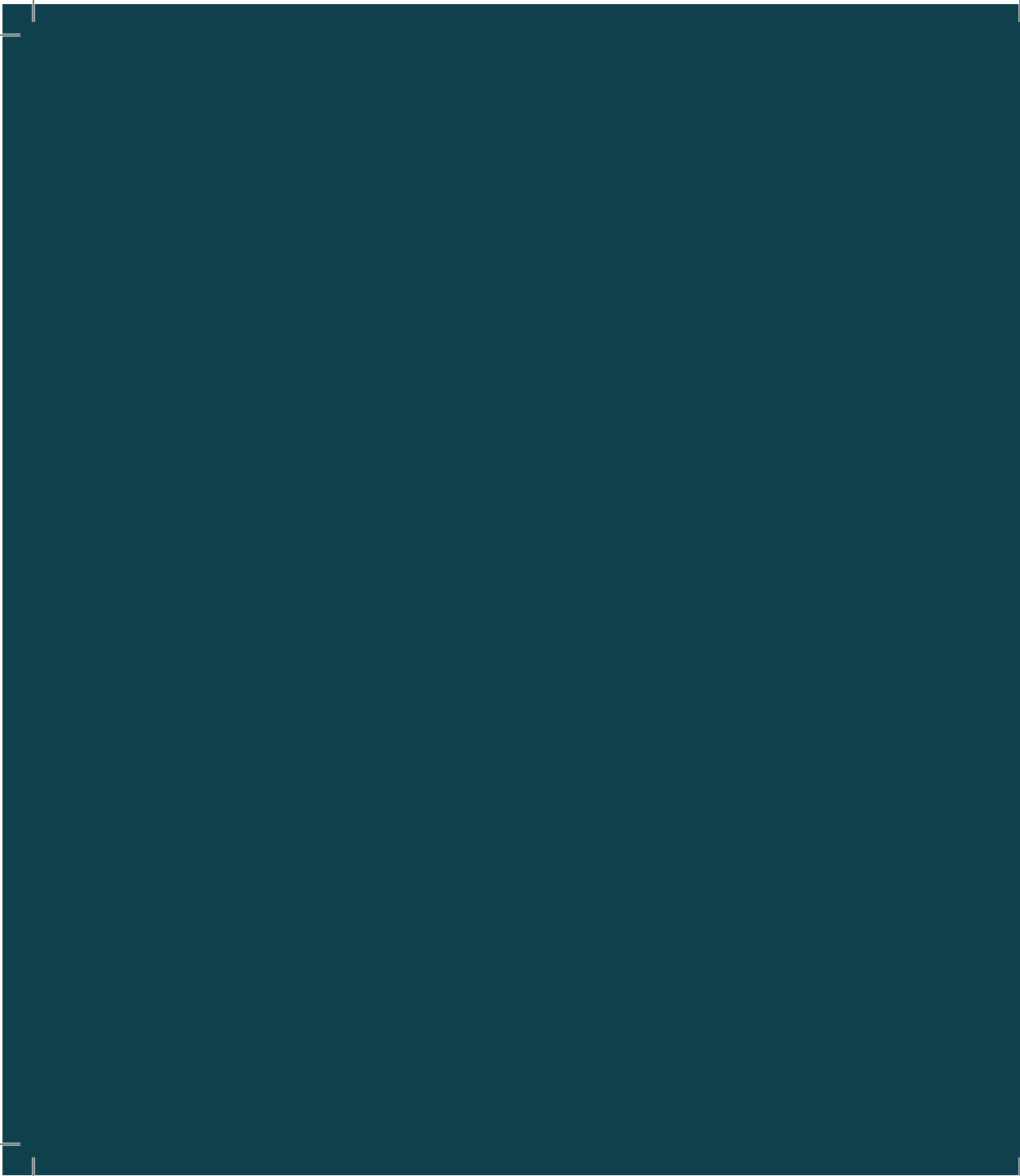


Isolerer bæredygtigt og lagrer CO₂





**Isolerer bæredygtigt
og lagrer CO₂**

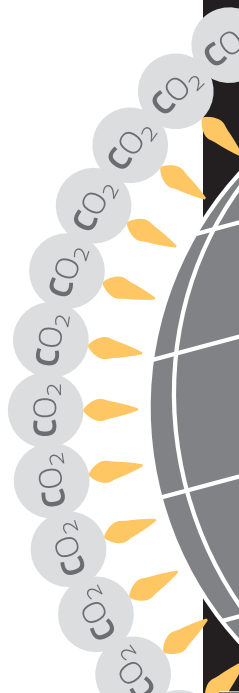
Hvad er fidusen ved at »lagre« CO₂?

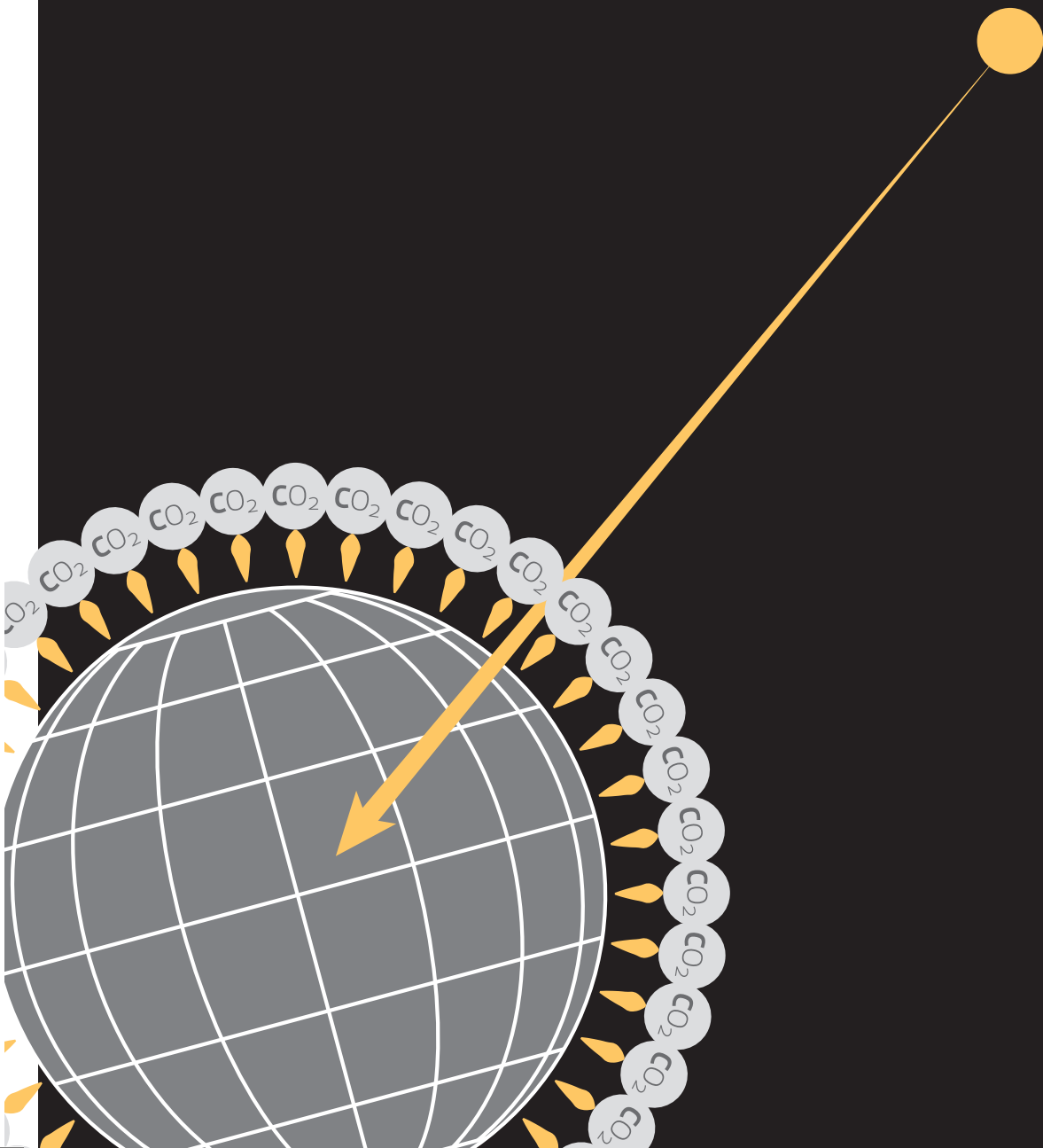
For meget CO₂-gas i atmosfæren forhindrer naturlig varmeudstråling fra kloden.

