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PUB-WOOD

Construction with Wood – Sustainable Construction?

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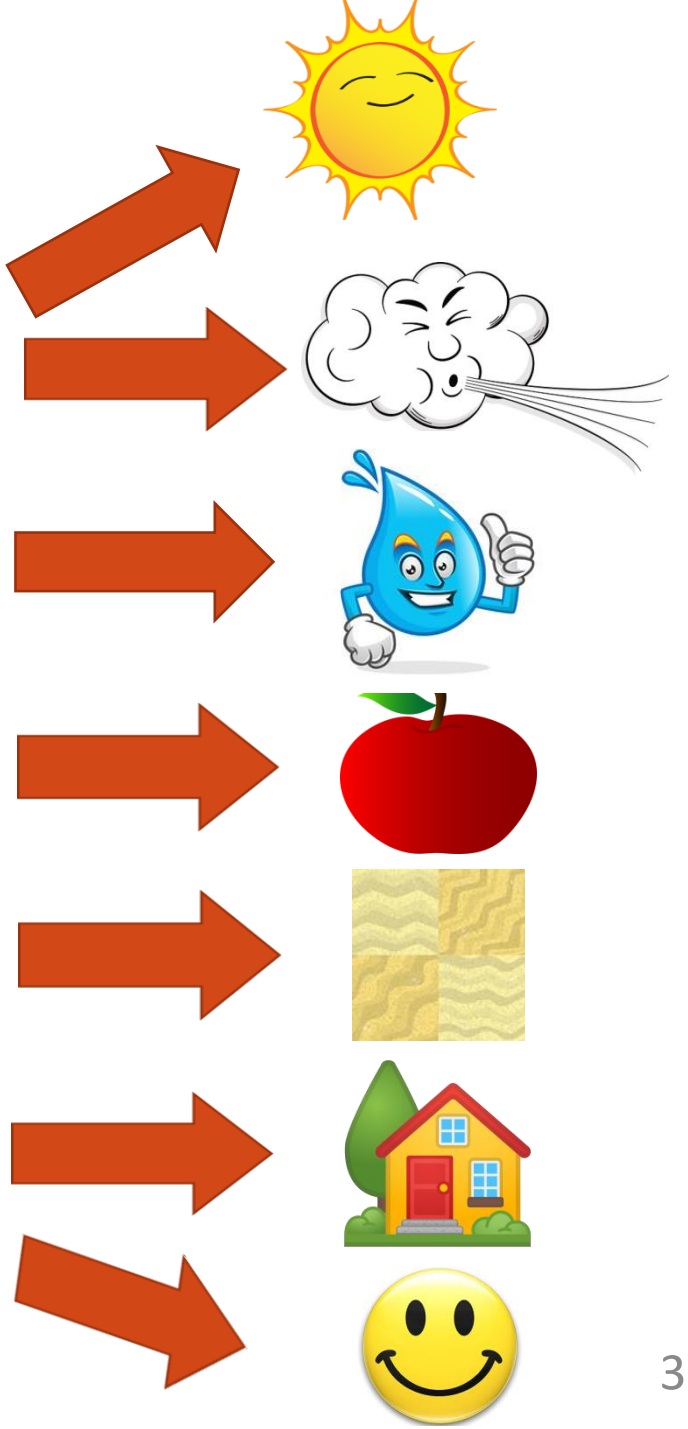
STUDY AND CONSULTING CENTER

Content

- Sustainabile development. Why it is important?
- Sustainability dimensions
- Sustainability rating systems
- Why building with wood is sustainable?

