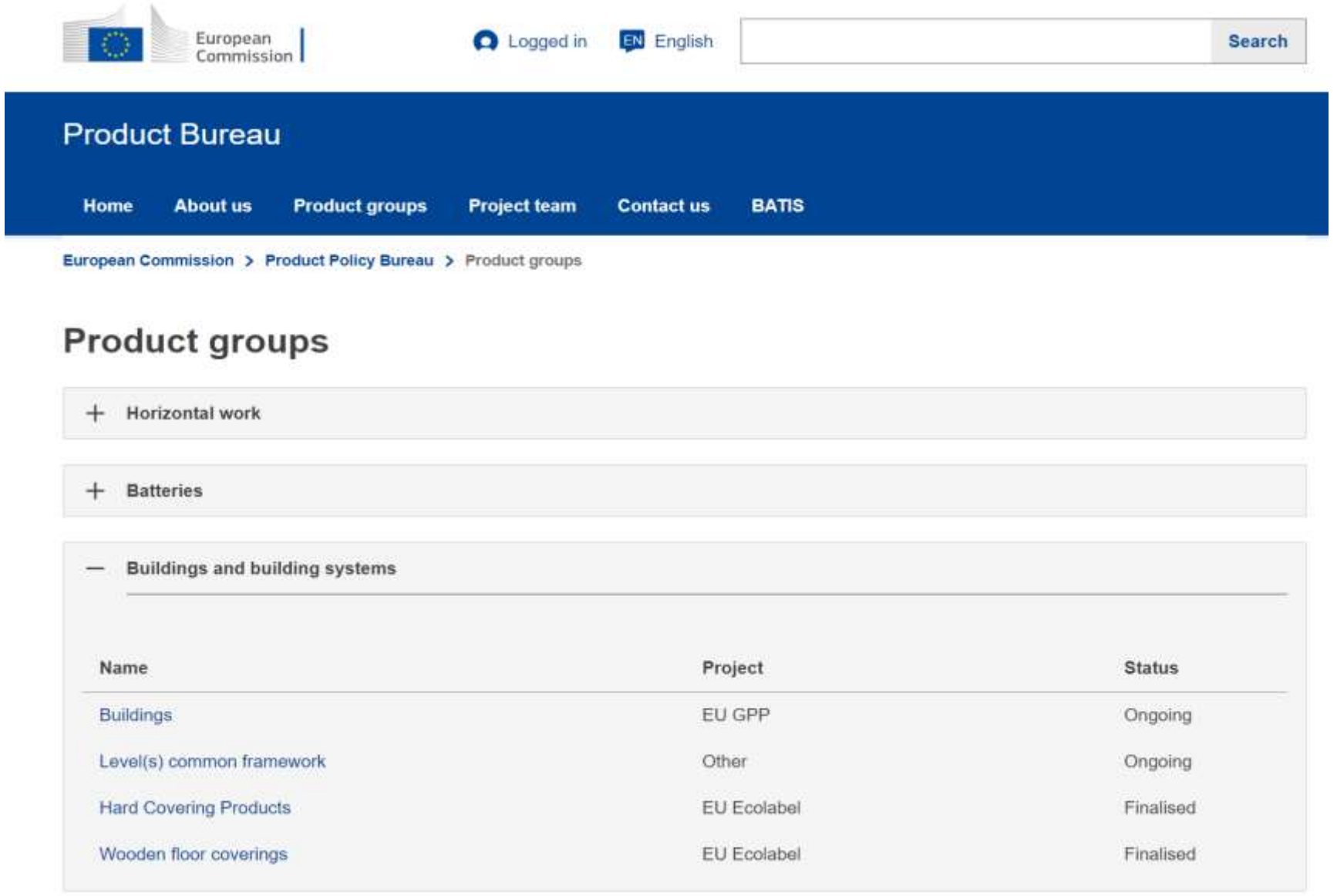
- ISO 14025 sets the (voluntary) rules for EPDs, which
  - *if produced according to this Norm-* shall be based on LCAs.
- However in it's current implementation, only the rules how to report information regarding greenhouse gas (GHG) emissions were agreed. Thus the scope of the LCA that can be used for the preparation of the EPD data may be so limited that it would rather be a carbon-footprint and not an LCA, and can even omit information about chemicals.
- However, reference is still made to the five Norms ISO 14040/44 that gouverning the transparency and quality of LCAs, although these refer to full LCAs but also allow to fix a different (more limited) scope to answer a defined question, such as the carbon footprint.
- ISO 21930 is about EPDs for construction products, and EN 15804 is even further details the product categories. This is currently (2023) still negotiated in a CEN process, namely CEN/TC 350, negotiating product category "cement".
- Although all these norms and standards are voluntary, companies chose to use them to show the quality and demonstrate committment.
- Besides, REACH requires downstream-users of chemicals i.e. producers of construction products to communicate information about any substances of concern down their supply-chain. In order to avoid a separate declaration producers often chose to declare the use of substances of concern in the EPDs.

Sources: ISO-Norms (summaries), www.ecostandard.org/work_area/sustainable-buildings-construction-products/ and German Environment Agency (UBA):Umweltdeklaration von Bauprodukten | Umweltbundesamt

LCAs and EPDs in tendering

- Require company LCA for bonus/malus points to tenderers
- Prevent systemic disadantage of SMEs by encouraging partnerships
- Ensure correct use of LCA by always citing goal, system boundaries and assumptions
- Understand the limitations of carbon footprint and not mistake is for overall sustainability assessment.
- Eventhough climate change is a central problem, circularity is a potential solution and could in turn be enabled by using clean materials. This can usually not be seen from EPDs.
- Reference norm, qualification and audit-requirements

PROBAS https://www.probas.umweltbundesamt.de/
ÖKOBAUDAT (http://oekobaudat.de)
Netherlands DUBROCALC https://www.dubocalc.nl/en/what-is-dubocalc/
Ireland https://www.epa.ie/publications/circular-economy/resources/EPA_GPP_Criteria_Office_2023_06.pdf
https://www.epa.ie/publications/circular-economy/resources/GPP-Guidance-for-the-Irish-Public-Sector.pdf



https://susproc.jrc.ec.europa.eu/product-bureau/product-groups

link to SDGs

ENV1.1

Life cycle assessment of the building

Goal

Our aim is to consistently plan buildings with a focus on their life cycle in order to minimise emissions-related environmental impacts and the consumption of finite resources throughout all phases of a building's life.

Benefit

Life cycle-oriented planning of buildings with the help of life cycle assessments supports building owners and planners in making environmentally orientated decisions on the basis of comprehensive information. Solutions can be identified that are optimised with regard to various relevant environmental issues as well as different impact locations and impact times. The application of a consistent method supports the reporting of relevant environmental indicators of the building, such as $CO_{2\ emissions}$ or energy demand over the entire life cycle.

Contribution to overarching sustainability goals

	CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT GOALS (SDG) OF THE UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	3.9	Effects of chemicals, air, water and soil pollution	7.1.a/b	Conservation of resources
			7.2.a	Renewable energies
	7.2	Share of renewable energies	12.1.b	Sustainable consumption

Source: DGNB

Module 3

How to use Green Public Procurement (GPP) for sustainable construction

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8.2.2024 Pilots meeting

Read before preparing your training to decide if relevant to your target group.

How to use Green Public Procurement (GPP) for sustainable construction

3.1. IDEAS FOR TRAINING CONCERNING GPP AND GREEN BUILDING CERTIFICATES

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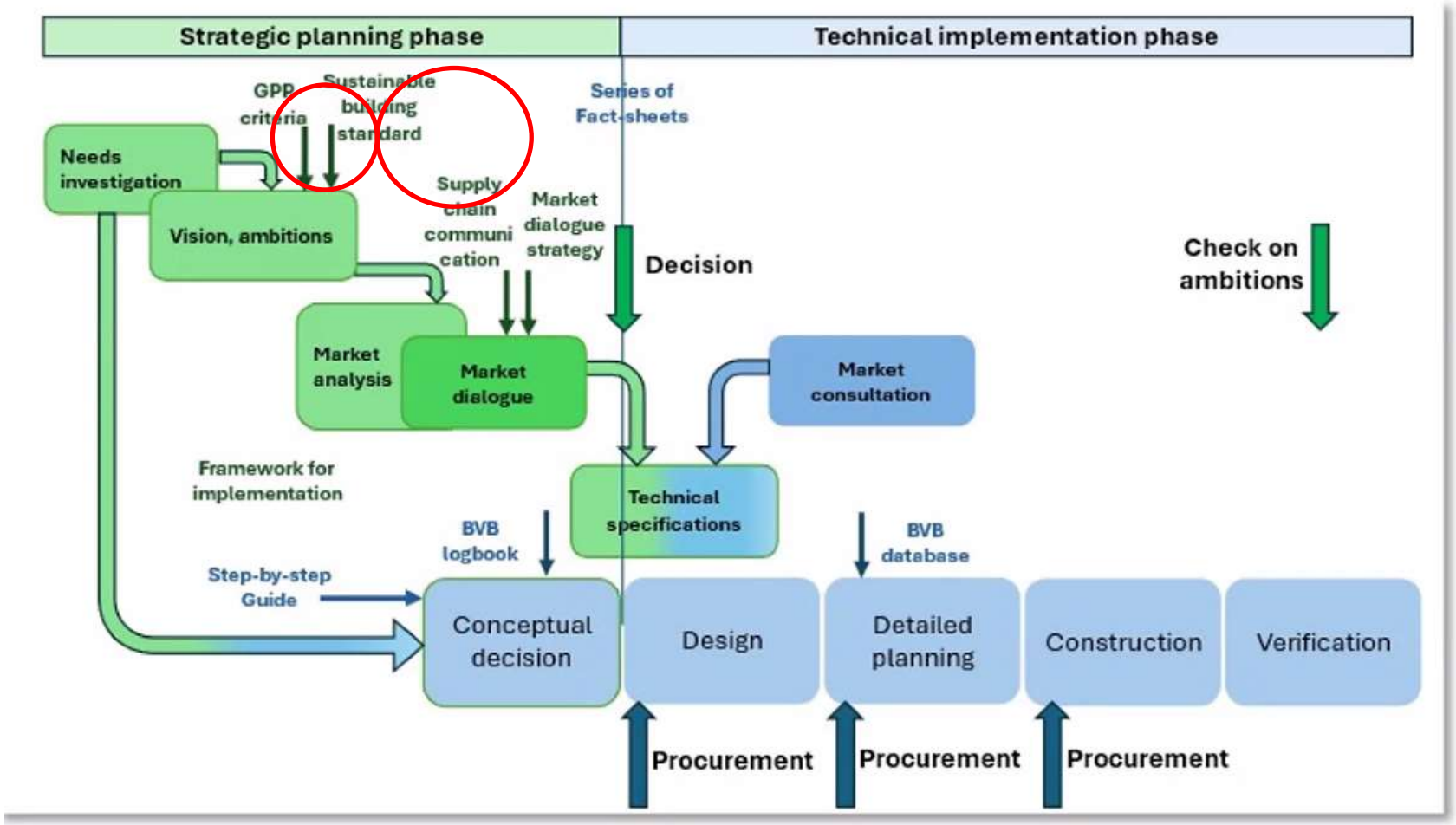
Interrelation of strategic & technical solutions at municipalities