Temperaturen på jorden stiger og fører til skadelige klimaændringer.

Vi slipper for meget CO₂ ud, så det gælder om at reducere udslippene så hurtigt og så massivt som muligt. Verdenssamfundets mål er et nuludslip inden 2050–2100.

Lagring af CO₂ i skov- og træprodukter hindrer udslip og er et vigtigt bidrag til at begrænse CO₂-mængden i atmosfæren.





Egentlig er det ikke CO₂, vi kan lagre, men kulstof

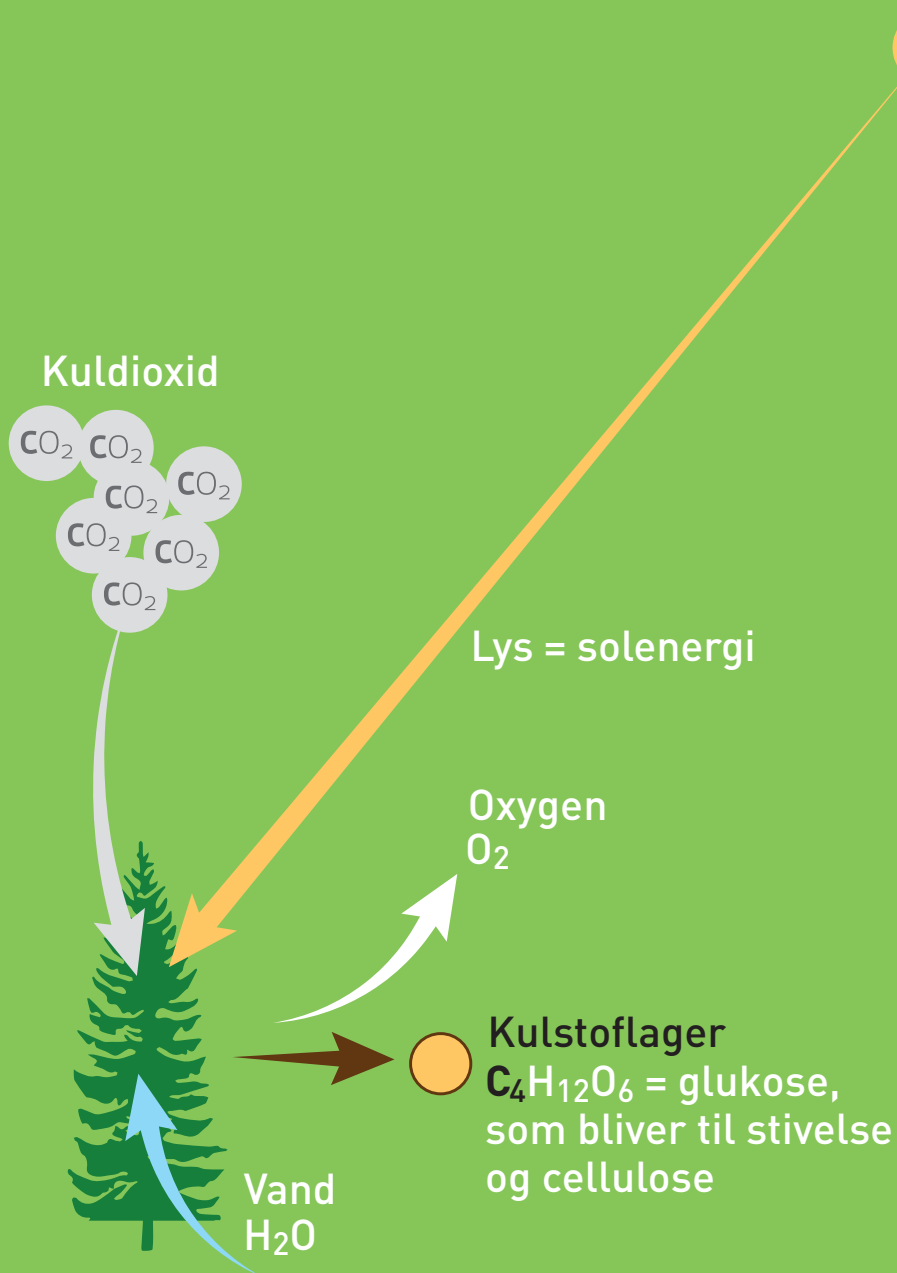
Kulstof er »C-et« i CO₂ og er det, som lagres i skov- og træprodukter.

I fotosyntesen optages CO₂ og reagerer med vand.

4

Dette danner glukose, som igen danner stivelse og cellulose; det vil sige de vigtigste dele af træet. På denne måde bliver CO₂ bundet og lagret i alt træværk og i alle produkter, som laves af træ.

Ved at lagre kulstof forhindres reaktion med oxygen ved forbrænding eller forrådning, samt at klimagassen CO₂ dannes.

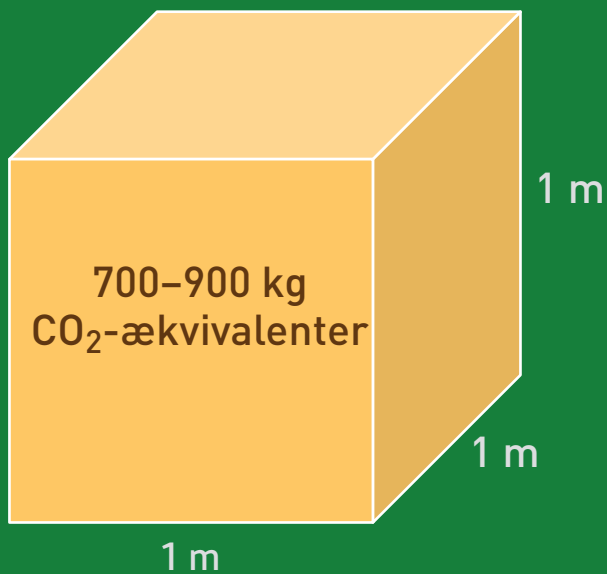


Eftersom det er kulstof, vi lagrer, skal vi omregne til CO₂

Vi omregner kulstoffet, som er bundet i en træstamme, til den mængde CO₂-gas, som træet har optaget fra atmosfæren for at vokse.

Et træ indeholder vægtmæssigt ca. 50 procent kulstof. Én kubikmeter indeholder 200–300 kg kulstof afhængigt af træsorten. Omregnet er det ca. 700–900 kg CO₂.

Et 70 år gammelt grantræ lagrer således ca. 4.300 kg CO₂.