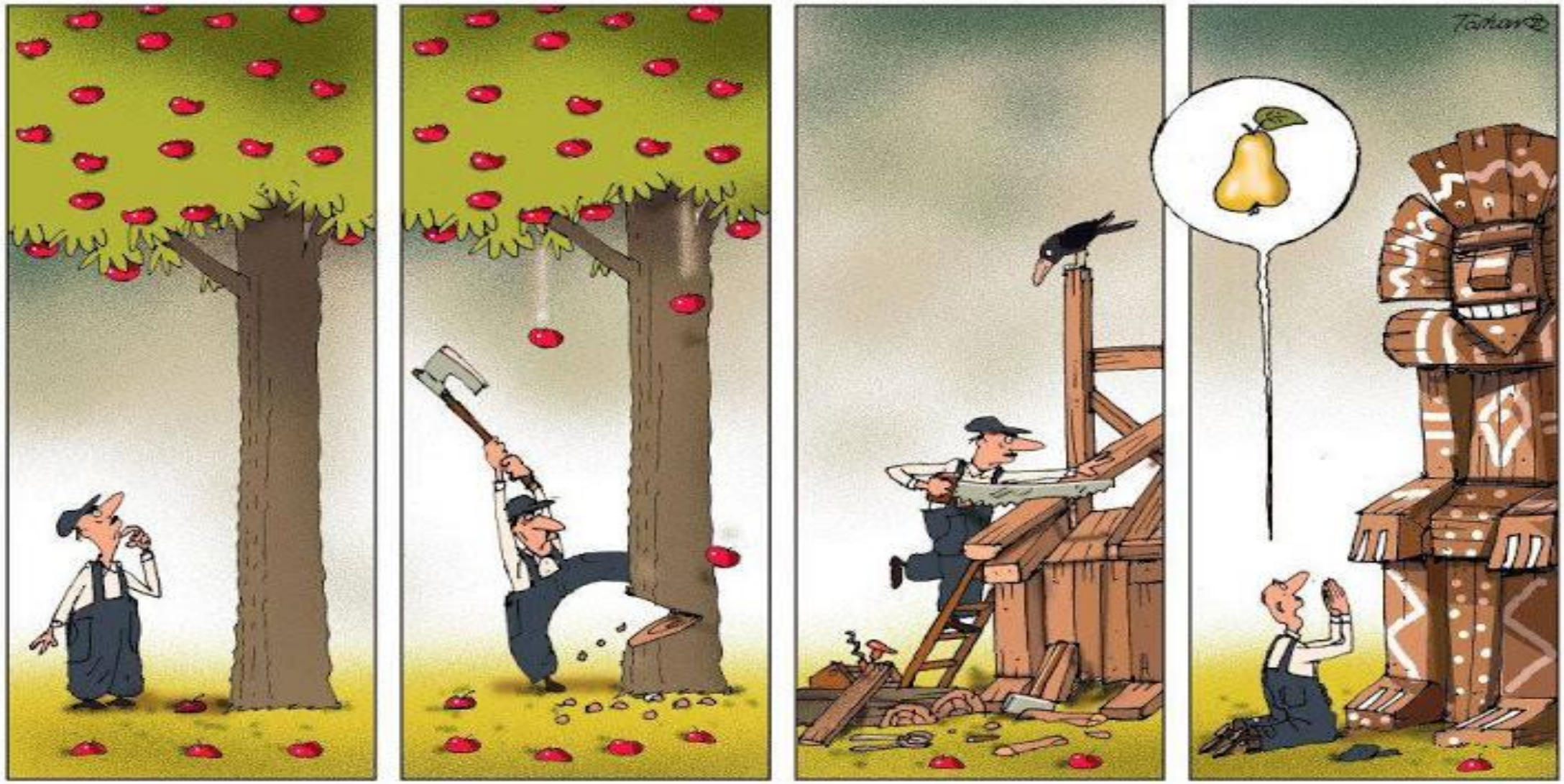
Nature – sustainable system

iStock photo



Consumption culture

Pictures from: https://oneinabillionblog.com/economics-2/economy/example-economy-over-consumption/



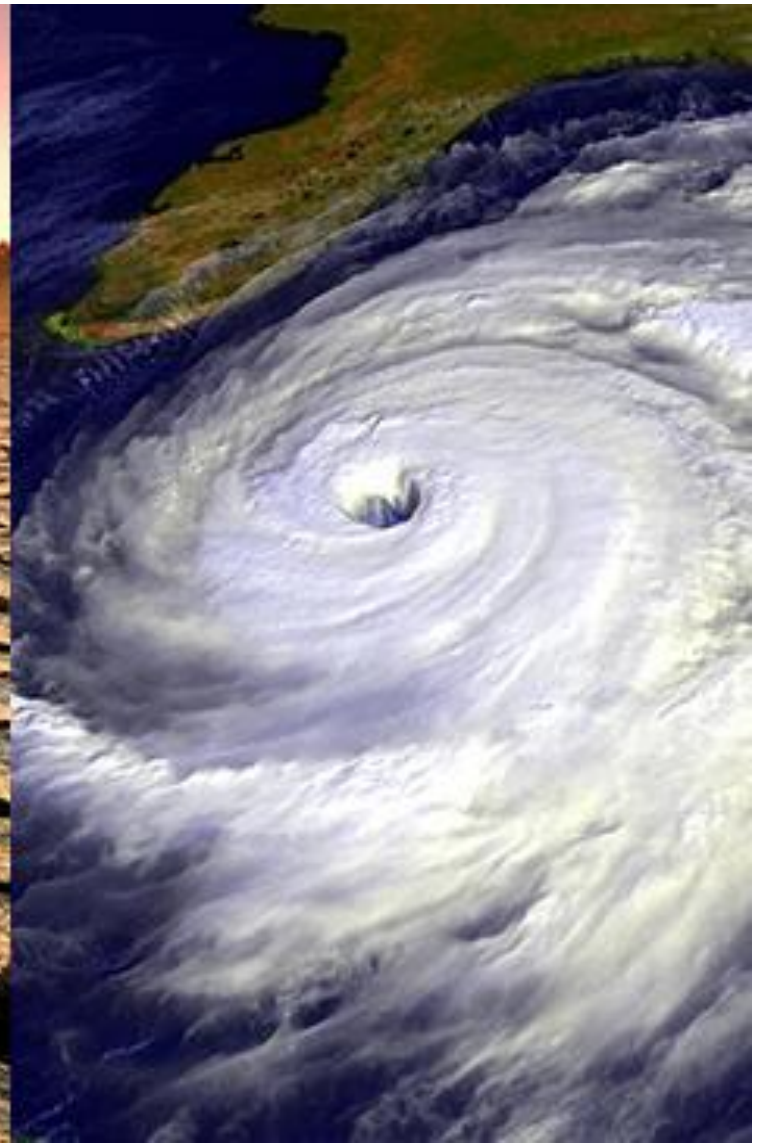
Picture from: https://imgur.com/gallery/bSb5xly