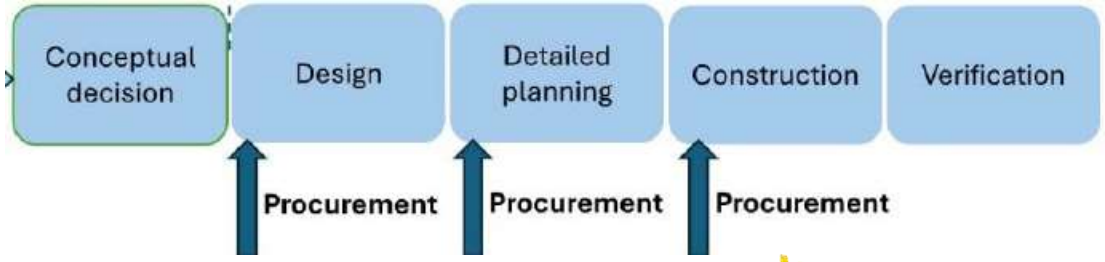


Green certificates: Training should answer these questions

- What can be achieved with certificates and/or specific criteria behind them?
- How to link the right certificates, the building project in question and the project's objectives (linkage to vision & ambition)?
- Is there suitable certificates for my construction project? Where do I find them and for which purpose have they been made? How can I use the criteria behind certificates without certifying the whole construction project? (Note from Västerås: Highly depending on the sustainability decisions for the project. The project leader is depending on contractual and political decisions.)
- How to use certificates and/or criteria behind them in each step of the construction project and procurement? (see the pic) (Note from Västerås: Linked with the “Is there suitable certificates“ question.)
- How to prioritize and for which product/activity to require certificate and/or criteria behind them, how to focus on “hot spots” regarding Chem Clim Circle –aspects? (Addition from Västerås: Are there contrasting criteria and the criteria that form synergies?)
- Give a concrete example (theoretical new pre-school project) how to use certificates AND criteria behind them.

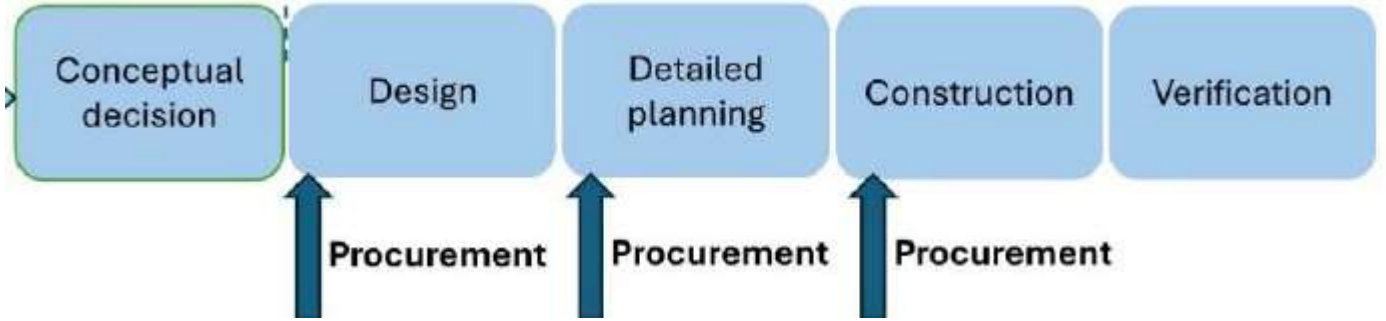
GPP criteria: Training should answer these questions

- What can be achieved with specific GPP criteria in relation to construction project?
- How to link the right set of criteria, the building project in question and the project's objectives (GPP linkage to vision & ambition)?
- Is there suitable pre-made GPP criteria for my construction project? Where do I find them and for which purpose they have been made?
- How to use different criteria in each step of the construction project and procurement? What is the timeline when how to use pre-made criteria in in each step of the construction project ? (picture)
- How to prioritize the criteria and for which product/activity to set it, how to focus on “hot spots” regarding Chem Clim Circle –aspects?
- **Give a concrete step by step example (theoretical new pre-school project) how to use GGP criteria.**



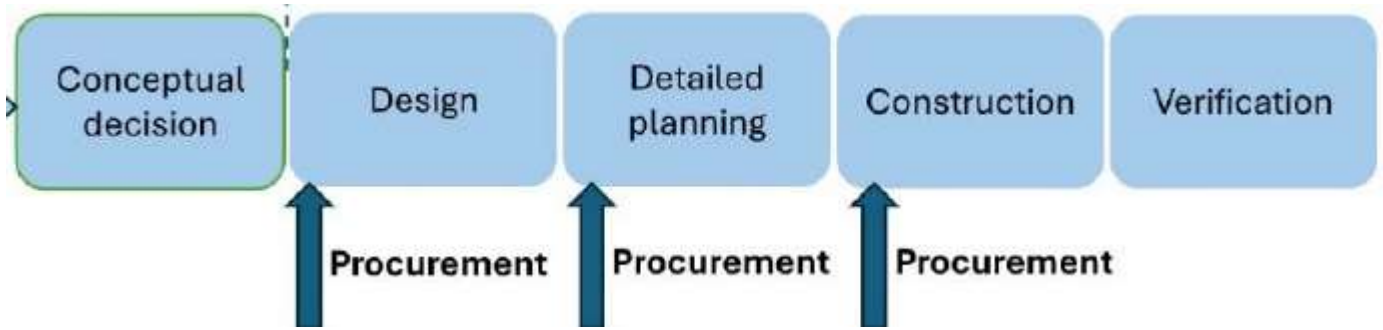
Green certificates: Training should answer these questions

- What can be achieved with certificates and/or specific criteria behind them?
- How to link the right certificates, the building project in question and the project's objectives (linkage to vision & ambition)?
- Is there suitable certificates for my construction project? Where do I find them and for which purpose they have been made? How can I use the criteria behind certificates without certifying the whole construction project?
- How to use certificates and/or criteria behind them in each step of the construction project and procurement? (see the pic)
- How to prioritize and for which product/activity to require certificate and/or criteria behind them, how to focus on “hot spots” regarding Chem Clim Circle –aspects?
- Give a concrete example (theoretical new pre-school project) how to use certificates AND criteria behind them.



Ecolabels: Training should answer these questions

- Is there suitable ecolabels for my construction project? Where do I find them and for which purpose they have been made?
- What can be achieved with specific ecolabels in relation to construction project?
- How to link the right ecolabels, the building project in question and the project's objectives (ecolabels linkage to vision & ambition)?
- How to use ecolabels in each step of the construction project and procurement? (see the pic)
- How to prioritize and for which product/activity to require ecolabel, how to focus on “hot spots” regarding Chem Clim Circle –aspects?
- Give a concrete example (theoretical new pre-school project) how to use ecolabels.



Some additional ideas from Sweden

- Room for progress in BVB documentation routines
- Checkups and controls are important, and routines could be improved. (reduces corruption)
- Deviation routines and documentation could be improved.
- Summarizing and compiling the amount of hazardous substances in the building could be improved.

3.2. STAGES OF TENDERING

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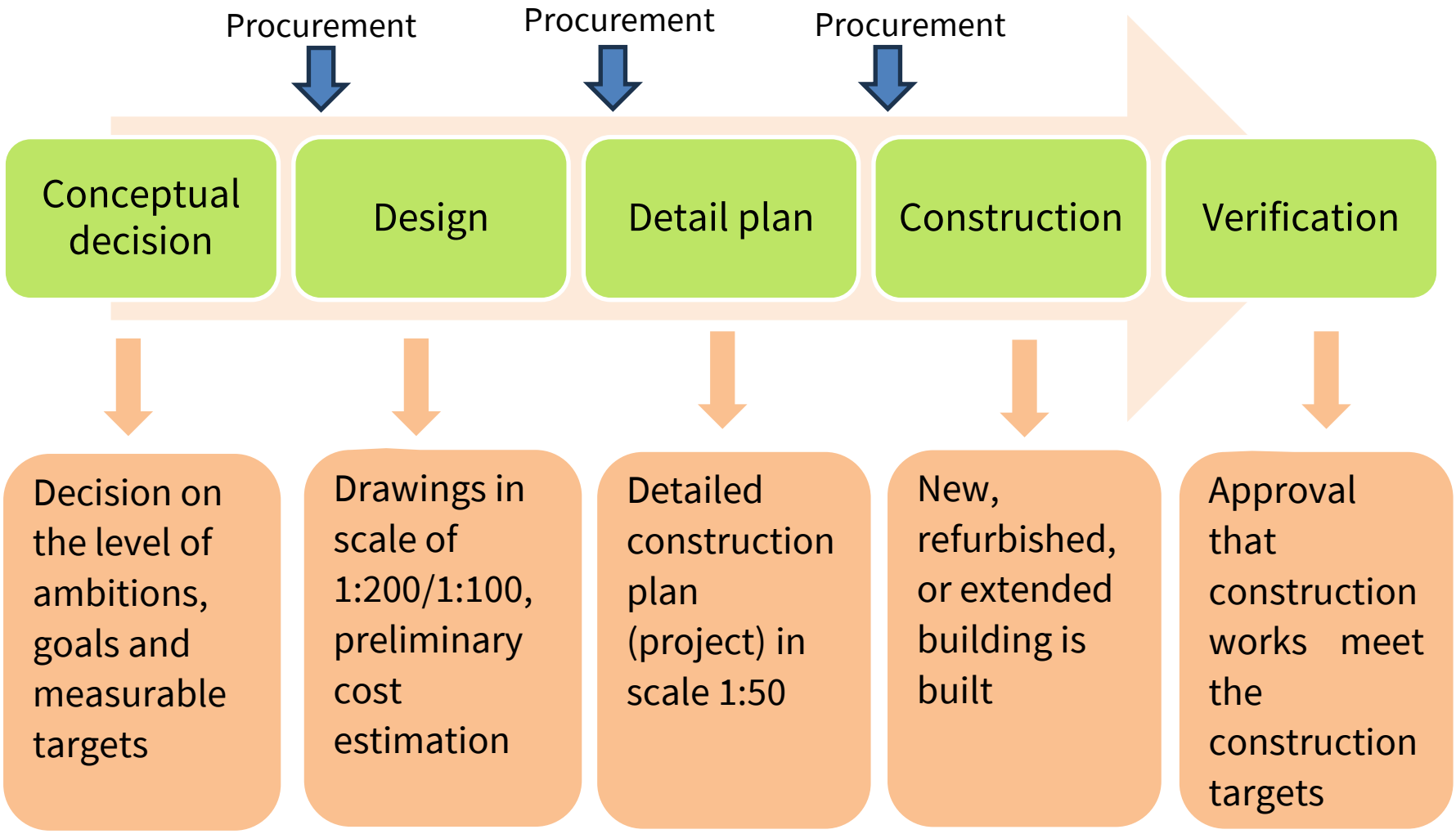
Tendering in construction process



Procurement for elaboration of a design

1st stage – prequalification for selection of the architectural/designer company. Selection criteria for the designer/architectural company includes requirements to prove experience/competencies of the architect/designer in similar construction/refurbishment projects

2nd stage when e.g. 5 prequalified architects are selected, a competition can be organised to submit their proposals for the design of the building according to technical specification received

In case technical specification cannot be established with sufficient precision and depending on the degree of clarity municipality has about the project, it can select a **competitive procedure with negotiation**, a **competitive dialogue** or a **design contest**.