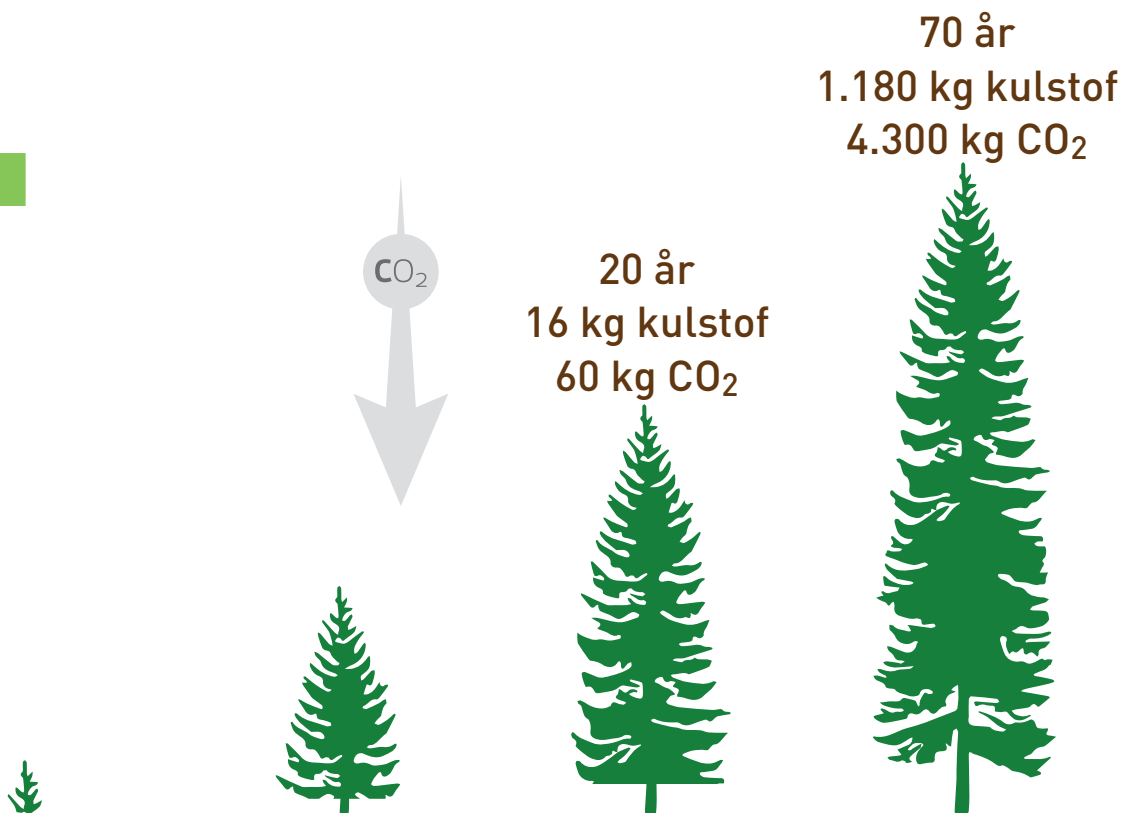
70 år
1.180 kg kulstof
4.300 kg CO₂

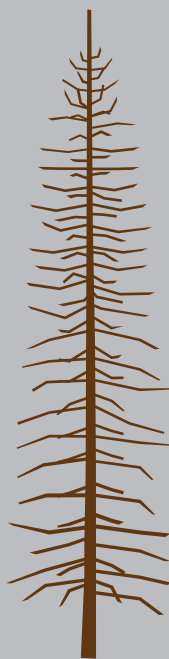
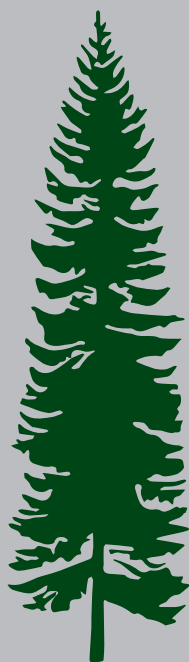


Se, hvad der sker i et træs livscyklus

Det naturlige forløb ... spiring ... vækst ... død ... forrådnings. Når træet vokser, optager det CO₂-gas og lagrer kulstoffet. Når det dør og rådner, dannes der igen CO₂-gas, så det går lige op.

8





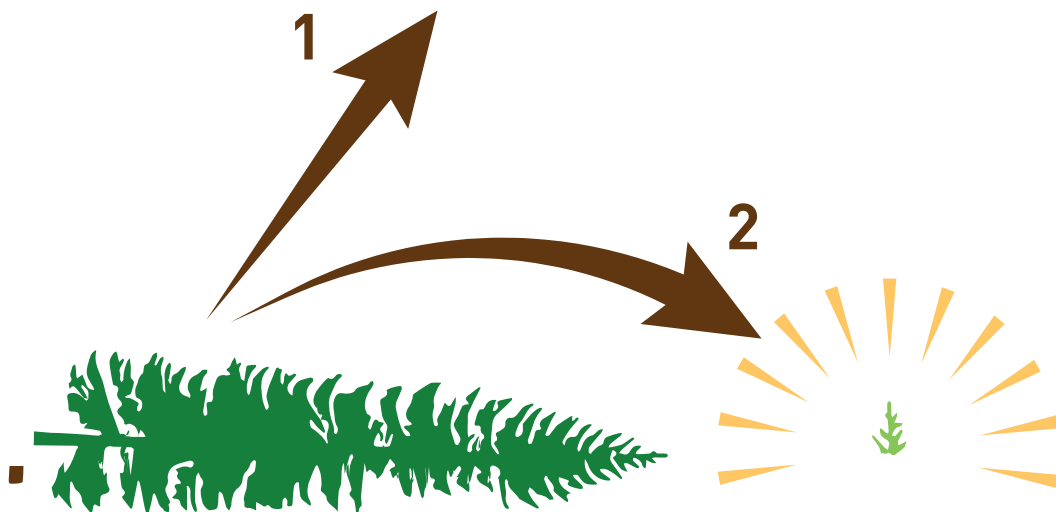
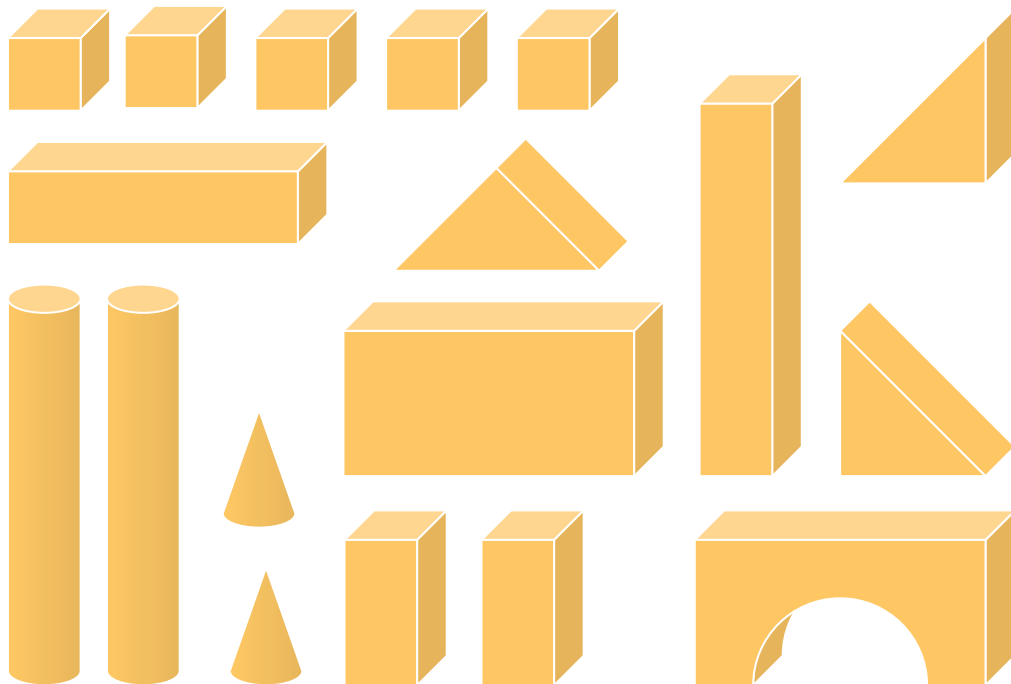
Smart at gribe ind i træets og skovens livscyklus og forhindre udslip

Vi fælder træet og gør to ting:

1. Laver nyttige ting af træet, som vi har behov for, i stedet for at lave disse ting af materialer, som er fossilbaserede eller ikke-fornybare. Disse træprodukter går ind i deres eget kredsløb.
2. Planter et nyt træ dér, hvor det gamle stod.