Economic problems

Social problems

Environmental problems

Climate change

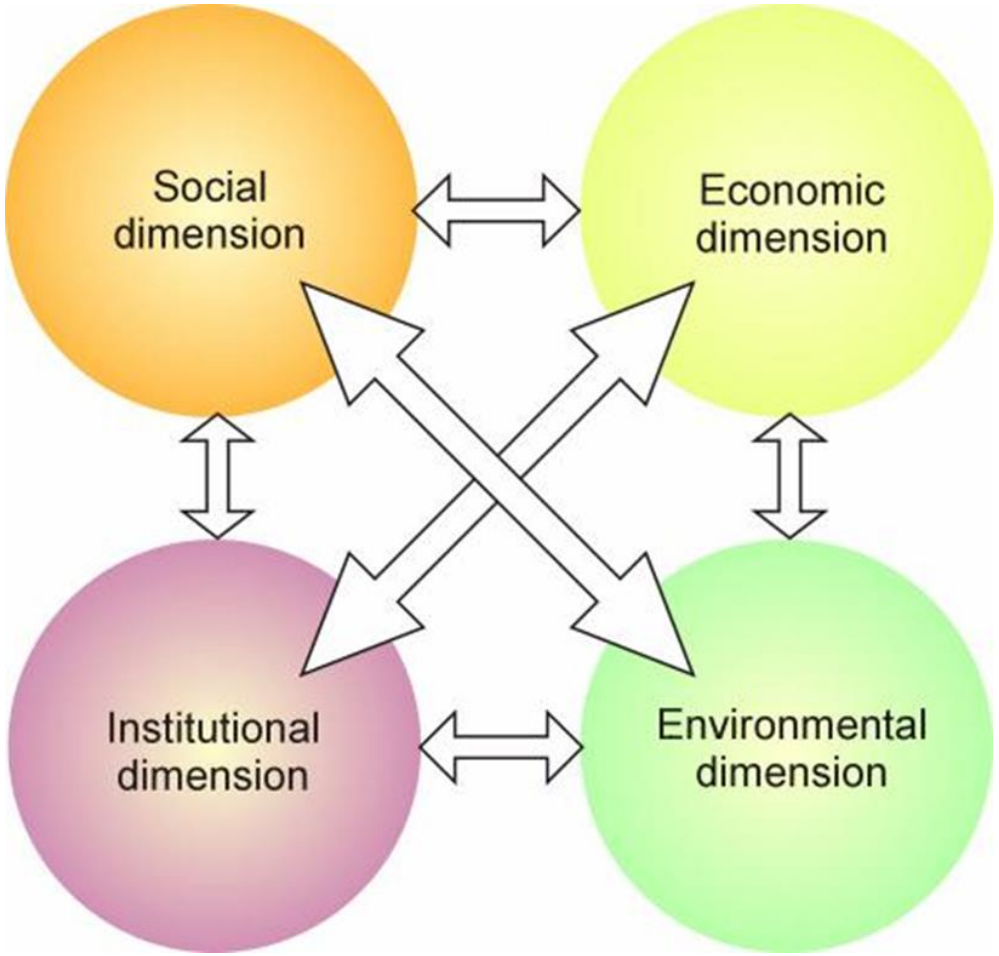



Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Gro Harlem Brundtland
quotefancy

Agenda 2030

- In 2015, countries adopted the 2030 Agenda for Sustainable Development and its **17 Sustainable Development Goals**.
- In 2016, the Paris Agreement on climate change entered into force, addressing the need to limit the rise of global temperatures.

Sustainability dimensions



Pictures: Left - http://www.eolss.com/eolss/5a.htm ; right - http://www.oneworldcentre.org.au/global-goals/agenda-2030-and-the-sdgs/

SUSTAINABLE DEVELOPMENT GOALS

Source: http://www.oneworldcentre.org.au/global-goals/agenda-2030-and-the-sdgs/

Sustainable construction

- **Sustainable construction** means designing, renovating or converting a building in compliance with environmental rules and energy-saving methods.
- The purpose of this holistic process is to **restore and maintain harmony between the natural and built environment**.

Source: http://www.mixbrow.com

Sustainability rating systems

BREEAM (Building Research Establishment's Environmental Assessment Method), UK (1990)

BREEAM Offices 2005 - Design & Procurement Assessment tool

Design Stage Assessment Results

BREEAM Rating: Example 1	Good

Core & Design & Procurement Credit Allocation Table

Overall Credit Allocation	Env Weighting	Available	Achieved	Percentage section credits achieved	Overall Weighted Percentage
Management	15%	10	5	50.00%	7.50%
Health & Wellbeing	15%	15	8	53.33%	8.00%
Energy		17	9	52.94%	
Transport		14	7	50.00%	
Energy & Transport	25%	31	16	51.61%	12.90%
Water	5%	6	4	66.67%	3.33%
Materials	10%	12	4	33.33%	3.33%
Land Use & Ecology	15%	11	6	54.55%	8.18%
Pollution	15%	12	6	50.00%	7.50%
				Totals	50.75%

BRE BREEAM

BREEAM Offices 2005 - Design & Procurement Assessment tool

Design Stage Assessment Results

BREEAM Rating: Example 1	Good

BREEAM Rating	% Benchmark
Unclassified	<25
Pass	≥25 - <40
Good	≥40 - <55
Very Good	≥55 - <70
Excellent	≥70

Source: Fowler & Rauch (2006)

- At 90.8%, HAUT (Amsterdam) received the highest BREEAM score in the category ‘Homes – Design’.

Source: https://teamv.nl/en/haut-wins-international-breeam-award-2018/

LEED® (Leadership in Energy and Environmental Design), USA (1998)

SSA Child Care Center, LEED Project # 0265
LEED Version 2.0 Certification Level: CERTIFIED
Feb. 27, 2003

28 Points Achieved — Possible Points: **69**

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

6 Sustainable Sites		Possible Points:	14
Y			
Y	Prereq 1	Erosion & Sedimentation Control	
1	Credit 1	Site Selection	1
	Credit 2	Urban Redevelopment	1
	Credit 3	Brownfield Redevelopment	1
1	Credit 4.1	Alternative Transportation, Public Transportation Access	1
	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
	Credit 4.4	Alternative Transportation, Parking Capacity	1
1	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
1	Credit 6.1	Stormwater Management, Rate and Quantity	1
	Credit 6.2	Stormwater Management, Treatment	1
	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	Credit 8	Light Pollution Reduction	1