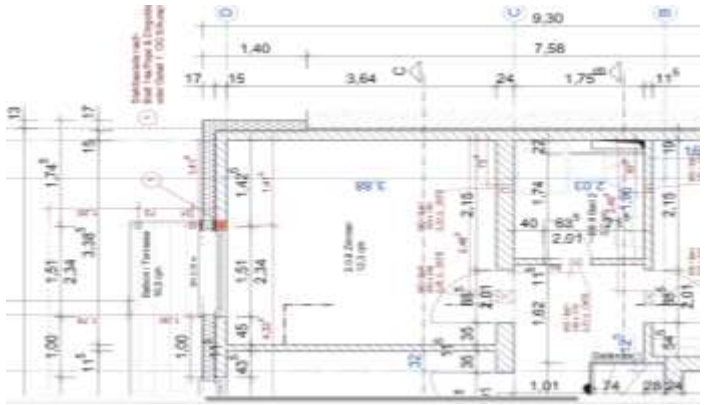
3 pillar criteria in technical specification

Pillars	Requirements in technical specification/terms of refence
Tox free	• requirements for materials for the building envelope, interior (e.g., using wood, eco-certified materials, low VOC emission construction materials • requirement for solutions to reduce the need of use of biocides • eco-certification of a building
Circular	• recyclability & reusability & easy to repair materials, building elements • easy separability of building elements in case of demolition • minimisation of new materials
Climate neutral	• shape of the building - compactness and good use of daylight • ensuring maximums solar gains, natural shading, cross ventilation • insulation materials preventing also overheating in summer • regionally/locally produced materials • avoidance of materials with high embodied energy • air tightness of building (sealed envelope) • primary energy consumption and the threshold for use of fossil fuels • visual connectivity to the exterior landscape • passive heating/cooling options • ventilation with heat recovery/use of renewable sources) • places for parking of bicycles and electric vehicles

Procurement of elaboration of a detailed construction plan (project)

- **1st stage** for selection of a company for elaboration of a detailed construction project. The potential service provider company shall prove the experience of the construction design manager in e.g.:
  - experience in elaboration of detailed construction project of energy efficient buildings;
  - experience in elaboration of construction project for building energy management systems (BEMS);
  - experience in elaboration of construction project for installation of energy efficient water consumption systems.

- As the result of the first stage procurement selected companies (e.g., top 3-5 candidates) are invited to the **2nd stage**. They receive technical specification and prepare proposals for elaboration of the detailed plan.



3 pillar criteria in technical specification

Pillars	Requirements in technical specification/terms of refence
Tox free	• Avoiding certain hazardous substances e.g., Phthalates, TVOC, Formaldehyde, SCCP, MCCP, PFAS, APEO, Flame retardants, Boric acid (boric compounds), BPA, BPS, BPF, Heavy metals (e.g., Cu, Cd, Hg), Organic tin compounds, MIT/CMIT, PVC plastic in materials completely or setting maximum allowed concentrations of HS • Eco-certified (eco-labelled) materials • Eco certification of a buildings e.g. Nordic Swan • Indoor air quality requirements
Circular	• Use of re-used and easy to recycle materials • Materials used should be recyclable/ reusable/easy to repair • Waste management at the construction site, incl. storage of recyclable construction waste
Climate neutral	• Low embodied energy of material • Preference to local materials • Energy performance standards e.g., low energy building, passive house • Water saving devices • Machinery at site only with non-fossil fuels

Procurement of construction works

Criteria (requirements) related to experience of the construction PM e.g.:

- experience in construction of energy efficient buildings;
- experience in installation and submission for exploitation of building energy management systems (BEMS);
- experience in installation of energy efficient water consumption systems;
- experience in implementation of waste management plan, minimising waste amounts, as well as knowledge and experience to ensure possibilities for waste treatment outside the construction site.

Examples:

- experience on construction works performed during previous 5 years (including the works performed and data on results, measurements).
- CV of specialists that will be involved in implementation of the project
- certification on capacity building in the respective fields.

3 pillar criteria in technical specification

Pillars	Requirements in technical specification/terms of refence
Tox free	• Requirements for impact of construction materials and finishing materials on indoor air quality e.g., concentration of VOC and Formaldehyde within the indoor air
Circular	• Requirement for the waste management at the construction site e.g., limits for the volume of construction waste originating at a construction site
Climate neutral	• Requirements for materials e.g., use of timber and timber products of legal origin e.g. timber or timber products used inside the construction must be legally harvested (e.g., FSC, PEFC certificates or equal according to EC regulation 995/2010)

Procurement as a tool

- Municipality procures a service for building/ construction
- When considering a sustainable construction, there may appear potential trade-offs:
  - Procurement is not only about including **criteria** in documents → success to go for **a dialogue** with architects, building constructors
  - Budget for construction is a challenge: **costs** are easier to calculate when compared to benefits → convince politicians to decide on price to gain **benefits**
- **Awareness and expertise of the staff** will support elaboration of convincing arguments turn decisions in favor of sustainable construction

Other GPP aspects

- **Occupant comfort and health** (acoustics, electropollution, accessibility)
- **Vulnerability and resilience to climate change** e.g. heat waves, drought, storms, flooding, to energy and water supply failures
- **Life cycle costing** (life cycle cost assessment)
- **Biodiversity** (site selection and land use impacts, landscaping and habitat creation, roof and facade greening systems, certification of wood products)

3.3. MARKET CONSULTATIONS

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When to apply and why?

Before launching a procurement, if market engagement still seems to be necessary, then as soon as a contracting authority has defined its procurement needs, it is advisable to start market consultations with possible service providers,

Market consultations can help municipality to:

- amend the procurement documents based on received information
- incorporate innovative solutions/approaches into the procurement process
- avoid situation of non-realistic or outdated specifications,
- define the best contractual terms and conditions.

Market consultations vs Market dialogue

Important! In opposite to market dialogue, **market consultation** is an integral part of the public procurement process, usually commenced by a Prior Information Notice (a notice used in public procurement to announce an upcoming procurement procedure).

It includes description of the consultation process and announcement of the forthcoming public procurement exercise.

MUNICIPALITIES

Can determine the state of current and future market capabilities and price structure in relation to their specifications and needs

SERVICE PROVIDERS

Receive information on expected requirements of contracting authorities which will be applied in the procurement process

In cases where budget for the construction project exceeds certain thresholds, it is mandatory to use EU-channels to announce the procurement of architectural services.

Procedure

If a municipality tends to apply **innovative solutions** for new construction, refurbishment or extension of a building:

- Use as many info channels as possible to share information publicly and widely
- Expand the pool of architectural, construction companies that have previously bid for or won similar contracts.

Municipality shall ensure that the same level of information is given to all potential service providers and competition is not distorted by the participants involved in market consultations.

Important:
There might be country specific requirements for market consultations.
It is recommendable to consult the relevant national authority.

Market consultation steps

		Helps municipality to:
1. Background research for consultation framing	→	identify the best type of market consultations
2. Preparing the market consultation	→	broaden the group of actors
3. Preparation and conducting interviews/meetings	→	to communicate with many potential bidders
4. Using the results	→	ensure that the same level of information is given to all potential service providers

3.4. TRADE-OFFS

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Procurement as a tool

- Municipality procures a service for building/ construction
- When considering a sustainable construction, there may appear potential trade-offs:
  - Procurement is not only about including **criteria** in documents → success to go for **a dialogue** with architects, building constructors
  - Budget for construction is a challenge: **costs** are easier to calculate when compared to benefits → convince politicians to decide on price to gain **benefits**
- **Awareness and expertise of the staff** will support elaboration of convincing arguments turn decisions in favor of sustainable construction

Chemical criteria in construction materials

- Municipality has a high level of ambition to promote tox-free construction in selection of materials
- Potential trade-offs:
  - Supply chain complexity, as new or quality products may not be available on local market → consult market through market dialogue, market consultation
  - Construction regulations (standards) may have a bias for conventional material application → check carefully requirements before purchase
  - Increased costs, as the quality materials tend to cost more than the conventional ones → check solutions to convince the municipality (contractor) representatives
- Final selection of materials is **agreed with the municipality!**

Design for deconstruction & adaptability

- Municipality aims to promote construction systems that incorporate circular economy thinking
- Potential trade-offs:
  - Selection of materials and components may involve higher initial investment costs → apply long-term thinking, life cycle costing
  - Lack of local market or infrastructure for recycled building materials
  - May require higher amount of material to comply with modular design → mitigated through careful design
- **Ask designers to consider the life cycle impacts, and waste reduction strategies!**

3.5. ENVIRONMENTAL LABELS AND ECO-LABELS

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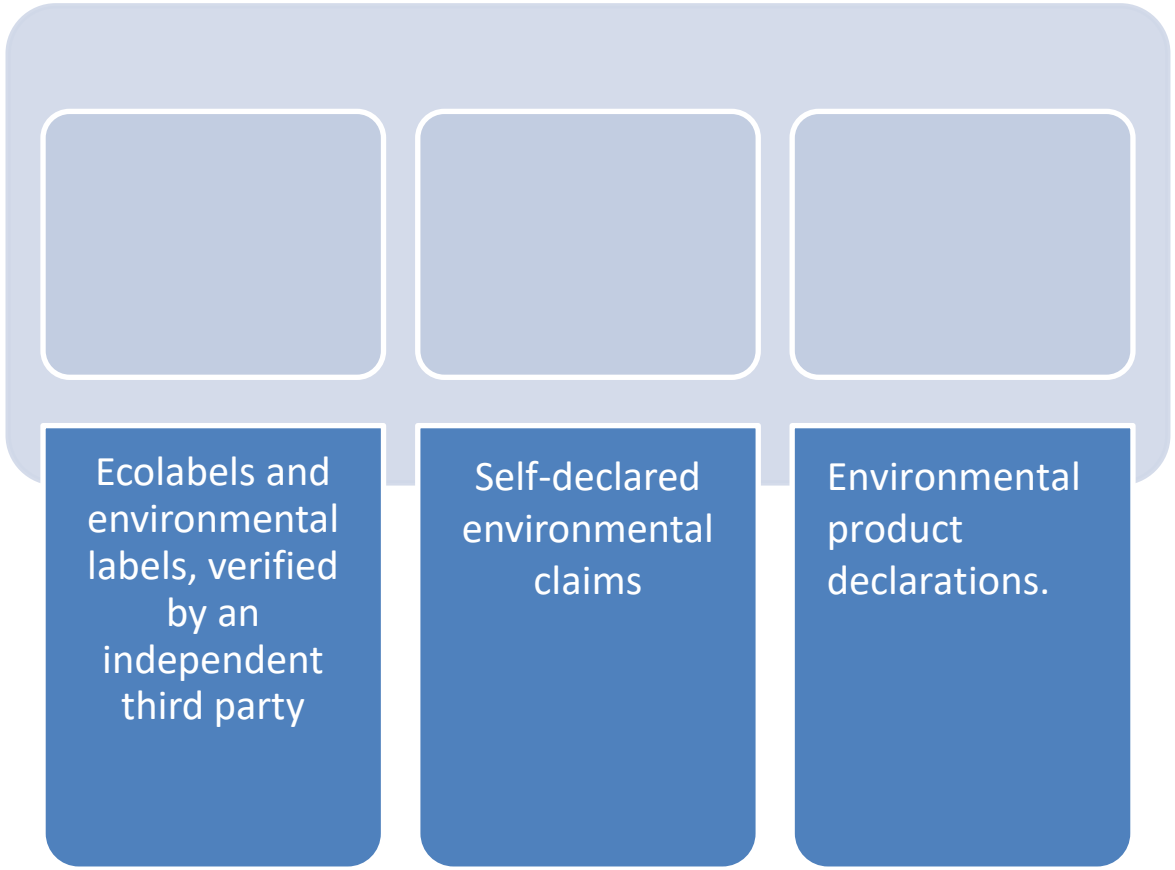
Environmental claims and eco-labels

- Manufacturers and retailers are highlighting the environmental and health aspects of products– with statements, symbols or other marks. These assertions are known as **environmental claims.**
- **Eco-labels are established both for construction products and buildings**
- Certifications vary in their approach and can be applied to the planning and design, construction, operation, maintenance, renovation, and eventual demolition phases of a building.
- Eco-labels can help in GPP:
  - You can take the criteria from established eco-label scheme
  - You can demand eco-labelled products
  - Have an ambition to have eco-ceritfied building.

