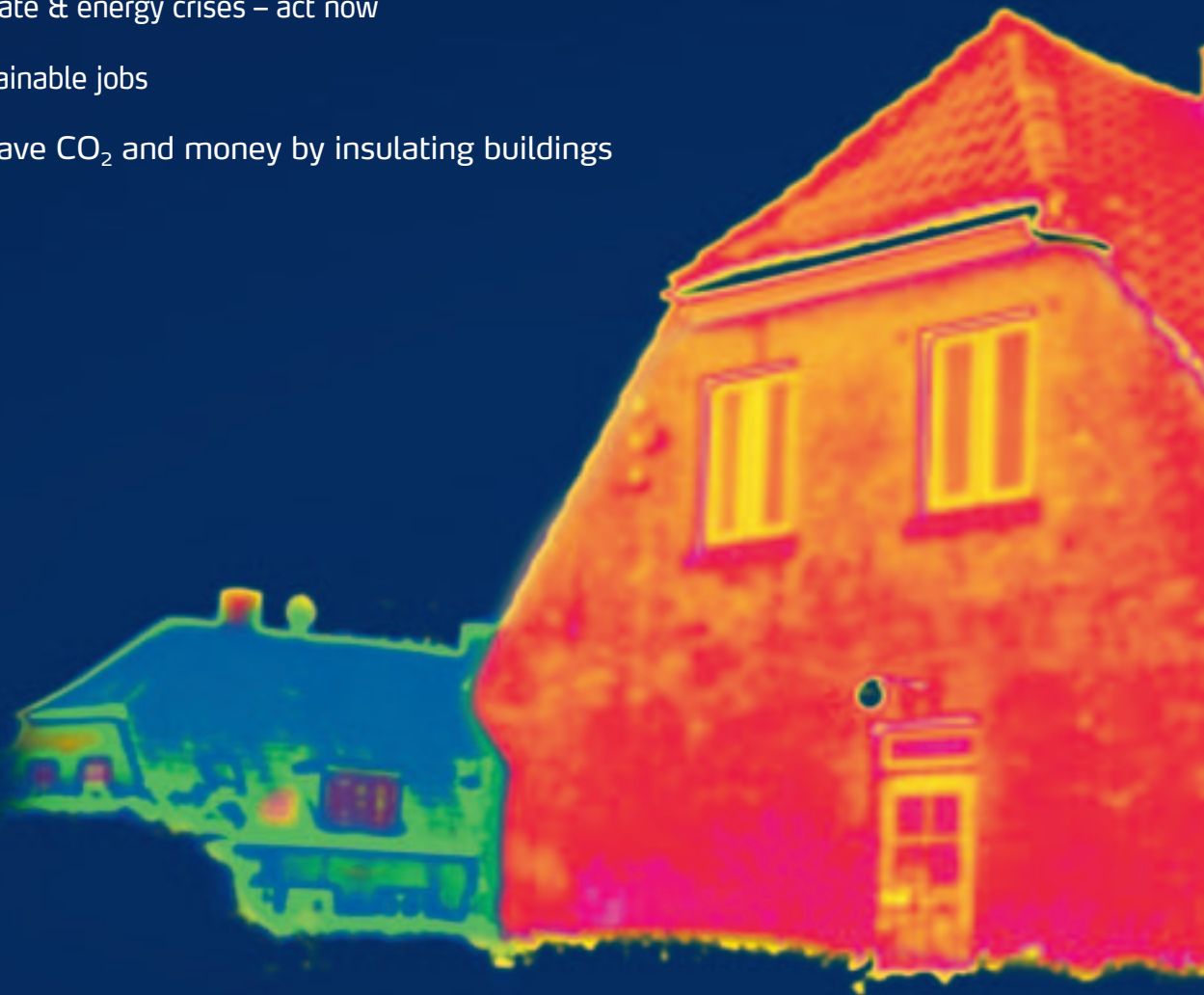


The greatest potential for energy and CO₂ efficiency gains lies in our buildings: Stop local warming

Combat the climate & energy crises – act now

Let's create sustainable jobs

Learn how to save CO₂ and money by insulating buildings



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www.rockwool.com/environment/environment+reports/archive



Climate film 'The low hanging fruit'
www.rockwool.com/energy+efficiency/stop+local+warming/climate+movie



Illustrations
www.rockwool.com/energy+efficiency/ee+library



More information & subscription to our Energy efficiency newsletter
www.rockwool.com/energy+efficiency