2 Water Efficiency		Possible Points:	5
Y			
1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
	Credit 3.1	Water Use Reduction, 20% Reduction	1
	Credit 3.2	Water Use Reduction, 30% Reduction	1

5 Energy & Atmosphere		Possible Points:	17
Y			
Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
2	Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
2	Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
1	Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
	Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
	Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 20%	1
	Credit 3	Additional Commissioning	1
	Credit 4	Ozone Depletion	1
	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

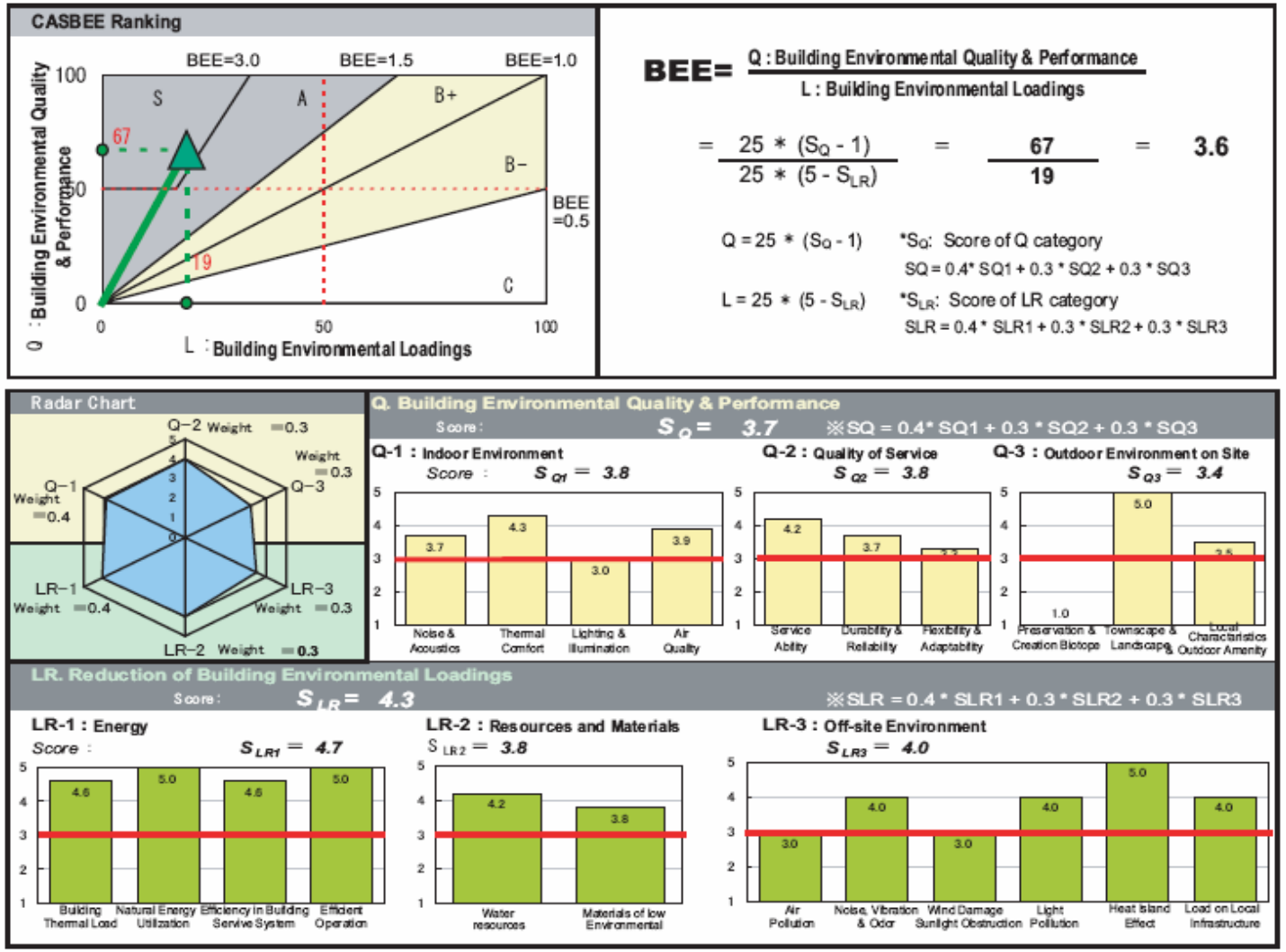
6 Materials & Resources		Possible Points:	13
Y			
Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Existing Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
1	Credit 2.2	Construction Waste Management, Divert 75%	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content, Specify 25%	1
1	Credit 4.2	Recycled Content, Specify 50%	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

7 Indoor Environmental Quality		Possible Points:	15
Y			
Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	Credit 1	Carbon Dioxide (CO_2) Monitoring	1
	Credit 2	Increase Ventilation Effectiveness	1
	Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
	Credit 4.4	Low-Emitting Materials, Composite Wood	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
	Credit 6.1	Controllability of Systems, Perimeter	1
	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

2 Innovation & Design Process		Possible Points:	5
Y			
1	Credit 1.1	Innovation in Design: Exemplary Performance 38% Local Materials	1
	Credit 1.2	Innovation in Design:	1
	Credit 1.3	Innovation in Design:	1
	Credit 1.4	Innovation in Design:	1
1	Credit 2	LEED™ Accredited Professional	1

Source: Fowler & Rauch (2006)

CASBEE (Comprehensive Assessment System for Building Environmental Efficiency), Japan (2001)



Source: Fowler & Rauch (2006)