Three types of environmental claims



- In contrast to vague “green symbols” ecolabels are credible, and certified by an impartial third party, and based on transparent environmental criteria derived from life cycle considerations.

Type I eco-labels

Although standards and requirements may vary, all ecolabels address multiple environmental and health aspects, including toxicity, air quality, energy and water use, recyclability, and the responsible use of natural resources. Such ecolabels are classified as Type 1 by the International Organisation for Standardisation (ISO) 14024:2018, and are awarded to environmentally preferable products and services based on life cycle considerations.

Most common Type 1 eco-labels

The EU Ecolabel, also known as the Flower Certification, is eco-labeling program introduced by the European Union (EU). It covers 24 product and service groups across 11 categories that are eligible for the EU Ecolabel.
Within the construction sector, there are three group categories:

1. **Indoor and outdoor paints;**
2. **Wood- and bamboo-based floor coverings;**
3. **Hard covering products.**

The certification process evaluates various aspects, including the origin of the materials, their chemical and biological properties, quality and quality criteria, composition, recyclability, and disposability. Additionally, the assessment encompasses ingredient analysis and the inspection of emissions of hazardous substances or substances that may pose health risks, such as plasticizers.

Nordic Swan

- Nordic Swan is an official ecolabel for the Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden), established by the Nordic Council of Ministers in 1989. Nordic Swan is covering 56 product areas, encompassing over 200 product types.

- Within the construction sector, there are seven group categories:

1. New buildings and renovation,
2. Chemical building products,
3. Construction and facade panels,
4. Moldings,
5. Floor coverings,
6. Indoor paints and varnishes, and

- Windows and Exterior doors.

Nordic Swan Ecolabelling's Building Product Database

Nordic Swan Ecolabel tells which products are good for the environment. A building is also possible to become certified with Nordic Swan Ecolabel if it fulfills the criteria for Nordic Swan Ecolabelled buildings.
The Nordic Swan Ecolabel sets requirements for energy consumption, indoor climate, quality of the building process and the building products and materials used in the building, for instance. All products and materials used in the building need to be inspected and approved by the Nordic Ecolabelling.
Products and materials approved to use in the Nordic Swan Ecolabelled buildings are collected to the Nordic Swan Ecolabelling's Building Product Database. These instructions guide the use of the database.

The Blue Angel

- The Blue Angel, launched by the German government in 1978, is an eco-labeling program. The Federal Environmental Agency (UBA) establishes the specialized criteria that products and services must meet to receive certification.

- Within the construction sector, there are 17 group categories, for example:
1. Wall paints (indoor);
2. Wallpapers;
3. Varnishes, Glazes and Primers;
- Floor coverings (elastic, textile, wood).

Nature plus

The Natureplus seal is a private eco-label in accordance with ISO 14024. It certifies adherence to high-quality sustainability standards across all relevant areas. To ensure compliance, accredited laboratories and assessors conduct tests in alignment with internationally recognized standards. Notably, the Natureplus quality label for building products stands as the sole European environmental label founded upon rigorous scientific criteria across various fields. This label guarantees that key criteria, encompassing resource sustainability, clean and efficient production, and the preservation of environmental and health standards, are upheld.

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Eco-certificates for buildings

BREEAM, which stands for Building Research Establishment Environmental Assessment Method, is among the most widely adopted and recognized environmental assessment methods for both buildings and infrastructure projects. BREEAM serves as a comprehensive framework for evaluating the sustainability performance of buildings and offers a standardized approach to assess their environmental, social, and economic implications across their entire lifecycle. The compliance with BREEAM standards is validated by an independent third-party organization.The BREEAM certification system encompasses critical criteria, including energy efficiency, health and comfort, accessible transport, water usage and management, environmental impact of materials, waste reduction, and the influence on the surrounding environment. The results are classified into five categories for new buildings and six for existing ones, representing varying levels of excellence. In Germany, Austria, and Switzerland, TÜV Süd is responsible for awarding the BREEAM certification

LEED

LEED, short for Leadership in Energy and Environmental Design, is a green building certification program established by the U.S. Green Building Council (USGBC) in 2000. LEED uses a point-based rating system, where buildings accumulate points by meeting specific sustainability criteria. This rating system encompasses various aspects of a building's design, construction, operation, and maintenance. Based on the number of points earned, a building can attain different certification levels, namely Certified, Silver, Gold, or Platinum. The LEED certification system relies on several critical criteria, including Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation in Design, and Regional Priority Credits.

DGNB

The German Sustainable Building Council (DGNB) is a sustainable building certification system originating in Germany in 2007. DGNB conducts a comprehensive assessment of a project's sustainability, addressing ecological, economic, sociocultural, and functional dimensions. It places a strong emphasis on a life cycle perspective, considering the entire journey of a building from construction through to demolition and recycling.DGNB awards quality labels in various levels, including bronze (not applicable to new buildings), silver, gold, and platinum. For exceptional architectural excellence, buildings with gold or platinum status may also qualify for a diamond award. Notably, entire neighborhoods can also attain certification. DGNB's evaluation encompasses a wide array of areas, including ecology, economics, and social aspects. While prerequisites must be met, optional criteria offer opportunities for additional points

3.6. CONFORMITY CHECKS & QUALITY CONTROL

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Introduction

- Several methods and tools for verification of the results during the final conformity check
- Specification of requirements and procedures for quality control and conformity checks in tendering documents
- Subcontracting external service provider to perform e.g., measurements
- Verification by certification institute e.g., Nordic Swan, BREEAM, LEED, DGNB

Documentation (declarations, certificates, logbooks)

- **Declaration from the manufacturer** of the chemical product, construction product, construction goods or construction material
- **Construction product declarations** or corresponding if available for the product
- **Declaration** from confirming compliance with the requirement concerning antibacterial/ antiviral surfaces
- **Certificates for the origin** of timber and/or timber products (e.g., FSC, PFSC)
- Checking the **logbook of materials** used in the building during construction/refurbishment/extension works to identify if tox free, re-used/recycled materials have been used

Data sheets

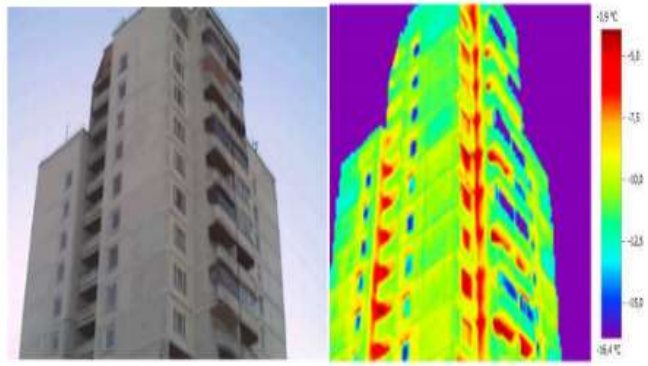
- Documentation from the manufacturer e.g., **technical datasheet** stating compliance with relevant standard, indicating performance i.e. such as thermal conductivity coefficient λ

- **Safety data sheets** (SDS) in accordance with Annex II to REACH for all chemical products

Performing tests & measurements

Conformity with tox free aspects:

- **air quality measurements** and analyses of measurement results (analysis report, including measurement methods and frequency)



Conformity with climate neutrality aspects:

- **Thermographic measurements** to identify thermal bridges
- **Blower door test** to identify uncontrolled air leakages through the building envelope
- **Energy audit** and request for **energy performance certificate**

3.7. GPP EXAMPLES FROM OUR PROJECT REGION

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City of Helsinki, Finland

Procuring and building a Nordic-Swan-labelled Kindergarten from A to Z

Kindergarten Soittaja in Kannelmäki

- Background
- Procurement objectives
- Criteria used
- Results and Environmental impact
- Conclusions/Lessons learned

Background

- Replacing a kindergarten built in 1969
- Architectural competition of a new kindergarten in 2020 (Winner: Rudanko+Kankkunen)
- **Special requirement: Nordic Swan ecolabel**
- Timeline

- Feasibility study in 2020
- Project planning 2021-2022
- Construction 2022-2023
- Kindergarten is opened in January 2024

- Building data

- Two-storey building, 2.370 sqm
- 300 sqm open-air terrace
- Room for 224 children
- Concrete structure, wooden facade

Procurement objectives

- Project-level goals were established and included within various phases of the procurement procedure. These these included objectives for ….
-

Criteria used

- **The project manager specified the requirements for a Nordic Swan ecolabel kindergarten in the *project programme***
  - ***the Nordic Swan*** *ecolabel has been applied in the construction project*
  - *the building materials and the surface materials used in the building are monitored products*
  - *ecolabelled building materials and products could be used (Swan ecolabelled or EU ecolabelled), or so-called inspected materials and products, when they meet the requirements set in the criteria of the Swan ecolabel (approved product).*

More criteria used

- Low energy demand (use stage) of minimum 10 % better than NZEB (near zero energy buildings).
- Moisture control, daylight requirements and minimised exposure to harmful substances.
- Environmental properties and health properties of chemicals used in both construction materials and chemical building products.
- A material logbook to ensure traceability of the building components.
- Measures to preserve and improve biodiversity at the building site.
- Control of construction process.

Results and Environmental impact

- Meets strict chemical requirements for substances harmful to health and the environment. This applies to everything from paints and sealants to insulation, vapour barriers and floors.
- Promotes a circular economy by stimulating the demand for reused building products and products made of recycled materials. A material logbook ensures the traceability of the building components. It also promotes producer take-back systems and meets strict standards for the sorting of construction waste.
- Helps to preserve and improve biodiversity at the building site and meets strict requirements for certified construction timber from sustainably managed sources.

Conclusions/Learned lessons

- Building public facilities such as schools, libraries and daycare centres is an important investment in the future of any community
- Municipalities must balance the costs and the requirements for a healthy and safe indoor environment. Research is needed to make the right decisions.
- Also consider the cost-benefits that may arise from using "cleaner" material, for instance higher reputation ad desirability, health-costs, better recycling value

Riga municipality

- The focus is mainly on energy efficiency, equipping buildings with heat pumps, solar panels, etc.
- In cooperation with several other municipal institutions, Riga has introduced certain tax incentives for buildings that use materials that increase energy efficiency.
- Thus, these buildings result in lower heat consumption and, subsequently, the use of heating materials (fuel etc.) and reduced emissions.

- Another example from Latvia would be the use of Green building materials and energy efficiency solutions for Ogre Central Library in Ogre, Latvia.

Tallinn City municipality, EE

- When designing and comprehensively renovating buildings, it is ensured that the building is highly efficient, constructed with low emissions, and using circular materials (wooden structures).
- It is common requirement also generate renewable energy (solar energy) on-site.
- If possible, it is connected to the district heating system, which reduces carbon emissions, as Tallinn municipality's district heating is efficient and 80% produced from renewable fuels. Tallinn municipality relies solely on electricity from renewable sources when connected to the grid.