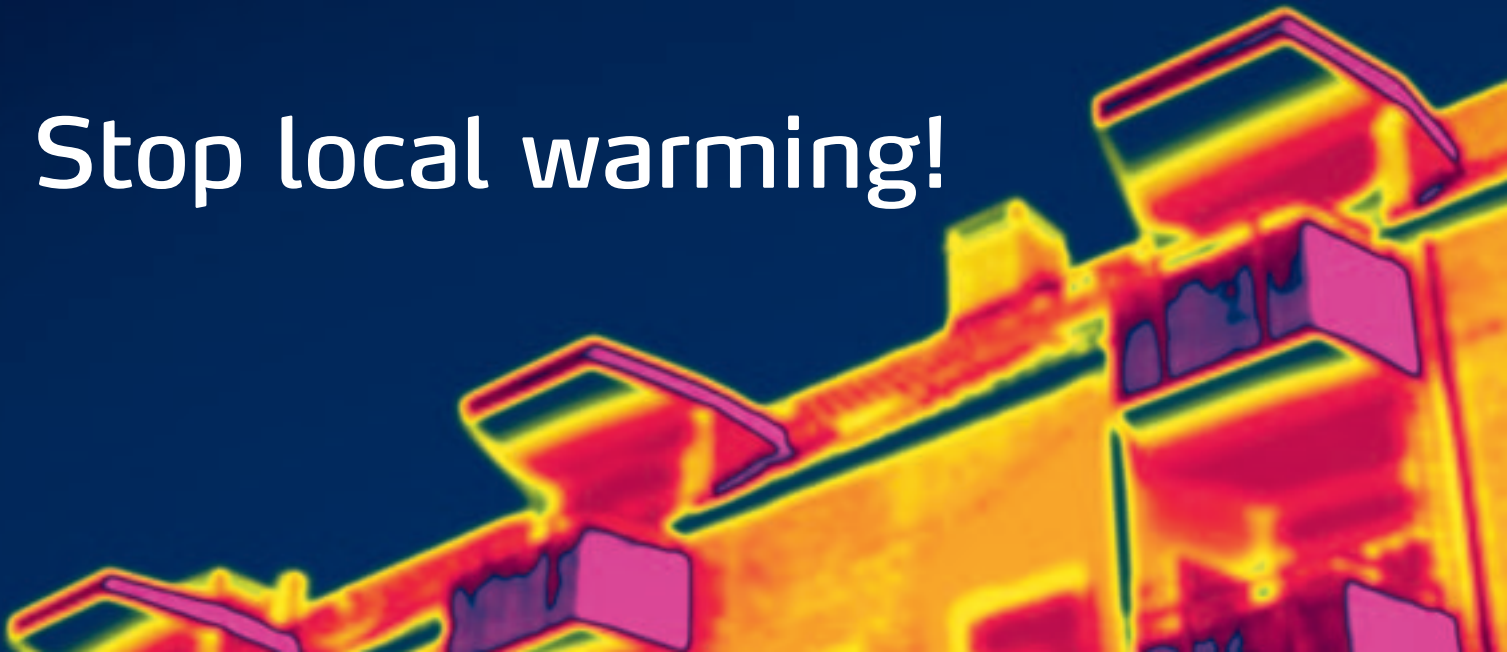
Or contact Group Communications at communications@rockwool.com



The invisible climate problem

A heat-sensitive, thermographic camera can disclose where energy for heating or cooling leaks from poorly insulated buildings.

Stop local warming!



The fight against climate change starts at home – and it starts now. Buildings are the key energy user and CO₂ emitter in modern society. But it needn't be like that. We can make attractive, affordable buildings so energy efficient that they won't consume 40% of our energy. In fact, we can even make buildings so energy-efficient that just by adding a small solar panel or other means of sustainable energy and energy storage we will create zero carbon buildings independent of the grid. This report shows you how.

Jobs

With millions of idle hands, now is the time to invest in a better future and renovate our energy-wasteful existing building stock. Through energy modernisations, we can create hundreds of thousands of jobs, save annual energy costs worth many hundred billion dollars and Euros, and cut CO₂ emissions by the hundred of millions of tonnes. Insulating our buildings will not only be profitable by saving expensive energy. It will actually improve our quality of life – and security of energy supply.

A well-kept secret

To many people it comes as a surprise that insulation is one, if not the most profitable big CO₂ reducing measure they can undertake. The Rockwool Group is one of the few industrial companies that prevents a hundredfold more CO₂ emissions than those coming from our production. This year's production of Rockwool insulation will, in its lifetime, leave 'a positive carbon footprint' larger than the annual CO₂ emissions from a country like the Netherlands. Yet we too will continue to find room for improvement in our own operations. We are committed to communicating the progress of our sustainability efforts for an energy and CO₂ efficient future and have in 2009 signed up to participate in the Carbon Disclosure Project.