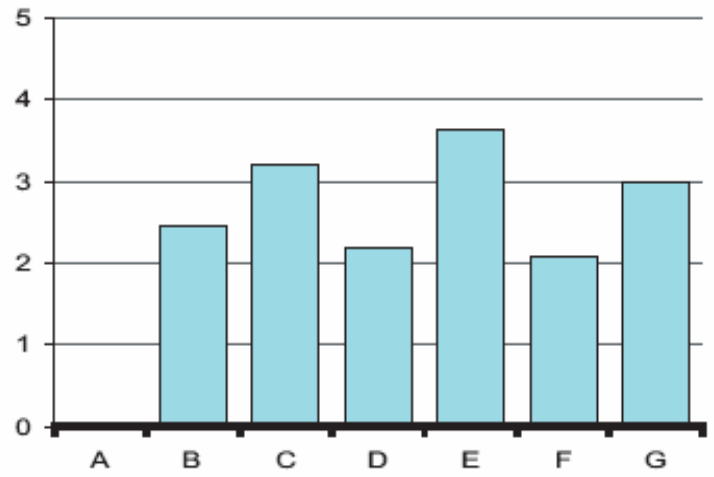
GBTool , the International Framework Committee for the Green Building Challenge, more than 25 countries (1998)

Results for SHIIODOME TOWER, Tokyo, Japan

Actual performance results based on information available during Operations Phase	*Active Phase (set in Module A)*	**Operations Phase**

Relative Performance Results

0 = Acceptable Practice; 3 = Good Practice; 5 = Best Practice



Performance Issue Areas

Scores for Operations are based on measurement of actual performance and on verification that certain measures planned earlier have actually been undertaken.

Key Facts About This Project

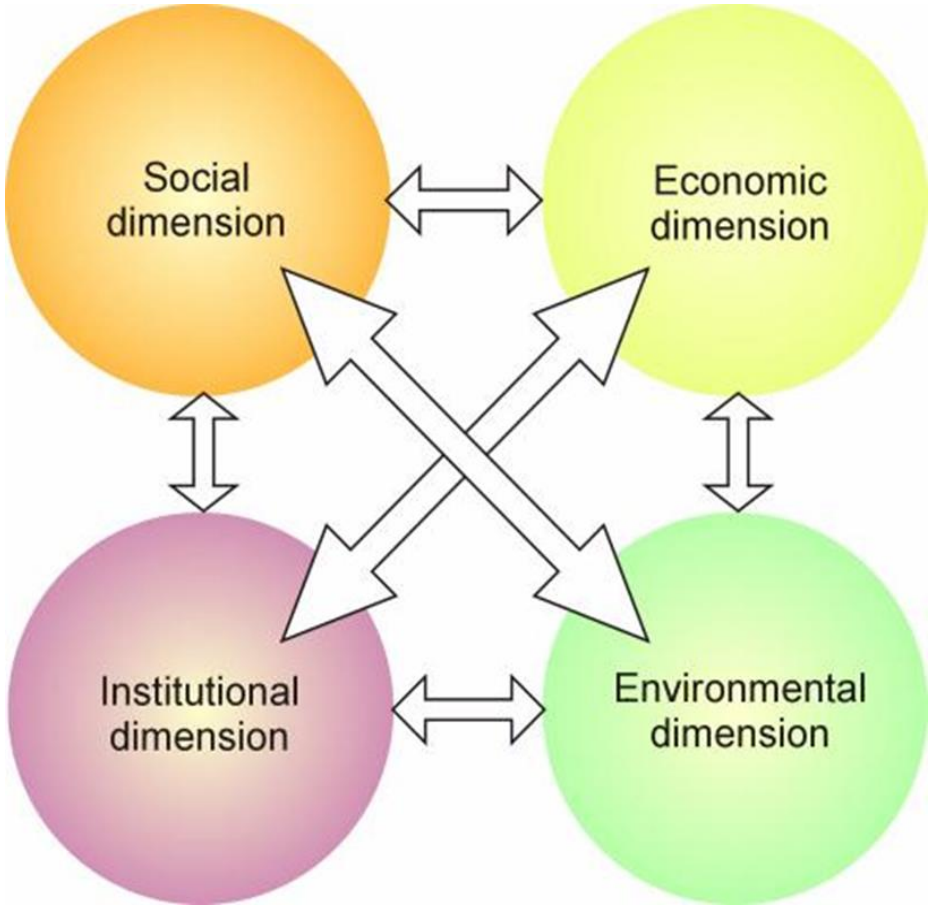
This project occupancy type(s) includes Office Occupancy and Retail Occupancy. The total gross area of the project is 78043 m2, in a building that has 38 floors above grade. The building is new construction only.

Assumed life span is 100 years. Monetary units are in Yen	Amortization rate for embodied energy of existing materials is set at 0 percent.		
	There is no existing building on the site that can be re-used.		
With current context and building data, the number of active low-level parameters is:	42	Max. potential low-level parameters:	50
The number of low-level mandatory parameters with a score of less than 2 is:	8	Active low-level mandatory parameters:	12

To see a full list of issues go to the Issues worksheet; to alter weights, go to the Weights worksheets.		Active Weights	Weighted scores
A	Site Selection, Project Planning and Development	0%	0.0
B	Energy and Resource Consumption	24%	2.5
C	Environmental Loadings	19%	3.2
D	Indoor Environmental Quality	19%	2.2
E	Functionality and Controllability of Building Systems	14%	3.6
F	Long-Term Performance	14%	2.1
G	Social and Economic aspects	10%	3.0
	Total weighted building score		2.7

Source: Fowler & Rauch (2006)