10



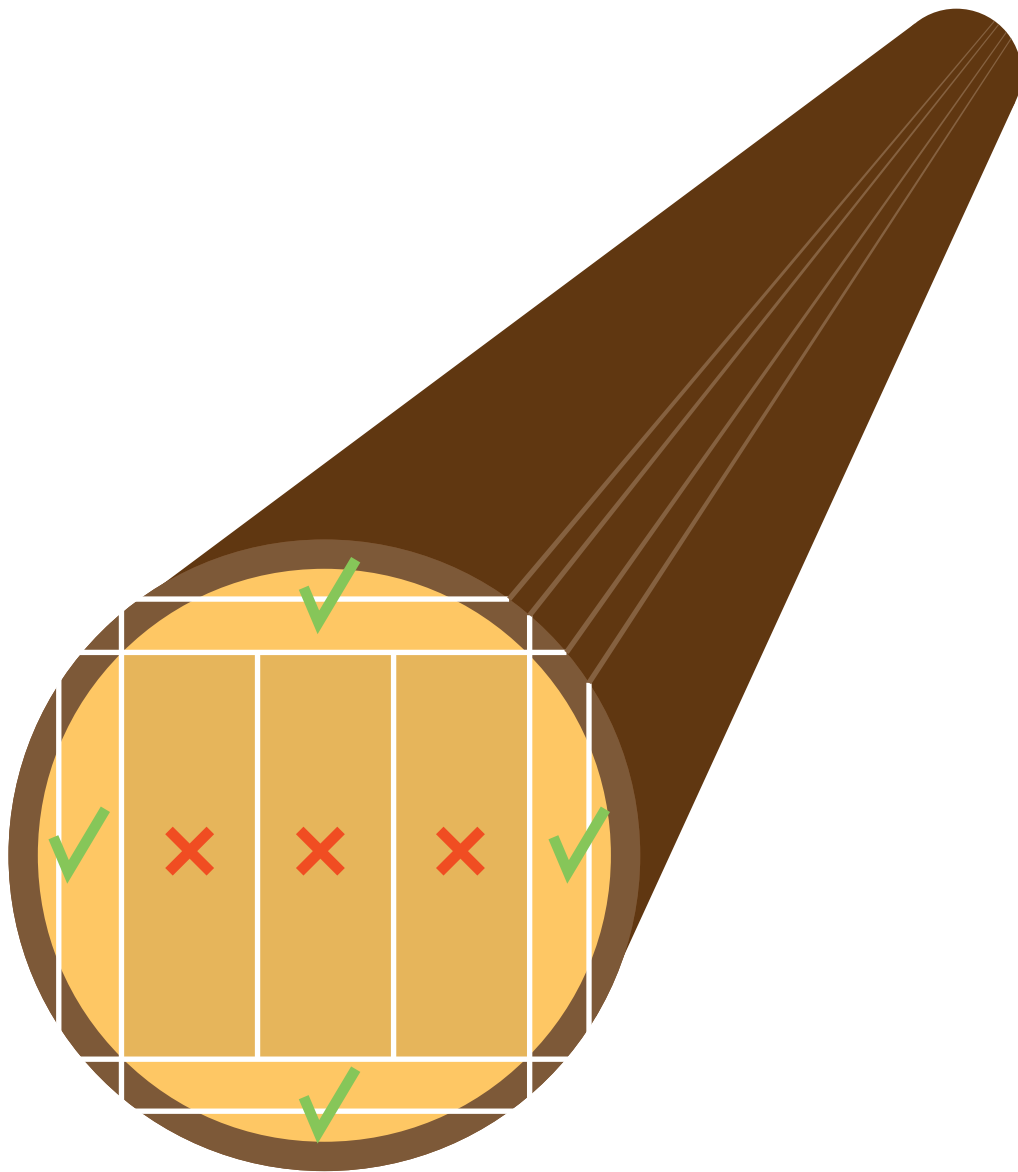


Træfiberisolering anvender den mindst værdifulde del af træstammen

Vi laver Nativo® Træfiberisolering af træstammens ydre del, som er vanskelig at anvende til andre formål. Det udgør 55 procent af produktet.

12 45 procent er savflis, som dannes, når træstammen opskæres på savværket og laves til træmaterialer.

Produktionen af træfiberisolering konkurrerer altså ikke om de dele af træstammen, som anvendes til konstruktionsmaterialer og andre massive træprodukter.



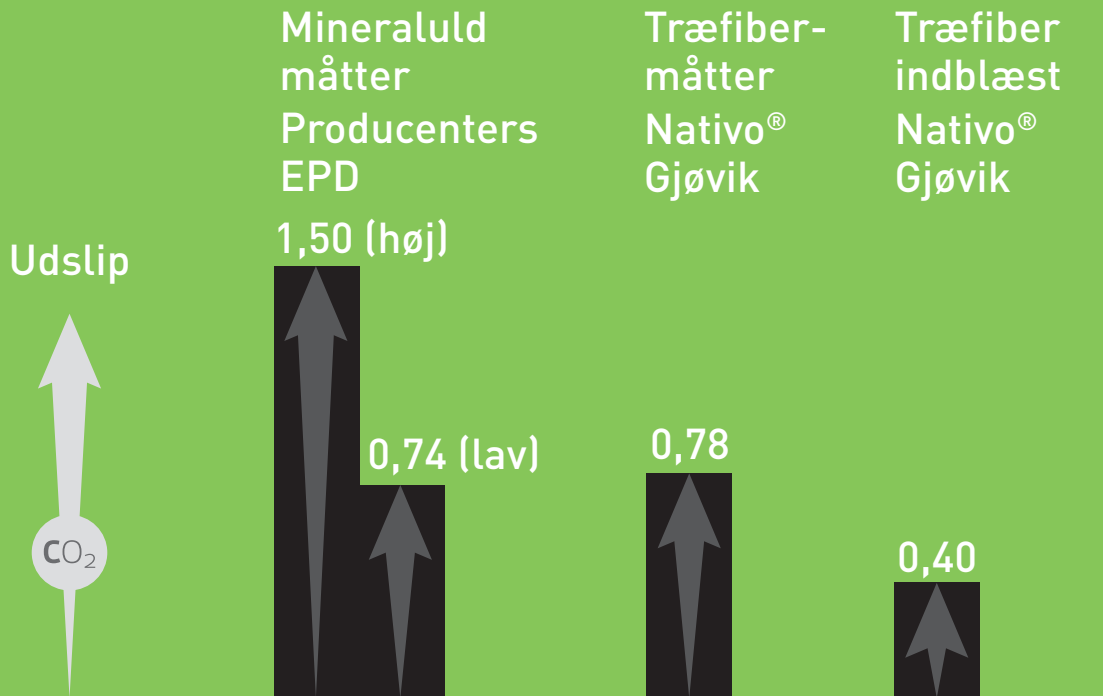
CO₂-udslip fra Nativio® Træfiberisolering sammenlignet med mineraluld

Ved produktion af isoleringsprodukter forbruges der råvarer og energi til indvinding af råvarerne, transport og bearbejdning.