Copenhagen

The UN Climate Summit - from 7-18 December in Copenhagen – is a window of opportunity for building a better future. Within our area of expertise - buildings - we say 'yes, we can!' to the call for immediate action and an 80% reduction of CO₂ emissions in the industrialised world. What's more we can do this in a helpful way that provides prosperity and green jobs. Now is not the time to make excuses, now is the time to act.



Eelco van Heel
CEO
The Rockwool Group

The fight against climate change starts at home

The climate crisis is one of the greatest challenges of mankind, closely interlinked with the energy crisis. The concern is that these crises will be overshadowed by the immediate pressing problem - the financial crisis and the surge in unemployment. This begs the question: Can we also afford to combat the climate crisis?

We cannot afford not to. In fact, the moment couldn't be better. With millions of idle hands, this is the right time to invest in a healthier life - to waste less energy while saving on



600 million people – some 10% of the world population – live in low lying areas in danger of being flooded

expensive fuel costs and – within our field of expertise – to improve homes and workplaces by creating indoor climates where we can learn, produce and relax in comfort.

80% less CO₂

An 80% reduction in CO₂ emissions by 2050 - this is the challenge facing the developed world, if we want to have a fair chance at restricting the rise in average global temperature to 'just' the critical 2°C. On a global scale, emissions must be more than halved. According to the UN Intergovernmental Panel on Climate Change (IPCC) immediate action is paramount. CO₂ emissions must start decreasing within just six years. However, in developing countries, growth in prosperity is desperately needed. The limited resources of cheap fossil and bio fuels only add to the inevitable fact that economic growth in poor countries can only be sustained by using energy saving and CO₂ efficient technologies.

Buildings can deliver

Buildings are the right place to begin. For a start they are responsible for some 40% of energy consumption – and a major part of manmade CO₂ emissions - in Europe and the US. We already have the technology to renovate old buildings in a cost efficient way so that they consume much less energy for heating and cooling than average buildings – in some cases improving energy efficiency by more than 80%. Studies from Ecofys and the Technical University of Denmark indicate that cost-effective energy efficiency improvements of 80% are possible within buildings.

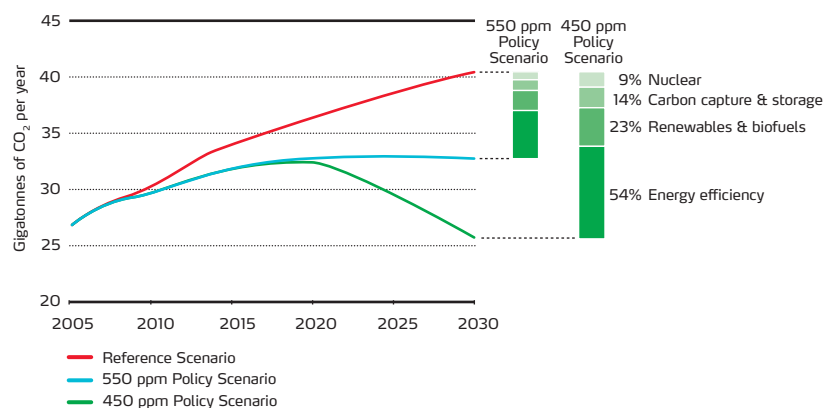
Even today, we can make new buildings so energy efficient that by just adding a solar panel or other sustainable energy pro-

ENERGY EFFICIENCY – THE MOST IMPORTANT KEY TO A LOW CARBON SOCIETY

Energy efficiency remains THE KEY to limiting climate change. Even an ambitious expansion of renewable energy AND strong use of energy-intensive carbon capture and storage (CCS) AND intensified nuclear power are not enough. Reducing the concentration of CO₂ in the atmosphere to 450 ppm (parts per million) is imperative. At this level there is a chance to limit the growth in average global temperature to 2°C, according to the UN climate panel (IPCC). At 550 ppm the temperature may increase beyond this tipping point.

Source: the International Energy Agency (IEA)

Reducing CO₂ emissions - what delivers most?