Helsinki

Requirement of using M1-classified construction materials; life cycle control / guidance of construction project; determination of threshold value for carbon footprint value of residential construction to reduce emissions; criteria for sustainable procurement (starting from preliminary design); The City of Helsinki’s circular economy cluster program, aims to promote circular economy innovations and business, open to companies, research institutes, universities and organisations interested in developing circular economy with concrete actions.

What can it be used for

These examples show again the **power of GPP**.

The **markets react** and offer what is requested.

Using ecolabels makes checking easier, particularly when compliance is checked by a **third party**. This way the municipality stays clear from any doubt of having judged the compliance of competitors differently.

In a market that is still absorbing the requirements one could consider to start with "**development criteria**", meaning the winner is will be obliged to demonstrate compliance with criterion XX 6 months / one year after the start of the contract.

BVB logbook

Using a third-party evaluation system such as BVB
enables municipalities not only to access and collect the information about the chemicals in the construction material,
but has the evaluation /judgement of the content according to the BVB criteria. That way
the evaluation process remains independent from construction needs. This independence is crucial to maintain the credibility and reliability of the evaluation processess.

A logbook-type of documentation but without the BVB evaluation system, where all construction material (with full content declaration) is traced, might in future serve as a basis to introduce an evaluation system for the chemicals content of construction material and will already help the dismantling/recycling/reuse stage of the building.

Siobhan Protic, BEF Germany, May 2024

Module 4

Modules for Architects

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SDS

Modules for Architects

4.1. BUILDING MATERIALS AND TOXICS

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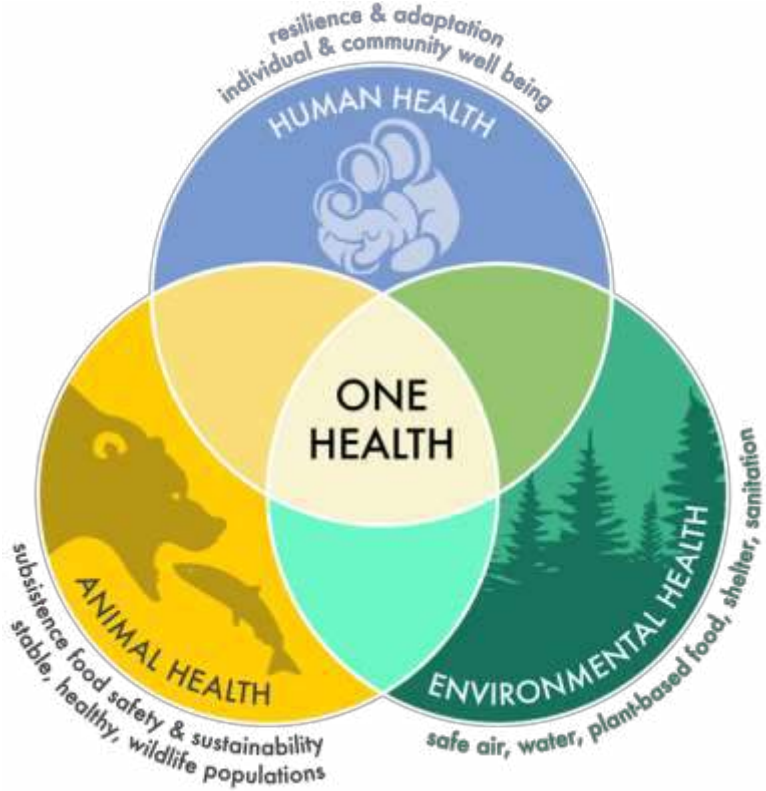
Building tox-free

- Motivation: Why should we try?
- Do-ability: Is it even possible?

- How do we know what to look out for?
  - Hotspots: where do we find HS in construction?
  - Example: insulation materials

- Where to find further information

Motivation: Why should we try?



https://www.uaf.edu/onehealth/

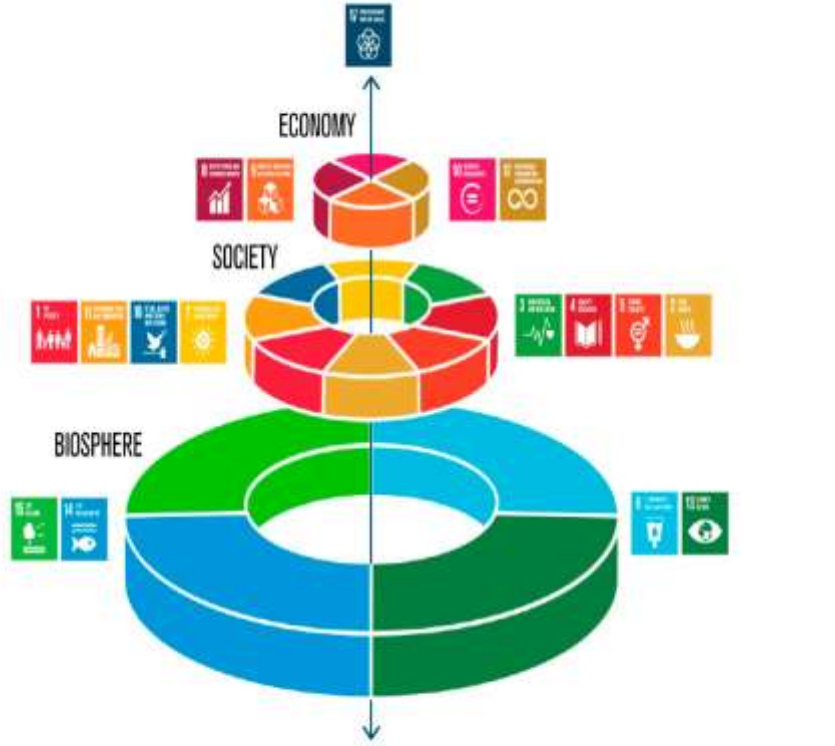


Figure 1. Example of an integration of the UN SDGs with a tripartite nested model of sustainability as proposed by Rockström and Sukhdev (2016).

Sustainability **2018**, 10, 4471; doi:10.3390/su10124471
www.mdpi.com/journal/sustainability

Do-ability: Is it even possible?





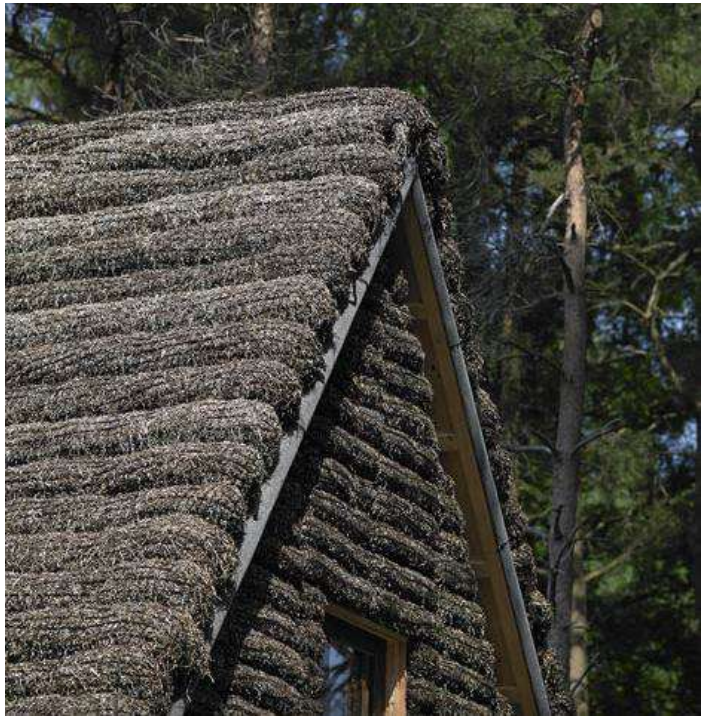

Do-ability: Is it even possible?

Do-ability: Is it even possible?

Built examples

https://thegrowingpavilion.com/

Photo by Eric Melander



Widera, B. (2014). Possible Application of Seaweed as Building Material in the Modern Seaweed House on Læsø. Wroclaw University of Technology, Faculty of Architecture: 30th international plea conference, researchgate.net.

Hotspots: where do we find HS in construction?
Example: insulation materials

Modules for Architects

4.2. HOW DO WE KNOW WHAT TO LOOK OUT FOR?

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Find your hotspots with the NHC3 fact sheet

HOT SPOTS IN BUILDINGS

The so-called hot spots are critical areas within a building where risks related to toxicity, embodied emissions, heat losses, or circularity are heightened. These can vary between building types and different rooms; for instance, in wet rooms, the choice of materials and finishes may impact both toxicity and circularity. Identifying these hot spots is crucial for ensuring the health of occupants and the sustainability of the building itself. Preventive measures, such as selecting suitable materials and adopting proactive maintenance practices, play a vital role in mitigating these risks

TOXICITY HOT SPOTS

The toxicity hot spots indicate areas where the risk of exposure to harmful substances is heightened. Although individual pieces of furniture or building elements can be potentially hazardous, the main areas of concern are large mono-material surfaces or objects.

One critical area is the finishes and coatings of walls, ceilings and floors. Here products such as paints and varnishes can introduce volatile organic compounds (VOCs) into indoor environments. Opting for low-VOC or VOC-free alternatives is advisable to mitigate indoor air pollution. Similarly, careful consideration of adhesives and sealants is necessary, as certain products may emit harmful chemicals. Choosing options with low emissions or exploring non-toxic adhesive solutions contributes to a healthier indoor environment.

Flooring materials also represent a noteworthy toxicity hot spot. Carpets, for instance, which are made with synthetic materials can contain PFAS (Per- and polyfluoroalkyl substances) in the case of their treatment for stain, soil, water resistance. PFAS are persistent in the environment and cause toxic effects on people. Also, PVC linoleum is problematic, it can emit VOCs after installation.

No matter of the selected interior finishes and treatments, it is important to ensure sufficient air exchange rate. For this, replacement of ventilation system filters, according to the requirements of the system, is important.

Beware of the chemical cocktail effect. This is an exposure caused by interaction of several (hazardous) chemicals. Usually, cocktail effects are unknown or not well studied. This can include the emissions or off-gassing from different materials, finishes, or products used in construction or interior design. For instance, a toxic cocktail in a building might result from the combination of paints with high levels of volatile organic compounds (VOCs), adhesives releasing formaldehyde, and certain flooring materials emitting harmful chemicals. The synergy of these elements can potentially create an environment where the cumulative effect of various toxins becomes more significant than the individual impact of each.

EMBODIED EMISSION AND HEAT LOSS HOT SPOTS

Embodied emissions and heat loss hot spots in a building can vary depending on factors like building type, climate, and local regulations. These also contribute significantly to a building's environmental impact and energy efficiency.

As such, the primary hot spot of embodied emissions is the load-bearing structure of a building. To be exact, these contribute between 30 and 80% of the total embodied emissions of buildings [source]. To reduce this impact, LCA (life cycle assessment) and material flow analysis already in early design stages can be done, when selecting materials and manner of construction. LCA allows to compare various material alternatives and the respective CO2 footprint of these. While material flow analysis allows to find reusable materials in the proximity as well as potential for reuse or recycling after the building's end of life. This contributes to a more circular construction sector and allows to reduce other environmental impact such as resource depletion, when paying attention where the materials are sourced and do these locations support sustainable business models.