Dette giver en forskellig mængde CO₂-udslip afhængigt af typen af råvarer, hvor krævende det er at udvinde disse, hvor langt de skal fragtes, og hvor omfattende en bearbejdning der kræves.

14

Alt dette indgår i beregningerne af udslippene i grafen til højre. Tallene viser kg CO₂-ækvivalenter isolering per kvadratmeter med samme isoleringsevne.

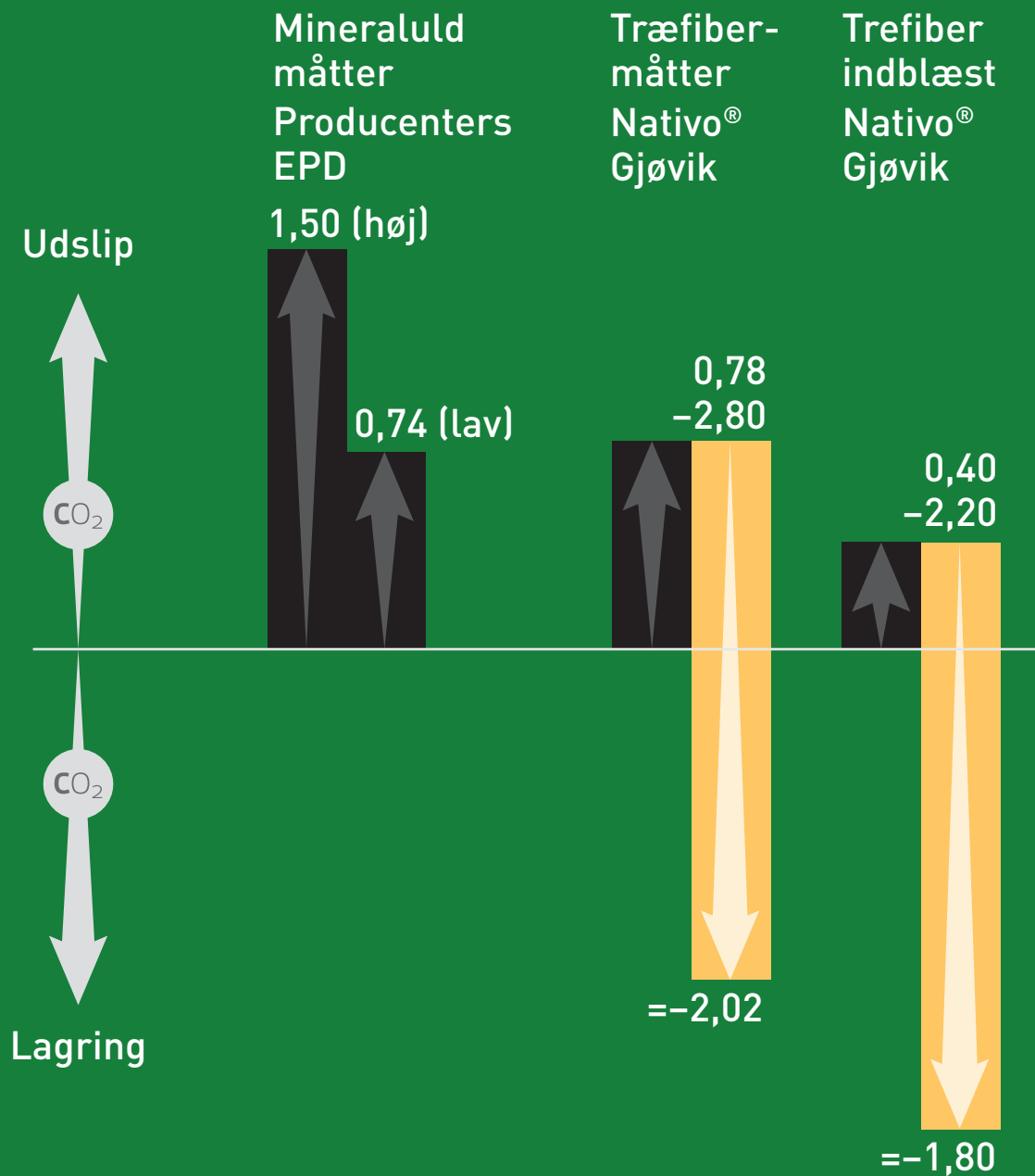


Se, hvad der sker, når vi indregner CO₂-lagringen

Medregner vi det kulstof, som lagres i produkterne, ser billedet helt anderledes ud.

Nativo[®] Træfiberisolering lagrer væsentlig mere kulstof, end der slippes ud ved produktionen. Samlet set sker der altså lagring frem for udslip.

Mineraluld er ikke fornybart og lagrer ikke CO₂.



Produkterne får deres eget kredsløb

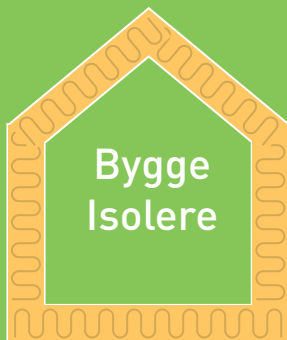
De kan bruges, genbruges og genvindes til nye produkter.

Holdes træet i cirkulation som produkter så længe som muligt, vil kulstoffet være bundet og lagret.

Ved forbrænding af træprodukter slippes der lige så meget CO₂ ud, som der oprindeligt blev bundet, men i mellemtiden er der vokset nye træer op i skoven, som binder yderligere kulstof.

Det samlede lager af kulstof i skov- og træprodukter er forøget.

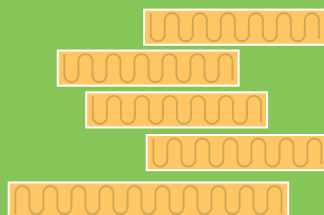
Træ
Restflis



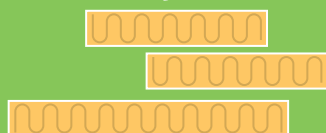
Bygge
Isolere



Rive ned
Sortere



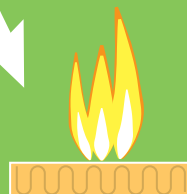
Genbrug og
materialgenvinding
Nye træfibermåtter



Vækstmedium
i kontrollerede omgivelser



Forbrænding
Opvarmning



Men dette kredsløb kan naturligvis ikke holde til evig tid

Lidt efter lidt bliver det vanskeligere at genanvende materialet. Til sidst er det umuligt. Så ender træfiber som en mulig energikilde, fordi det kan brændes og erstatte fossil energi. Dette er en tillægsgevinst.

20 Mineraluld kan kun ende i et deponi, når det ikke længere kan bruges.

Forbrænding
Energi



Træfiber



Mineraluld



Deponi



»Kan genvindes og genbruges« – ja, men sker det i praksis?