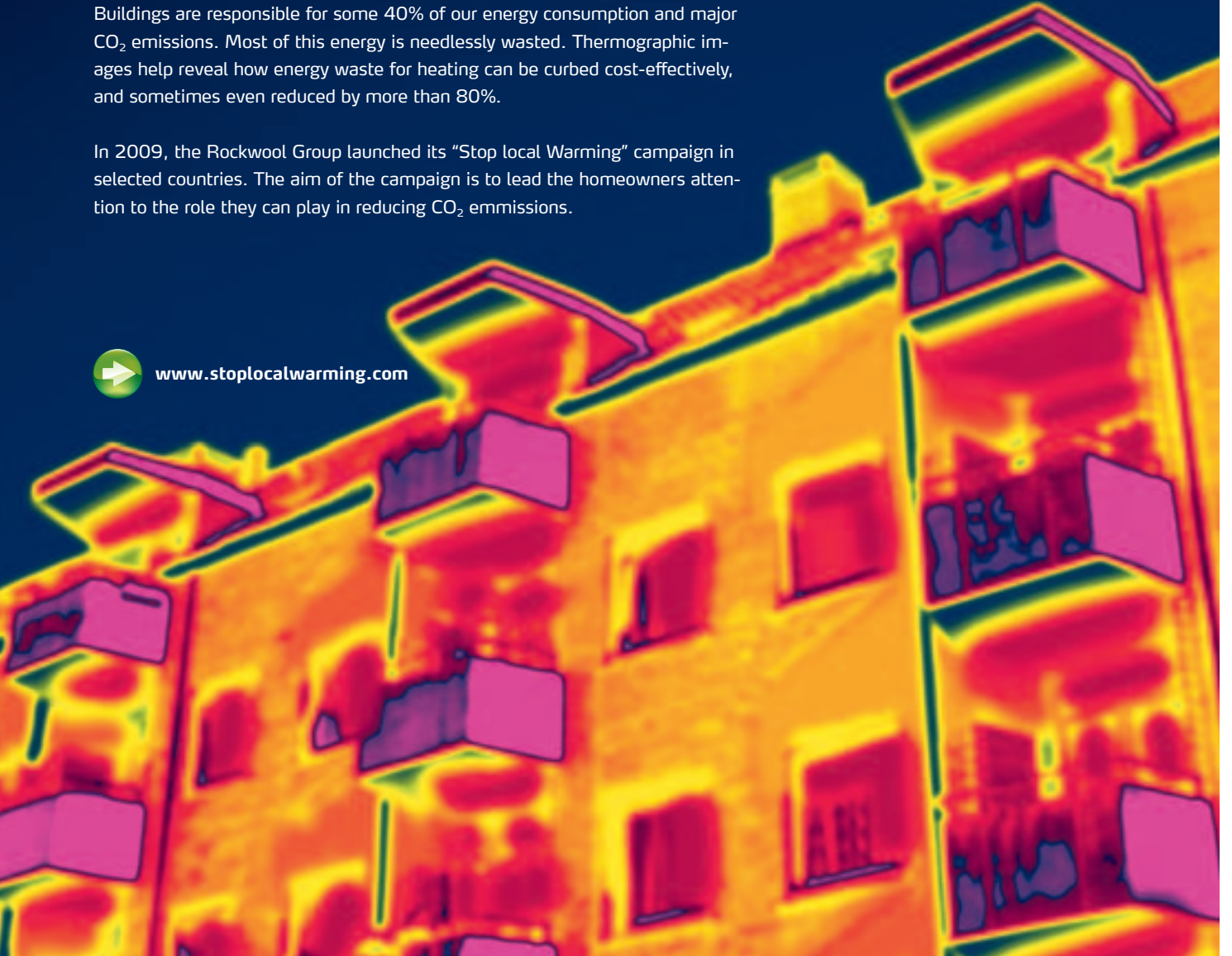
Energy waste can be curbed

Buildings are responsible for some 40% of our energy consumption and major CO₂ emissions. Most of this energy is needlessly wasted. Thermographic images help reveal how energy waste for heating can be curbed cost-effectively, and sometimes even reduced by more than 80%.

In 2009, the Rockwool Group launched its "Stop local Warming" campaign in selected countries. The aim of the campaign is to lead the homeowners attention to the role they can play in reducing CO₂ emissions.



www.stoplocalwarming.com



duction component and energy storage we will achieve a zero carbon PlusEnergy house that is independent of the grid. According to the IPCC, CO₂ emissions from buildings will increase by more than 50% by 2030, notably in East and South Asia and North America, unless the surge in new construction applies better levels of insulation and other carbon-lean technologies.

An ambitious international climate agreement

A new international climate agreement needs to be completed in due course before the Kyoto Protocol expires. Will world

This year's production of Rockwool insulation will, in its lifetime, save more than 200 million tonnes of CO₂ emissions from buildings and processes worldwide. This is more than the annual emissions of the Netherlands.

leaders seal an ambitious new deal at the UN climate change summit (COP15) 7-18 December 2009 in Copenhagen? If so, the EU will cut CO₂ emissions by 30% from 1990 to 2020. In 2009 the US decided to cut emissions by 17% by 2020 and 83% by 2050 compared to 2005. China's aim in its present 5-year plan is to improve energy efficiency by 20%.