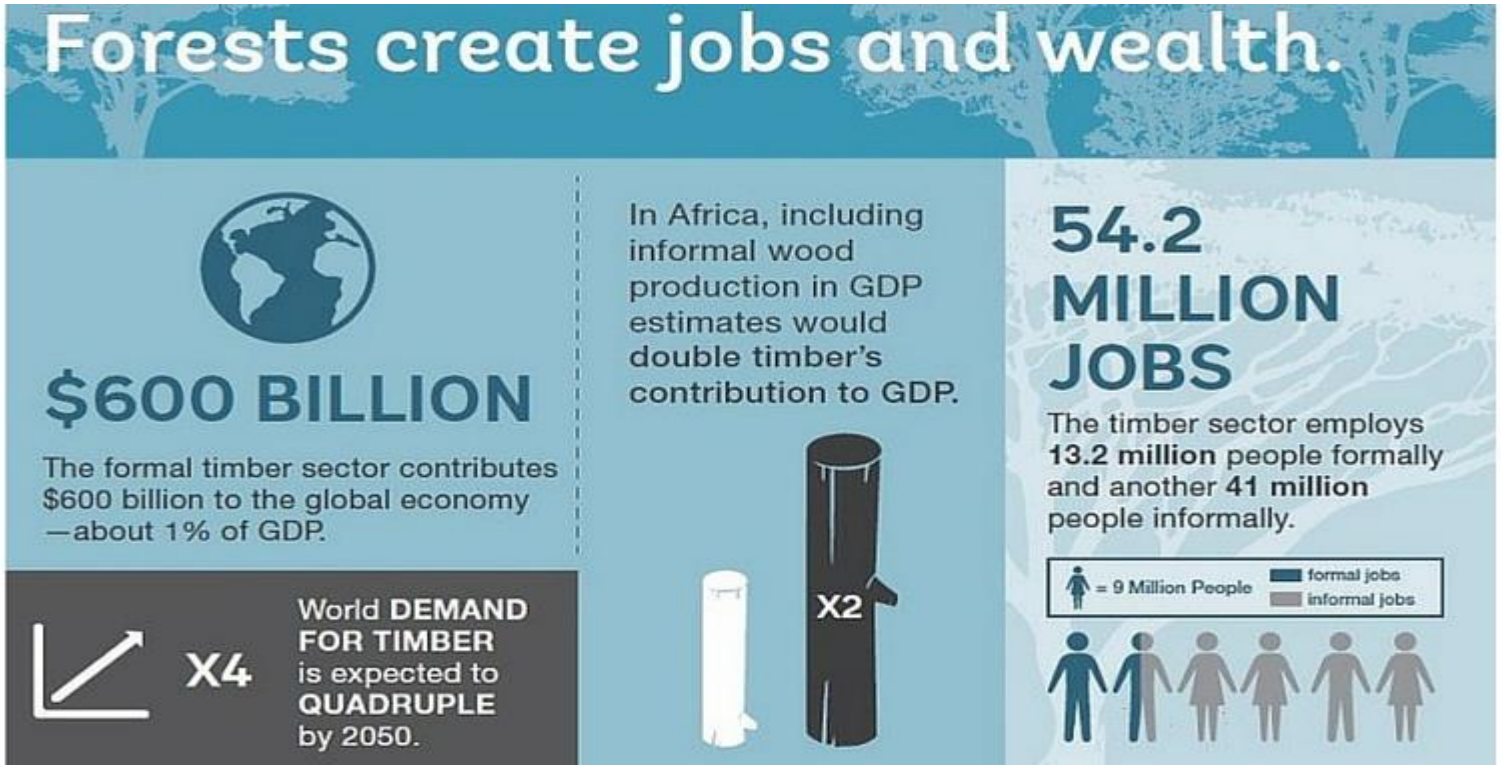
Construction with wood = Sustainable construction?



Pictures from: left - https://arcspace.com/feature/metropol-parasol/, right - http://www.eolss.com/eolss/5a.htm

Economic perspective

- **Wood is a good business.**
- **Jobs in various subsectors:** sourcing, sawing, planning, shaping, laminating, assembling, designing, building, maintaining.
- **The forests are sustainable—and so are the jobs they provide**.



Source: http://www.worldbank.org/en/topic/forests/brief/forests-generate-jobs-and-incomes

Cost effectiveness

- Wood can be **locally sourced** and is usually less expensive than alternative building materials.
- Wood building systems typically **cost less to install**. **It is lighter** than other materials, requiring a less expensive foundation. Transportation is cheaper.
- **Faster construction** schedules help to keep costs down.
- Contractors can reduce labor and material costs with **panelizing**.
- **Using wood can save** significantly on construction costs. **Woodworks.org** offers a cost calculator to help builders estimate cost savings from building with wood, taking into account numerous variables like material costs, speed of construction and availability of labor.

Source: https://www.forestfoundation.org/building-with-wood-is-cost-effective

EXAMPLE: BETHEL SCHOOL DISTRICT, BETHEL, WASHINGTON

- BSD's Clover Creek Elementary, completed in 2012, was built at a cost of $197.70 per square foot—a savings of more than **$50** per square foot over the average construction cost of an elementary school in western Washington.
- Using wood framing for a school saves about **20 percent** in materials and installation costs. For a $10-million project, this translates to a **$2-million savings**.

Source: https://www.forestfoundation.org/building-with-wood-is-cost-effective

Social perspective

- Public acceptance and appreciation
- Aesthetically pleasing design
- Quality of life. ProHolz BW GmbH reports that wood makes you feel good, lowers the heart rate and has a positive effect on people's health.
- Wood breathes and regulates the indoor climate and humidity.