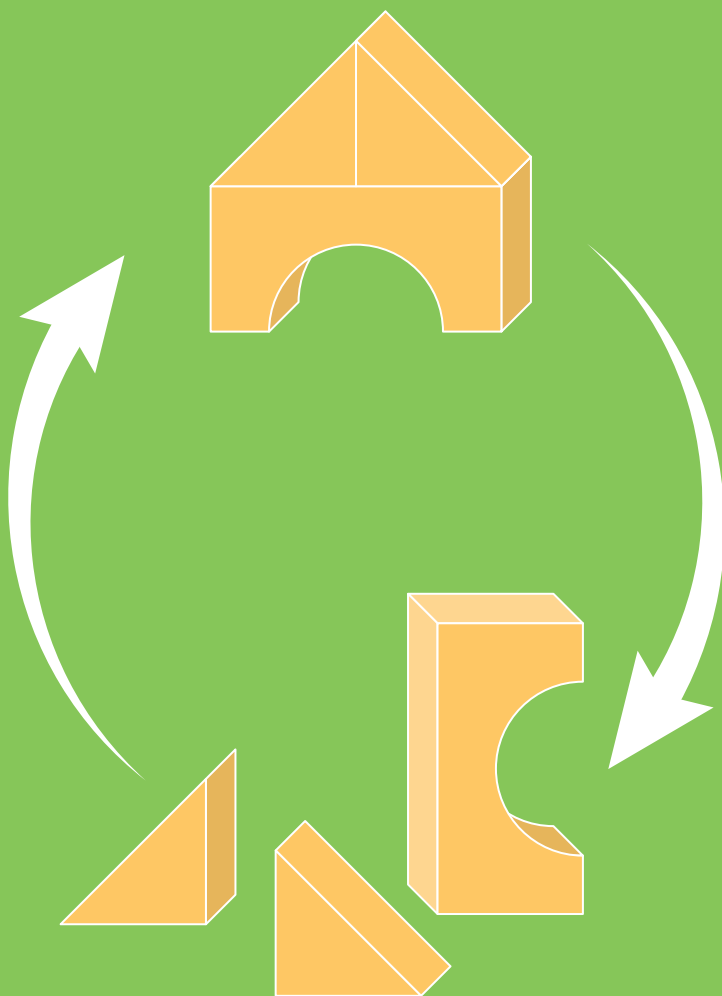
Vi har vel ingen kontrol over, hvad folk finder på, når de river et hus ned om måske 60 år?

Jo, det har vi. Dette reguleres ved hjælp af affaldsplaner med krav til sortering.

Affaldsmottagerne skal sørge for den videre behandling til genbrug, genvinding og recirkulering. Kravene til genbrug vil blive skærpet for alle byggevarer.

EU's affaldsdirektiv stiller krav om 70 procent genbrug eller materialegenvinding af byggeaffald inden 2020.

Bygge
Genbruge



Rive ned
Sortere

Hvad består Nativio® Træfiberisolering af?

Både indblæst isolering og måtter indeholder seks procent ammoniumsulfat som brandhæmmer. Det er et stof, som fremkommer naturligt.

Isoleringsmåtterne indeholder seks procent bindemiddel, som er uden miljøgifte.

24 Måske har du hørt om miljøfjendtlige bromerede flammehæmmere? Disse findes ikke i Hunttons produkter.



Nativø Træfiberisolering mætter

88 % træfiber

6 %
bindemiddel

6 %
brandhæmmer

94 % træfiber

Nativø Træfiberisolering indblæst

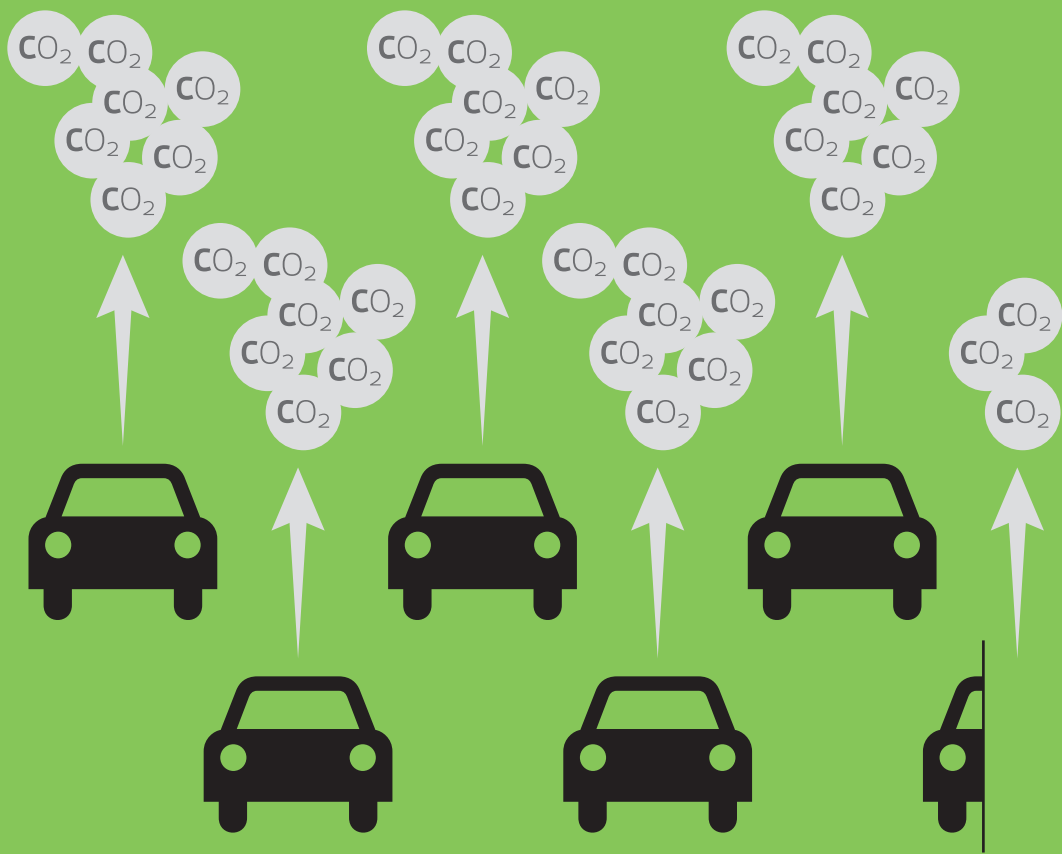


En smule isolering – betyder det noget som helst i en større sammenhæng?

Hvis man i et 150 kvadratmeter stort hus udskifter mineraluld med træfiberisolering, reduceres CO₂-udslippet med ca. 6,5 ton.

Det svarer til det årlige udslip fra en gennemsnitsdanske.

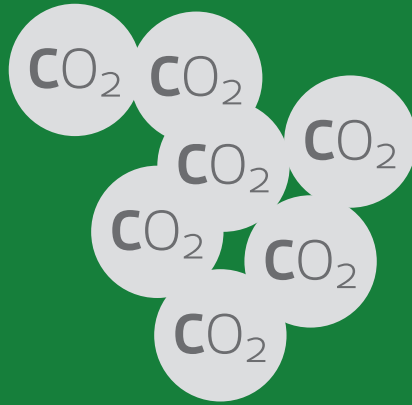
26 Det svarer også til det årlige udslip fra 5,3 nye gennemsnitsbiler i Danmark.



Og hvad så hvis vi ser det i et lidt større perspektiv?

Hvis man forestiller sig, at alle nye boliger i Danmark blev isoleret med træfiber, ville dette repræsentere en lagring af næsten 150.000 ton CO₂-ækvivalenter.

Det svarer til det årlige udslip fra ca. 101.000 nye danske gennemsnitsbiler.



× 110 000

Regnskoven skal bevares, siges det – mens vi altså bare kan fælde vores egen skov?

Skove på den nordlige jordklode holder bedre til fældning og nyplantning end de tropiske skove. Skovpleje med plantning og genvækst på samme arealer sikrer, at kulstof igen lagres i fornybare cyklusser.