Overall, avoid unnecessary treatments of materials to reduce not only the toxicity but also enable reuse and recycling in future. This also includes prioritising mechanical connections that allow for easy disassembly.

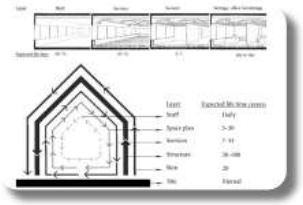
Poorly planned building envelope can be responsible for large heat losses. Attention must be paid to insulation, airtightness, windows and doors. However, hot spots might occur where various building elements are joined such as exterior wall corners, joinery between wall and a balcony etc. Here it is important to conduct three dimensional heat and moisture studies.

In case of cultural heritage, a very careful assessment must be done, to find solutions that do not compromise the value of the heritage and contribute towards the efficiency of the building.

CIRCULARITY HOT-SPOTS

In the realm of building design, circularity hot spots emerge as pivotal areas where the principles of a circular economy can be strategically applied, or conversely, where challenges to circularity may arise. These hot spots are influenced by factors such as building types, material use, and planning for adaptability.

Circularity is intricately tied to material selection and assembly methods. A fundamental hot spot is identified in areas where building layers are not separated, aligning with Duffy and Brand's shearing layers concept from the 1990s. This approach factors in the expected lifetime of different building layers, ensuring adaptability over the building's lifespan. [image source]



Another critical consideration is locating hot spots based on the largest material volume and/or weight. These materials demand careful scrutiny, focusing on established reuse or recycling infrastructure. Moreover, their assembly should facilitate disassembly without cross-contamination with other materials. For example, insulation boards glued to load-bearing construction can impede the circularity of the underlying construction materials.

CHECKLIST

- Identify the largest mono-material or surfaces per room and pay the highest attention to selecting non- or low-toxicity materials and treatments for those.
- Pick flooring, wall and ceiling finishes that do not require the use of adhesives for installation;
- Look for natural alternatives when possible;
- Look up material specifications and toxicity information in data sheets. If none provided, reach out to distributor or the producer with an inquiry;
- Ensure sufficient air-exchange rate for indoor spaces;
- Use LCA and material flow analysis to find the best solutions for low embodied emission and circular load-bearing structure;
- In building element connections that face exterior, use three dimensional thermal and moisture modelling;
- Avoid unnecessary treatments of materials and finishes;
- Prioritize mechanical connections between building elements and materials
- When planning, use Duffy and Brand's Shearing layer diagram to ensure building's and its materials circularity;
- When picking materials, clarify if these have established reuse and recycling options.

Prepared by: Marija Katrīna Dambe, NOMAD architects

This material was developed as part of the NonHazCity 3 (#C014) project, with financial support from the INTERREG Baltic Sea program of the European Union. The content of this material is solely the opinion of the authors, not that of the European Commission.

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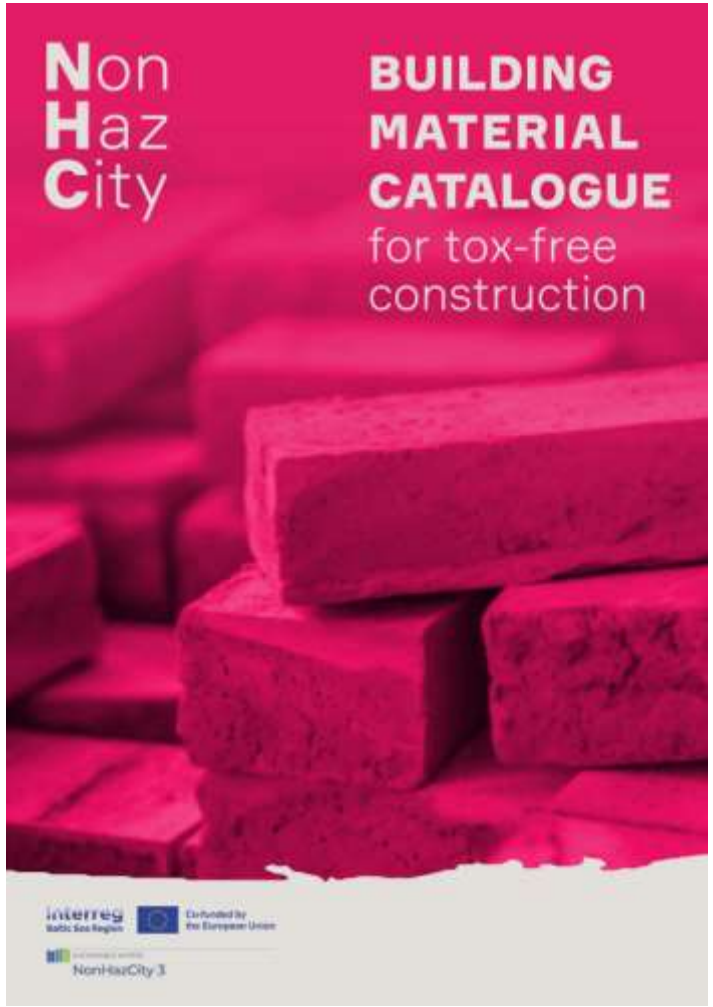
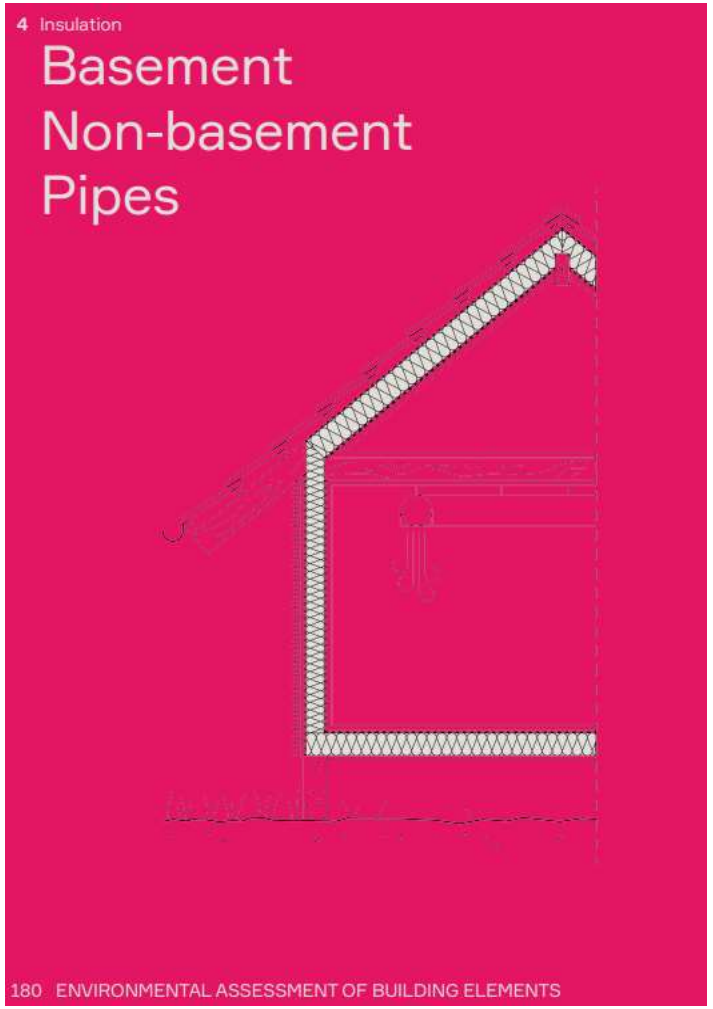
Where to find further information

Have a look at our materials on NonHazCity 3 - Interreg Baltic Sea Region (interreg-baltic.eu)

Material selection





https://interreg-baltic.eu/wp-content/uploads/2024/01/NHC3catalogue_E1_5_small.pdf

Sneak peak EPDs and SDS

EPD

Environmental Product Declarations (EPDs) are based on the life cycle assessment method according to ISO 14040/44 and the more specific standards ISO 14025 and EN 15804. EPDs can be understood as a kind of "fact sheet" of the declared product. They contain technical information, details of selected life cycle modules, corresponding environmental parameters, and, if applicable, test results for a detailed assessment. Environmental product declarations have a binding, generally valid basis; they are prepared by experts and independently verified - nevertheless, the manufacturer bears the responsibility for the EPDs. EPD International has developed or is still in the process of developing about 64 Product Category Rules (PCRs) for construction products. Product Category Rules (PCR) offer guidelines for life cycle assessments and EPD development in specific product categories. They determine the scope, functional unit, and environmental impact categories.

CHEMICALS-HEALTH CONNECTIONS – HOW TO INTERPRET SAFETY DATA SHEET

Many chemicals in mixtures (paints, varnishes, adhesives etc.) can be harmful to your health. Some substances can cause cancer, influence the hormone system, cause allergies and irritation. Individuals completing work in construction are often tasked with handling a variety of construction chemicals, some of which can be hazardous if improperly used. Safety Data Sheet (SDS) provides you the necessary information you need to know before you start to use chemical.

CONSTRUCTION CHEMICALS WITH SDSS

Legislation requires SDSs for hazardous chemicals or mixtures. The relevant mixtures in construction that have SDS are for example: adhesives, sealants, varnishes, paints, solvents, PU foams, wood preservatives, silicones, cement, concrete etc.

An SDS is not provided for construction materials (e.g. floor coverings, insulation plates etc) other than chemicals. You can get information about them from the EPD (Environmental Product Declaration).

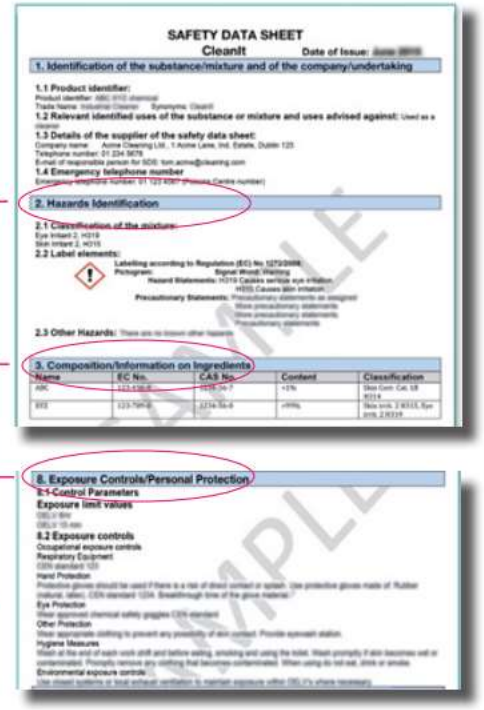
WHAT INFORMATION IS IMPORTANT TO KNOW

SDS includes 16 sections with physical, health, and environmental hazards; safety precautions for handling, storing, and transporting, provides guidance for Personal Protective Equipment (PPE), first aid and spill clean-up procedures.