Source: https://www.biooekonomie-bw.de/en/articles/news/sustainable-building-construction-municipalities-go-wood/

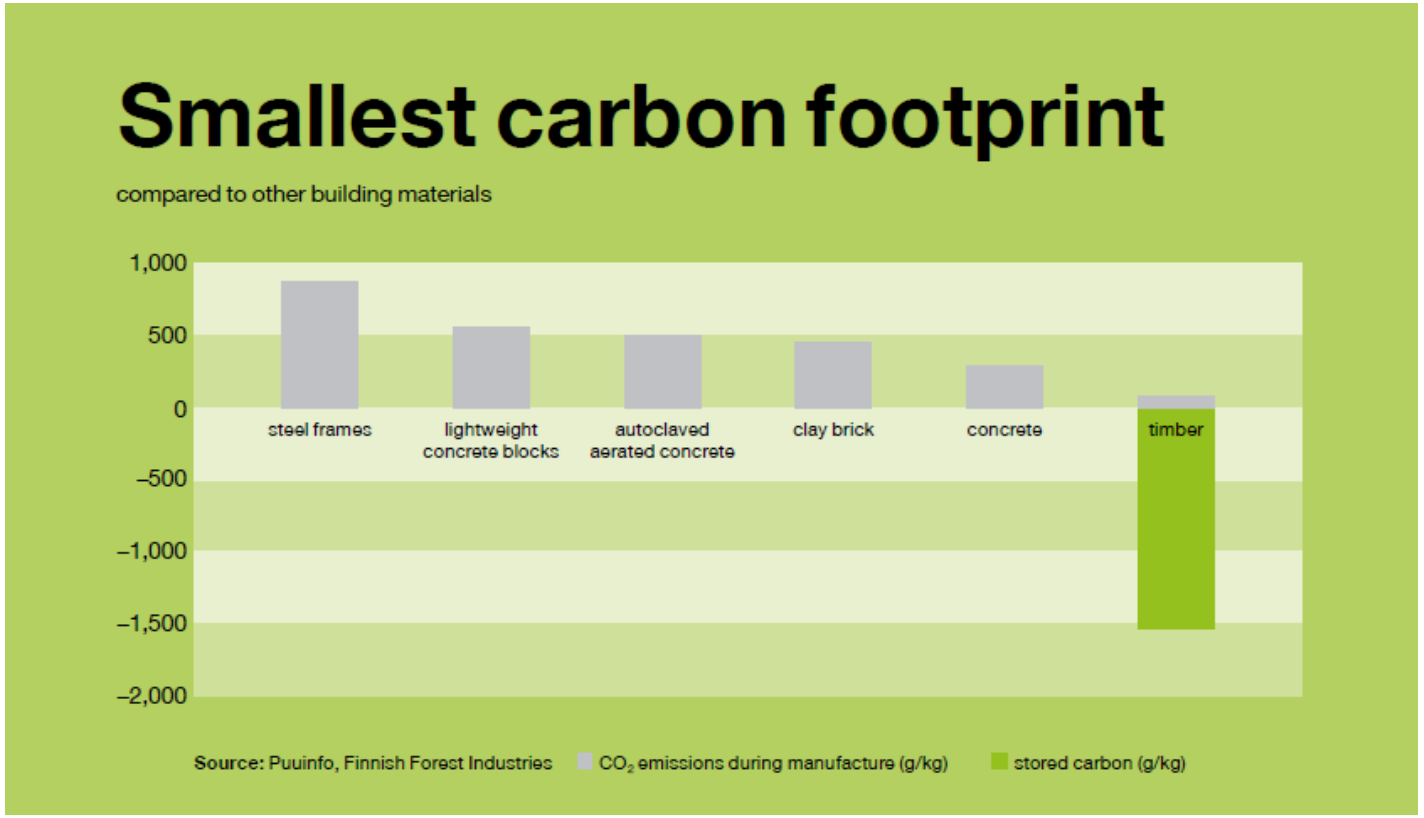
EXAMPLE: EGGLHAM PRIMARY SCHOOL (GERMANY)

- Studies have shown that compared to standard classrooms, timber classrooms give pupils a greater ability to concentrate and help to reduce stress and tension.

Source: Stora Enso (2019)

Environmental perspective

- Natural material.
- Reduced embodied energy.