30 Beskyttelse af skovområder er også vigtigt her i landet og gøres for at sikre både biologisk mangfoldighed og kulstoflagre.

Råvarer til Hunttons produkter er PEFC-certificerede. PEFC er en skovstandard for bæredygtigt skovbrug.



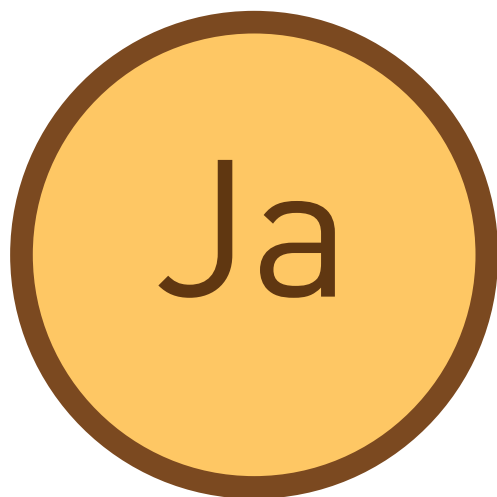
+



Alt det, der er sagt om miljø- og klimavenlighed, gælder vel for alle træ- og træfiberprodukter?

Ja, det er korrekt; så det gælder også for alle Hunttons produkter.

Der er alligevel forskelle afhængigt af bearbejdningen og den energi, som anvendes til produktionen.



Notes and references

Pages 2–3

Paris Agreement aim is that the global temperature increase should not exceed 1.5 to 2°C. It is estimated a global carbon budget that will ensure that such a goal is reached. Today's emissions level and reported national emission reductions under the Paris Agreement to 2050, indicates that the global carbon budget is used up within the next 20–30 years. Then, global emissions have to be zero or preferably negatively towards 2100. Negative means that capture and storage is greater than the emissions.

References:

IPCC, The Fifth Assessment Report (IPCC), 2014. IPCC Climate Change 2014: Synthesis Report (eds Pachauri, RK & Meyer, LA) (Cambridge Univ. Press, 2014).

Paris Agreement, 2015. Adoption of the Paris Agreement FCCC / CP / 2015 / L.9 / Rev. 1 (UNFCCC, 2015); <http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>

R. Millar, J. Fuglestvedt, P. Friedlingstein, J. Rogelj, M. J. Grubb, H. D. Matthews, R. B. Skeie, P. M. Forster, D. Frame, M. Allen, Emission budgets and pathways consistent with limiting warming to 1.5°C, *Nature Geosci.* 10 (2017) 741–747.

Pages 4–5

Photosynthesis, the process by which green plants and certain other organisms transform light energy into chemical energy. During photosynthesis in green plants, light energy is captured and used to convert water, carbon dioxide, and minerals into oxygen and energy-rich organic compounds.

References: Encyclopædia Britannica (<https://www.britannica.com/science/photosynthesis>) and Skogsnorge.no

Renewable is related to the raw-material in the product – the resources used. This means that the raw-material is formed again in nature and can be used without being used up. As long as the forest is well managed, and the regrowth exceeds the deforestation, the raw-material “forest” is renewable. To be precise the forest is a “conditionally renewable resource” where the condition is good practice of management. It is ensured through PEFC-certification.

Recycling/recyclable is related to what happens when the product is used in one place and demolished. The question is whether the used product can be used as a raw material for a new product. If all components of the used products can be used to create new products, it is 100 percent recyclable. Recycling is used as a term for both creating new products and for energy production (energy recycling). Energy is considered to be a new product, but energy recycling can only happen once. If the used products are recycled as materials in a new product, the recycling can happen over and over again. How many times depends on the deterioration of the original raw material during the use and recycling steps.

Reuse. If a product can be reused somewhere else without the need to change the product.

Pages 6–7 and 8–9

Carbon Amount in trees and wooden products.

References:

Alfredsen et al., 2008. Environmental effects when using wood. Compilation of knowledge of wood and wood products. Forest and landscape 03/2008. (in Norwegian)

EN-16449: 2014. Wood and wood-based products. Calculation of biogenic

carbon content of wood and conversion to carbon dioxide.

Pages 14–15

Comparison of insulation products based on declared unit (DE) = 1 m² insulation material with a thickness which provides a declared thermal resistance equal to $R = 1 \text{ m}^2 \text{ K} / \text{W}$. Lifetime set to 60 years, i.e. equal life of the building. Lifespan modules A1, A2 and A3 are used, which means emissions associated with the extraction of raw materials, transportation of raw materials, production processes to the finished product ready for dispatch from the factory.

References:

Tellenes, L., 2016. LCA analysis of future production of Hunton wood based insulation mats/boards, new production at Gjøvik city. Preparatory support to EPD documentation (Norwegian Institute of Wood Technology, unpublished).

Estimates: GWP A1–A3 = 0.78, blown GWP A1–A3 = 0.40. (only in Norwegian)

Tellnes, LGF, 2015 reviewed 2017. Environmental declarations for wood and wood-based products. Report # 58. ISSN 1501-7427, 4000/08/15. (only in Norwegian)

EPD glass wool insulation mats – Glava AS, Askim. NEPD No.: 221N ver 2.1, 2012 rev. 2016. Valid in the period 01.11.2013–11.01.2018. EPD Norway. GWP A1–A3 = 0.74.

EPD glass wool insulation mats – Saint-Gobain Finland AS Valid in the period 11.30.2016–11.30.2021. EPD Norway. GWP A1–A3 = 0.84.

EPD glass wool insulation material blown – Saint-Gobain Sweden AS Isover. NEPD-427-301-A ISOVER InsulSafe. Valid 7.4.2016–7.4.2021. GWP A1–A3 = 0.63

EPDs rock wool insulation material – Rockwool. NEPD 00131E rev1 adjusted 16.08.2016 ROCKWOOL® isolation. Valid in the period 10.25.2013–10.25.2018.

EPD Norway. GWP A1–A3 = 1.27.

EPD for rock wool insulation material – mats – Paroc AB Sweden.
NEPD00265E Paroc Insulation, product group with density <70 kg / m³. Valid in the period 09.15.2014–09.15.2019. EPD Norway. GWP A1–A3 = 1.48.

Petteresen, T. and Bramslev, K., 2016. Guidelines for the procurement of environmentally friendly building products. p.13 Table 2. Criteria for “best Nordic level”. The building material industry association and Green Building Alliance and NGBC, SGBC, GBCF, IGBC (the Nordic Green Building Councils).

Hagen, R., Mason, H. and Bramslev, K., 2016. Green Material Guide. Guide to environmentally friendly materials, Version 2.0. Context and Green Building Alliance.

The contents of this publication follow the rules for systematization and estimates set out in the following Norwegian and international LCA standards were applied:

EN ISO 14044: 2006. Environmental management. Life cycle assessment, requirements and guidelines.

EN ISO 14025: 2010 Environmental labels and declarations. Type III environmental declarations, principles and procedures.

EN 15804: 2012 Sustainable buildings. Environmental declarations and Basic product category rules for building materials.

EN 16449: 2014 Wood and wood-based products. Calculation of biogenic carbon content of wood and conversion to carbon dioxide.

EN 16485: 2014 Timber and sawn timber. Environmental declarations. Product Category Rules for wood and wood-based products for use in construction works.

prNS 3720. Method for greenhouse gas calculations for buildings. Draft 03.10.2017. (only in Norwegian)

Pages 16–17

See pages 14–15.

Captured carbon in wood fiber is included in the calculation according to methodology of EN 16485:2014 Timber and sawn timber. Environmental declarations. Product Category Rules for wood and wood-based products for use in construction works. Module A1.