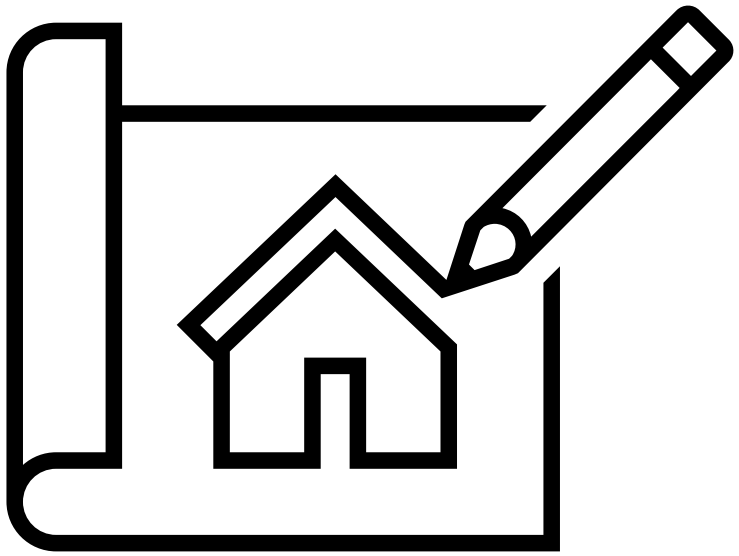
The most important sections are:

- Section 2. Hazards identification
- Section 3 Composition/ information on ingredients
- Section 8. Exposure controls/personal protection

➔ Check Sections **2, 3** and **8** of the SDS to find out about the hazards to your health and the safety precautions that need to be used.



5 advices when selecting construction materials



- Use a log-book to map materials
- Know your materials (check for declaration of content, SDS, EPDs, LCA data, product passports or certifications)
- Prefer natural materials over synthetic ones
- Avoid permanently attaching materials to each other (e.g. by adhesives) where possible, they are then not fully re-usable
- Be aware that chemicals can migrate from their original matrix to another. Having less products means having less chemicals in your evironment

NonHazCity

Modules for Architects

4.3. HOW TO INTERPRET ENVIRONMENTAL PRODUKT DECLARATION

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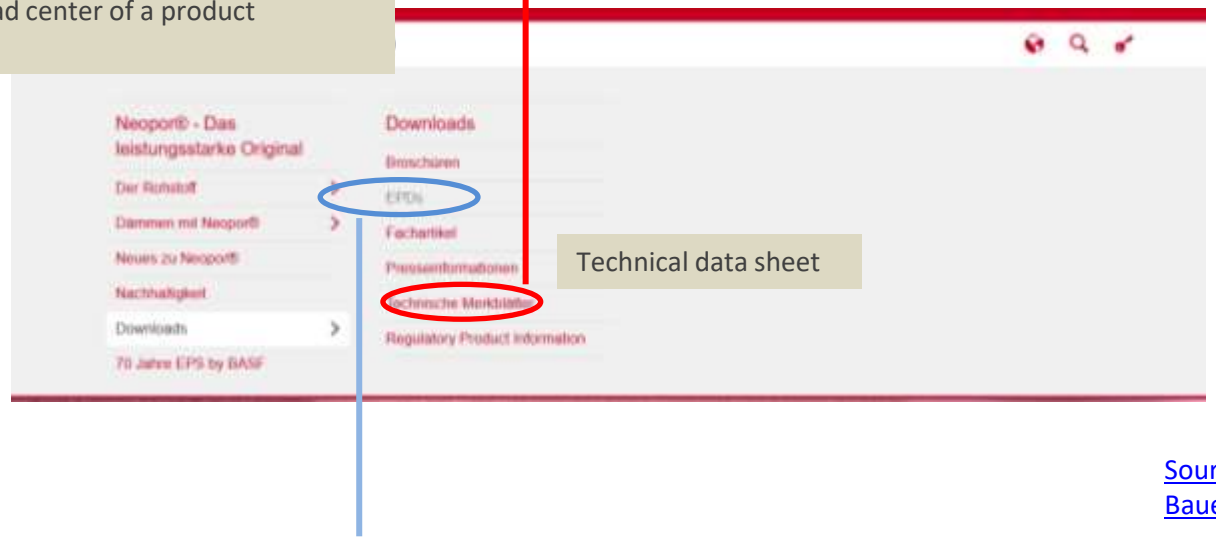
Gathering information about CCC aspects in the phase of choosing building products?

Choosing building materials mostly means
to check the datasheets/factsheets of manufacturers, to get information of the characteristics of the material.

Example of a
download center of a product



Source:Neopor® - nachhaltig Bauen last view 30.05.2024

More information on environmental aspects are given in the EPD-
What are EPDs?

What to do, iof there is no EPD available?

What are Environmental Product Declarations (EPDs)?

Environmental product declarations provide quantified environmental data of a product, under pre-set categories of parameters based on life cycle assessment and verified by an independent third party. EPDs do not state the benefits of the product, but provide verifiable information. EPDs can be understood as a kind of “fact sheet” of the declared product. They are accepted in various building certification systems (e.g. BREEAM, LEED), Building Information Management (BIM) software for building LCAs and Green Public Procurement.

Some countries have their own EPD organisations. In the Baltic Sea region, it is IBU EPD (Germany) and EPD Danmark (Denmark). They operate independently but adhere to the guidelines and standards established by EPD international.

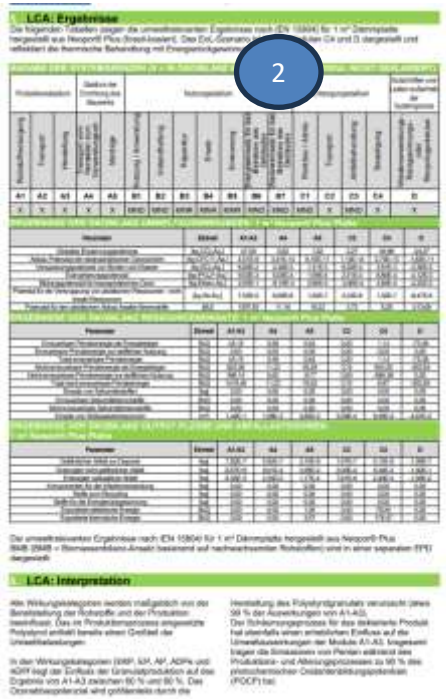
- Environmental product declarations, verified by an independent third party (Type III; ISO 14025).

What are Environmental Product Declarations (EPDs)?

EPDs consists of two parts:
A descritive part (1) and a list of LCA data (sheet of results) (2)

The descriptive part contains mainly information on: (1)

- Product description/Product definition
- Technical Data/characteristics of the product
- Base materials/Ancillary materials
- Manufacture (produtcion process)
- Environment and health during manufacturing
- Product processing/Installation
- Environment and health during use
- Reference service life (estimated life span of the product)
- Extraordinary effects for example fire protection
- Re-use phase (aspects of circularity)
- Disposal



Source: Veröffentlichte EPDs | Institut Bauen und Umwelt e.V. (ibu-epd.com) last view 15.03.2024

How to interprete Environmental Product Declarations (EPDs)?

1

The descriptive part contains mainly information on:

- Product description/Product definition
- Technical Data/characteristics of the product
- Base materials/Ancillary materials
- Manufacture (produtcion process)
- Environment and health during manufacturing
- Product processing/Installation
- Environment and health during use
- Reference service life (estimated life span of the pr
- Extraordinary effects for example fire protection
- Re-use phase (aspects of circularity)
- Disposal

Here possibility to check for hazardous substances or "not nice" ingridietns

Example of a
Decriptive part about base materials and ancillary materials

2.5

Dämmplatten mit Neopor® Plus bestehen aus Polystyrol (87 Massen-%). Das zum Aufschäumen zugesetzte Pentan (bis zu 5,5 Massen-%) ist ein C5-Kohlenwasserstoff. Während der Fertigungs- und Lagerprozesse wird das Pentan abgebaut.

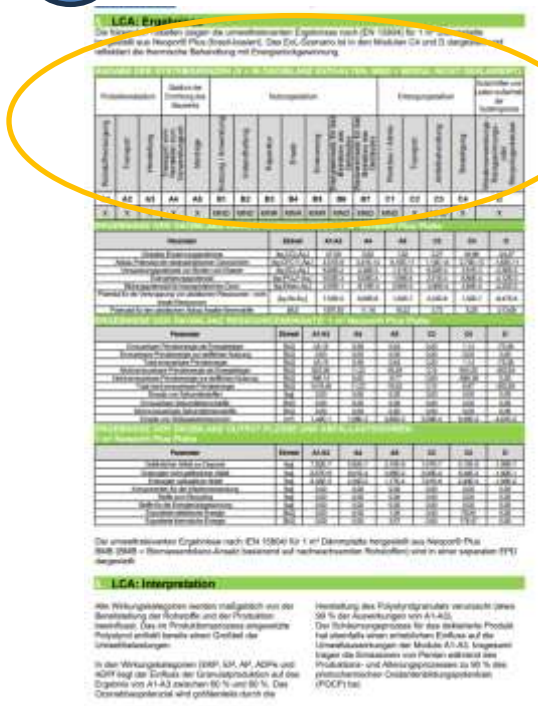
Zur Herstellung des flammgeschützten Polystyrol-Granulats wird zusätzlich ein polymeres Flammschutzmittel (Polymer-FR) mit ca. 1,1 Massen-% zugesetzt. Polymer-FR ist ein bromiertes Styrol-Butadien-Copolymerisat (CAS-Nr. 1195978-93-8) und unterliegt nicht den Bestimmungen der REACH-Verordnung für besonders besorgniserregende Stoffe. Zur Verbesserung der Dämmleistung wird dem Produkt Graphit (< 6 Massen-%) beigemengt. Dadurch wird das Reflektions- und Absorptionsverhalten der Wärmestrahlung verändert, wodurch die Dämmleistung der Produkte bei geringen Dämmstoffdicken verbessert wird.

Source:Neopor® - nachhaltig Bauen last view 30.05.2024

How to interprete Environmental Product Declarations (EPDs)?

About the a list of LCA data (sheet of results)

2



Example of a LCA sheet of results used by IBU
Phases of the life cycle of a product from production A 1-4, phase of use B 1-7 and demolition C 1-4 according to IBU.
The assessed data are related to the phases

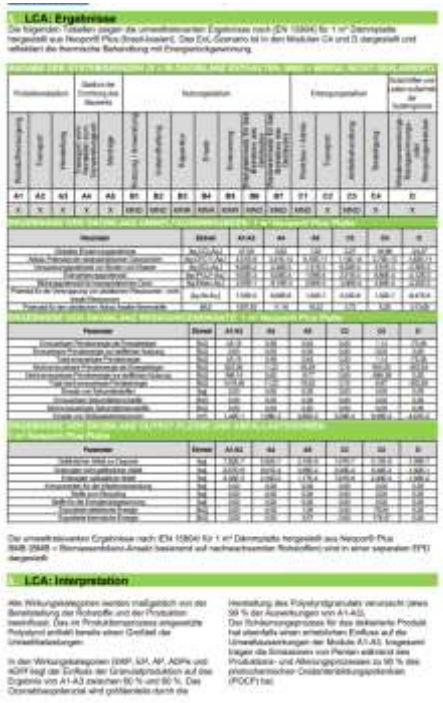
ANGABE DER SYSTEMGRENZEN (X = IN ÖKOBILANZ ENTHALTEN; MND = MODUL NICHT DEKLARIERT)

Produktionsstadium			Stadium der Errichtung des Bauwerks		Nutzungsstadium							Entsorgungsstadium				Gutschriften und Lasten außerhalb der Systemgrenze
Rohstoffversorgung	Transport	Herstellung	Transport vom Hersteller zum Verwendungsort	Montage	Nutzung / Anwendung	Instandhaltung	Reparatur	Ersatz	Erneuerung	Energieeinsatz für das Betreiben des Gebäudes	Wassereinsatz für das Betreiben des Gebäudes	Rückbau / Abriss	Transport	Abfallbehandlung	Beseitigung	Wiederverwendungs-, Rückgewinnungs- oder Recyclingpotenzial
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	MND	X	X

Source: Veröffentlichte EPDs | Institut Bauen und Umwelt e.V. (ibu-epd.com) last view 15.03.2024

IBU: Institut Bauen und Umwelt
The institute for construction and environment manages the EPD programme within the construction industry

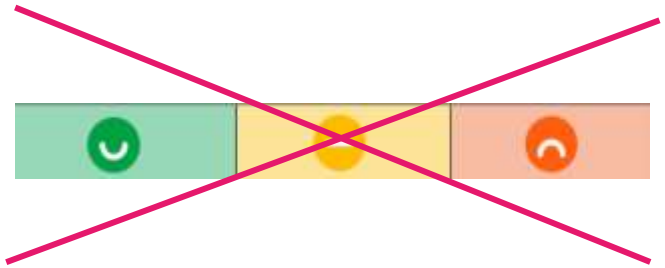
How to interprete Environmental Product Declarations (EPDs)?