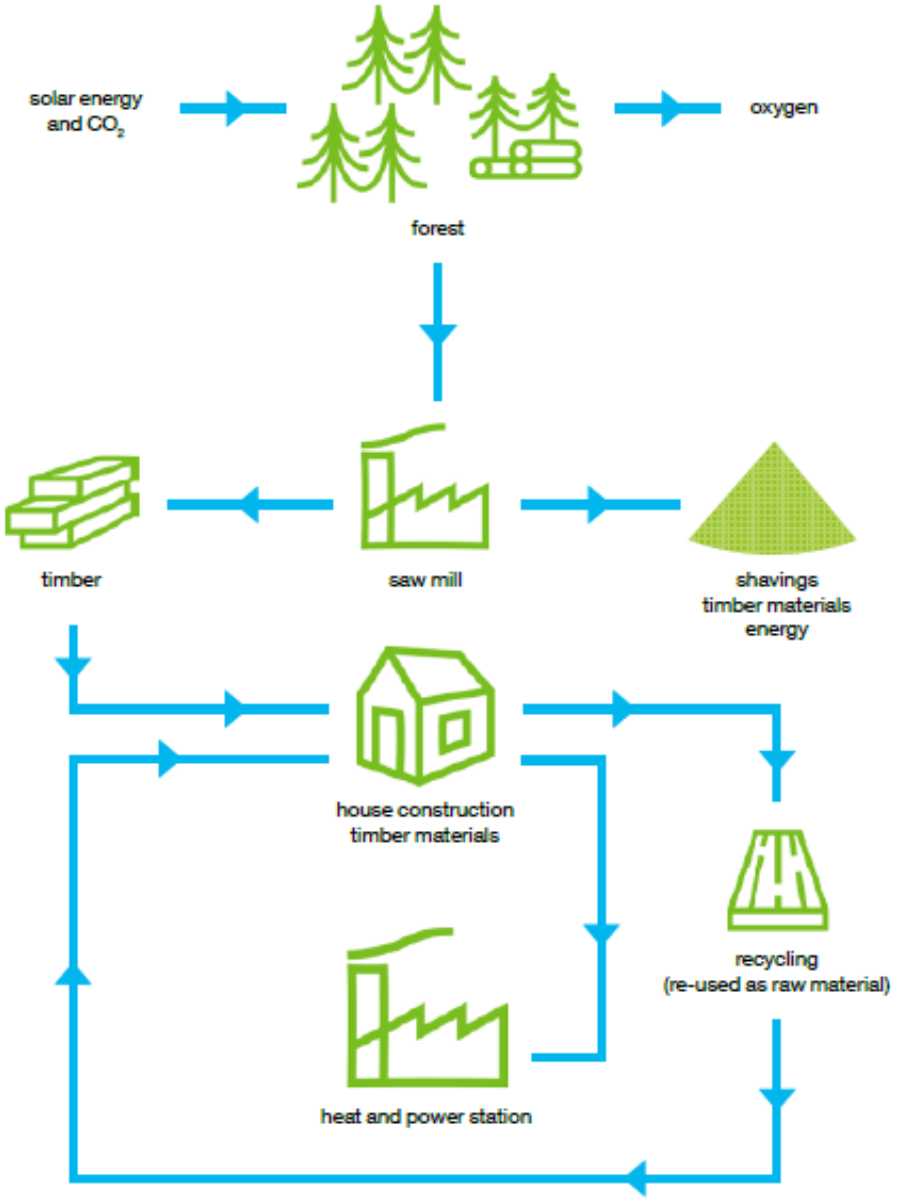
Source: Stora Enso (2019)

Environmental perspective

- **Fewer greenhouse gas emissions**. Global life-cycle assessment studies have proven that wood can offer lower greenhouse gas emissions, less air and water pollution, lower volumes of solid waste and less ecological resource use than other materials.
- In Austria, trees produce enough wood every 40 seconds to build a timber house.

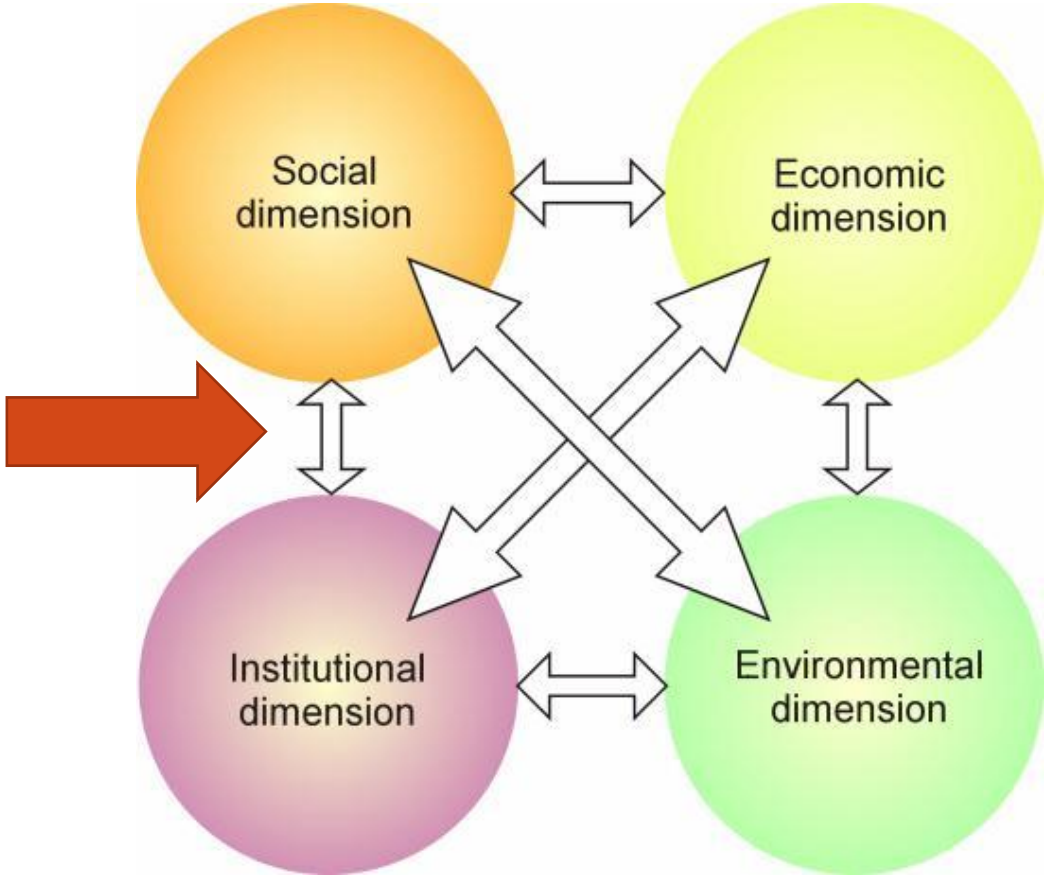
Source: Stora Enso (2019)

Natural cycle: wood can be used again and again



Source: Stora Enso (2019)

Conclusion: Building with wood contributes to sustainable development



Picture: https://www.dezeen.com/2018/11/14/calgary-new-central-library-snohetta-dialog-aaron-betsky-opinion/

THANK YOU FOR YOUR ATTENTION!

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