Pages 18–19

During the insulation reference lifetime, 60 years (the same as a building), a new tree will grow and capture equivalent quantities carbon as in the raw-material in wood fiber insulation. PEFC-certified timber ensures that the raw materials originating from sustainable forestry. <http://www.pefcnorge.org>.

The insulation product after use in one building, can be reused in a new building or be recycled into new insulation mats or other wooden based products. The carbon that is captured in wood fibers therefore remains stored beyond the first 60 years, as long as the products are reused or recycled.

In the calculations it is assumed that 20 percent of the wood fiber is incinerated after use in the 'first' building and emits as much CO₂ as captured during the growth. The storage effect is therefore reduced by 20 percent.

Pages 20–21

Wood fiber insulation which can't be reused or recycled, the incineration ends as energy recycling and a source which can substitute fossil fuels.

Mineral wool which can't be reused or recycled ends up in landfills.

Pages 22–23

References:

EU waste directives and Report on the Implementation of the Circular

Economy Action Plan and annex. COM (2017) 33 final. 01/26/2017. http://ec.europa.eu/environment/circular-economy/index_en.htm. Before 2020 the target is; 70 percent (weight) of non-toxic building waste shall be energy or material recycled.

Danmark uden affald. Ressourceplan for affaldshåndtering 2013-2018: <https://www2.mst.dk/Udgiv/publikationer/2014/05/978-87-93178-55-7.pdf>

Affaldsbekendtgørelsen: <https://www.retsinformation.dk/Forms/R0710.aspx?id=144826>

In Denmark today, approximately 87 percent of construction and building waste are recycled – including crushing and use as a substitute for stone and gravel. It is only a small part which is recycled and reused for the same purpose.

Pages 26–27

Greenhouse gas emissions from production of mineral wool insulation contained in an average dwelling: 21 kg CO₂-eq./m² BTA. Difference in emissions between mineral wool and wood fiber insulation including storage is –2.58 times.

We reduced the effect of storage with 20 percent because some of the wood fiber is incinerated after use. Substituting the mineral wool with wood fiber insulation, the emissions are reduced by: 21 kg CO₂-eq./m²*–2.58*0,8 = –43.45 kg CO₂-eq./m² BTA.

In a 150 m² home reduced emissions by a total 6,517 kg CO₂-eq./m² or about 6.5 metric tons of CO₂ eq.

Danish cars have 11,224 km per year as average driving distance. Average new car sold in Denmark emits 110 g / km. Combining these to (110*11,224) we find that an average new Danish car emits 1.23 metric tons CO₂-eq./year.

The reduction in emissions from the buildings are equivalent to the output

from 5.3 average Danish cars in a year. $(11,224/1,230 = 5.28)$.

References:

Estokova, A. et al., 2017. Analyzing embodied energy, global warming and acidification potentials of materials in residential buildings. *Procedia Engineering* 180 (2017) 1675–1683.

Transportvaneundersøgelsen www.tudata.dk

<http://www.statistikbanken.dk>

Selvig, E., 2017. 'www.klimagassregnskap.no' and calculations in this publication. Civitas AS.

Pages 28–29

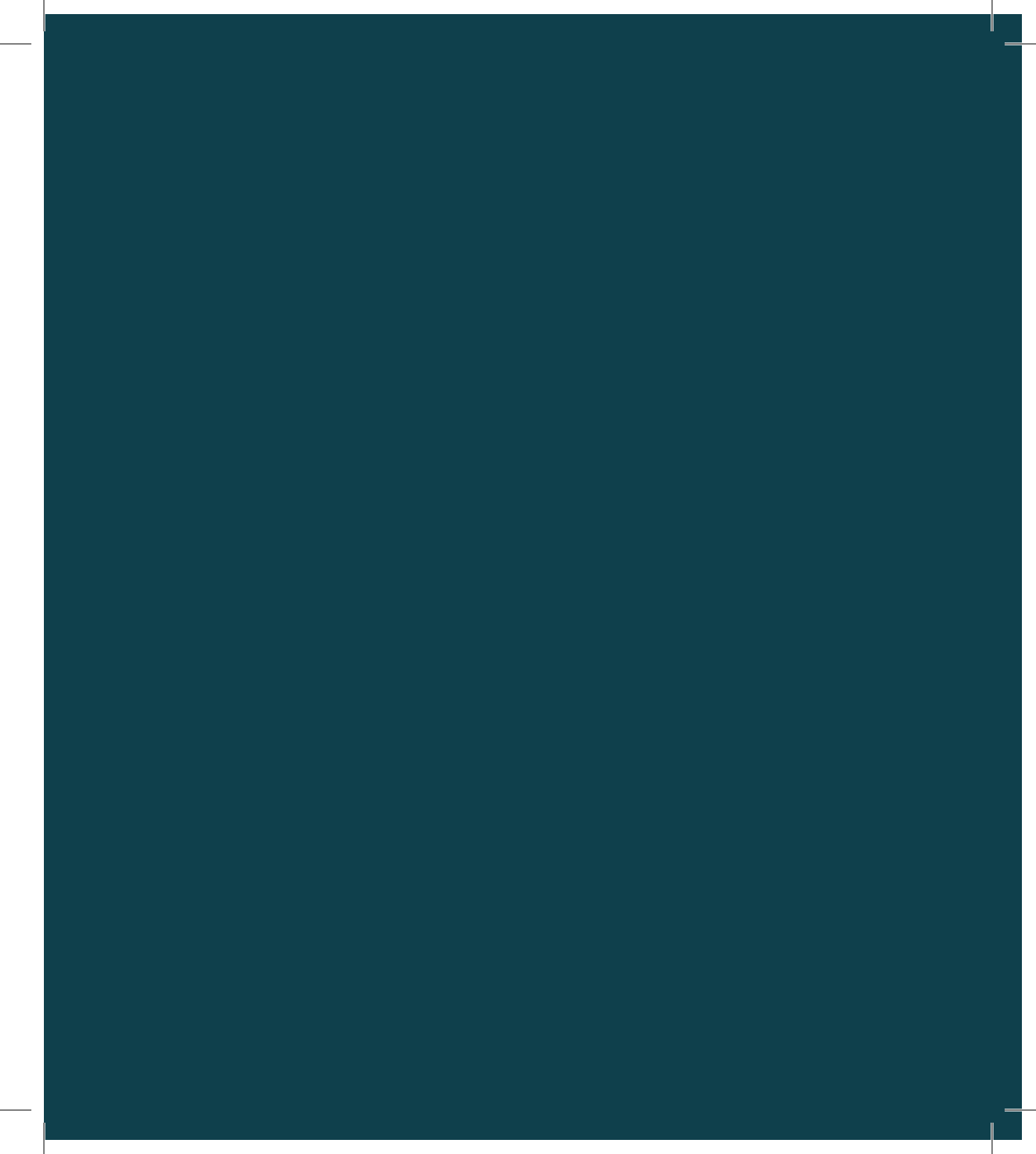
It was in Denmark in 2017 fulfilled 21,258 homes with a floor area of 3,358,764 m². If all dwellings used wood fiber insulation rather than mineral wool insulation, the emissions could be reduced by 145,934 metric tons of CO₂-eq. per year. This corresponds a year driving with 118,203 Danish new average cars.

References:

See pages 26–27.

Pages 30–31

PEFC is the world's largest forest certification system, established in 1999. PEFC was originally established as a European certification system under the name Pan European Forest Certification. PEFC Norway certification system is made up of several documents/ standards that define requirements for certification of forestry and requirements for traceability. http://www.pefcnorway.org/side.cfm?ID_kanal=30



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