LCA: Ergebnisse

LCA: Interpretation

But how to interprete these various figures in the fect sheet?

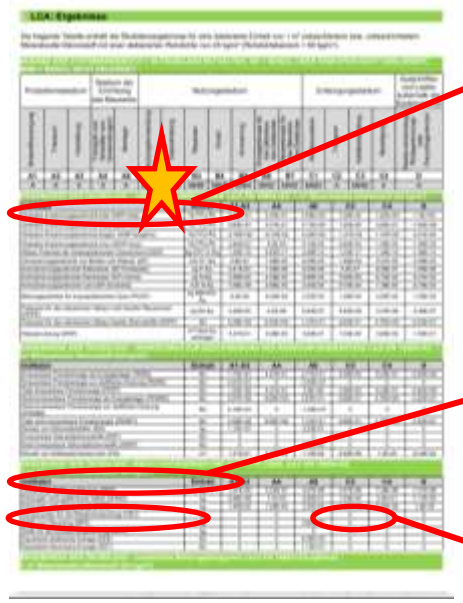
- There is no general guidance (possible) due to complexity



- But can the LCA sheet be used to compare the environmental impact of different products?

How to interprete Environmental Product Declarations (EPDs)?

Where to find the „big points“ ★ concerning the ccc approach?



ERGEBNISSE DER ÖKOBILANZ – UMWELTAUSWIRKUNGEN nach EN		
Indikator	**Einheit**	**A1-A3**
Globales Erwärmungspotenzial total (GWP-total)	kg CO_2-Äq.	3,45E+01

Global warming potetial in the production process in Kg CO2 equivalent :
3,45E+01 = 34,5 Kg ★ (here per 1 m³)

ERGEBNISSE DER ÖKOBILANZ –ABFALLKATEGORIEN UND OUTPUT 1 m³ Mineralwolle-Dämmstoff (24 kg/m³)		
Indikator	**Einheit**	**A1-A3**
Gefährlicher Abfall zur Deponie (HWD)	kg	1,67E-06

Hazardoues waste deposed in the production process :
1,67E-06 = 0,00000167 Kg

Very small figure-
so no „big point“?

Stoffe zum Recycling (MFR)	kg	0	0	5,84E-02	0	0

Materials for recycling in the stage of demolition:
0,0 Kg

Example: Mineral wool
Source: Veröffentlichte EPDs | Institut Bauen und Umwelt e.V. (ibu-epd.com) last view 15.03.2024

Example

A building has to be insulated,
U-value of 0,24 W/m²K is mandatory
Check of the EPDs for three different variants, how this result can be achieved

Existing

Brick	0,450	100
Insulation	0,040	50
Brick	0,450	125
Plater	0,870	25
Thickness		300
U value		0,51

Variant 1
ETICS EPS Insulation

Brick	0,450	100
Insulation	0,040	50
Brick	0,450	125
Plater	0,870	25
Insulation	0,031	80
Thickness		380
U value		0,22

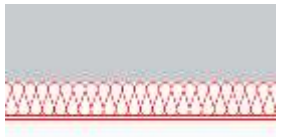
Variant 2
Mineral wool insulation

Brick	0,45			100
Insulation	0,04			50
Brick	0,45			125
Plater	0,87			25
Insulation	0,031	wood	0,13	80
Thickness				380
U value				0,23

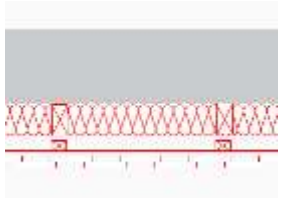
Variant 2
Wood wool Insulation

Brick	0,45			100
Insulation	0,04			50
Brick	0,45			125
Plater	0,87			25
Insulation	0,036	Wood	0,13	100
Thickness				400
U value				0,22

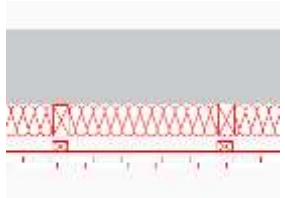
Principle of construction
ETICS



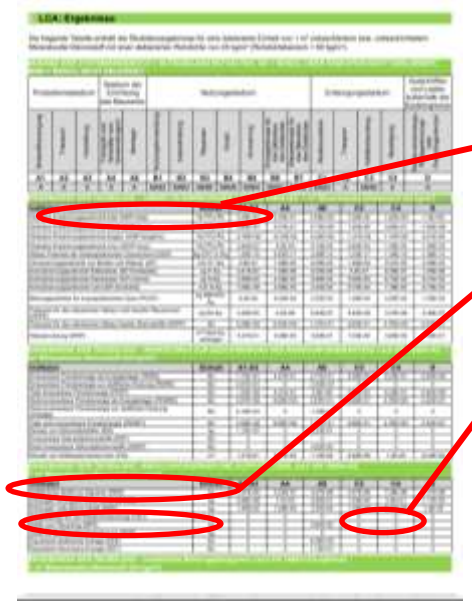
Principle of construction



Principle of construction



Check of the Environmental Product Declarations (EPDs) LCA fact sheet



1 GWP

2 HWD

3 MFR

	Variant 1 ETICS EPS Insulation	Variant 2 Mineral wool insulation	Variant 2 Wood wool Insulation
	EPS	**Mineral wool**	**Wood wool**
1 GWP	47,59 Kg	34,5 Kg	-67.5E kg
2 HWD	0,000000782 Kg	0,00000167 Kg	0,0 Kg
3 MFR	0,0 Kg	0,0 Kg	0,0 Kg
	Source: Daemmplatte mit Neopor Plus.pdf last view 15.03.2024	Source: Veröffentlichte EPDs | Institut Bauen und Umwelt e.V. (ibu-epd.com) last view 15.03.2024	GUTEX Thermoflex.pdf last view 15.03.2024

Very small figures
Which one is really worse concering the tox free approach?

Facit:

The LCA fact sheet contens
helpful figures
to check and compare
the global warmimg potential
of different
building products

There are still not enough data
about cirularity and toxicity,
to help out in the phase of
choosing a material/product

- Base materials/Ancillary materials

It is useful to check the list of
material in the descriptive part and
check it for hazardous substances

More information on toxicity is given in the saftey data sheets SDS

4.4. LIFE CYCLE ASSESSMENT (LCA) OF BUILDINGS

Interreg Baltic Sea Region
Co-funded by the European Union
SUSTAINABLE WATERS
NonHazCity 3
NONHAZCITY

Using LCA

- What is an LCA?
- Why is it done?
- When should it be done?
- Are there any golden rules?

- What else should be kept in mind?
  - Toxicity
  - Circularity
- Where to find further information

What is an LCA?

Life-cycle assessment (LCA) is a process of **evaluating the effects** that a product has **on the environment over the entire period of its life** thereby increasing resource-use efficiency and decreasing liabilities.

It can be used to study the environmental impact of either a product or the function the product is designed to perform. LCA is commonly referred to as a "cradle-to-grave" analysis.

Definition by UNEP

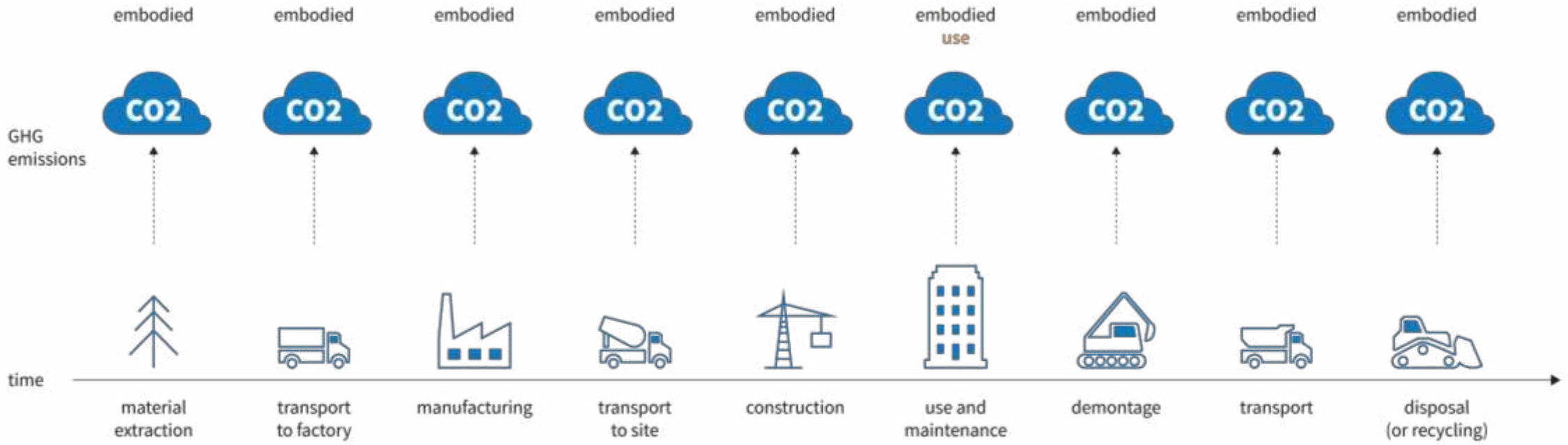
What is an LCA?

LCA's key elements are:

- **identify and quantify** the environmental loads involved; e.g. the energy and raw materials consumed, the emissions and wastes generated;
- **evaluate** the potential environmental impacts of these loads;
- **assess** the options available for reducing these environmental impacts.

Definition by UNEP

What is an LCA?



What is an LCA?

EPD

Environmental Product Declarations (EPDs) are based on the life cycle assessment method according to ISO 14040/44 and the more specific standards ISO 14025 and EN 15804. EPDs can be understood as a kind of "fact sheet" of the declared product. They contain technical information, details of selected life cycle modules, corresponding environmental parameters, and, if applicable, test results for a detailed assessment. Environmental product declarations have a binding, generally valid basis; they are prepared by experts and independently verified - nevertheless, the manufacturer bears the responsibility for the EPDs. EPD International has developed or is still in the process of developing about 64 Product Category Rules (PCRs) for construction products. Product Category Rules (PCR) offer guidelines for life cycle assessments and EPD development in specific product categories. They determine the scope, functional unit, and environmental impact categories.

What is an LCA?

- System boundaries and differences

Source: Ramboll – Compairing differences in building life cycle assessment methodologies

What is an LCA?

Source: Ramboll – Compairing differences in building life cycle assessment methodologies