The low hanging fruit

Saving vast amounts of expensive energy for heating and cooling, insulation is one of the most profitable CO₂ reducers. It's a low hanging fruit. In Europe alone, just by bringing buildings undergoing modernisation anyway up to contemporary (mediocre) energy standards, we can save 460 million tonnes of CO₂ per year. This saving equals Italy's total annual emission. It would make the average European richer and save her almost €500 in energy costs every year, according to Ecofys studies. In addition, EURIMA estimates that more than 500,000 jobs can be created.

Green jobs

Job creation through better energy efficiency is no longer restricted to Europe. A whole new climate and energy efficiency era has started in North America. US buildings currently contribute 9% of the world's CO₂ emissions, yet have huge potential for profitable energy efficiency. The average US home is more than 230 sq m and uses vast amounts of energy for heating and cooling, but is rarely insulated adequately. Using today's best practice, it is possible to construct new houses that use significantly less energy than a typical house, at little or no additional cost. Still, such highperformance homes currently represent a very small market share. However, the American Recovery and Investment Act, signed in May 2009 by President Obama, allocates approximately \$50 billion for energy efficiency programmes and incentives in order to spur change. It includes:

- 4.3 billion in expanded homeowner credit to make homes more energy efficient. Homeowners can recoup 30% of their costs
- 5 billion to weatherise homes of citizens with modest incomes
- 3.2 billion for local governments to reduce energy use and fossil fuel emissions

"Now's the time to get the unemployed of Europe getting our houses more energy efficient,"

*Sir Nicholas Stern,
at the International Climate Change Congress, Copenhagen 2009.*



80% in buildings - 'yes we can'!

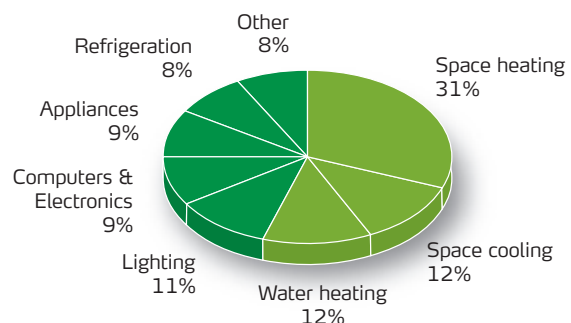
„Job crisis? Not on my part! Many home owners want to improve the energy qualities of their property and are spurred on by public incentives and co-funding. Insulating their façade really boosts the value of their house.“

Herr Wolthaus, building professional specialising in energy modernisations, Germany

ENERGY COSTS IN US HOMES - GREAT POTENTIAL IN AMERICAN BUILDINGS

Space heating and cooling plus water heating account for the biggest chunks of a typical US utility bill. Better insulation can reduce that spending considerably.

Source: 2007 Buildings Energy Data Book, Table 4.2.1., 2005 energy cost data.





China's challenge

Better buildings, better life

The rapid growth of the Chinese economy has lifted hundreds of millions of people out of poverty and has made the country one of the world's largest economies – but also the top emitter of greenhouse gases with 7.5 gigatons in 2007. China has become dependent on energy imports and needs to meet a new challenge: how to fuel a better life? Along with the economic growth comes the need for more buildings. According to McKinsey, total Chinese floor space will more than double from 42 billion sq m in 2005 to 91 billion in 2030.



Billions of dollars saved and thousands of jobs created. The US and China not only determine the fate of a climate agreement, but they can also harvest large profitable energy savings in their buildings. Over the next two decades, floor space in Asia and North America will grow dramatically. It will alleviate a tremendous strain on energy consumption and air pollution if their buildings are insulated properly.

Energy efficiency – the untapped potential

Buildings are expected to account for 35% of the country's energy consumption in 2010. The Chinese government has worked hard to impose new energy efficient building codes, but the gap between intention and practice remains wide. The Asia Business Council estimates that around 95% of buildings in China are highly energy inefficient, having thermal conditions that are two to three times less efficient than in developed countries. Key obstacles have been the strong focus on short-term construction costs with little emphasis on lifecycle costs and quality. Most buildings don't comply with official standards on actual inspection. There is an obvious need to equip buildings with insulation, good windows and systems to regulate heating and cooling more efficiently.

IN THE UNITED STATES ALONE, BUILDINGS ACCOUNT FOR:

72 % OF ELECTRICITY CONSUMPTION

40 % OF RAW MATERIALS USE

39 % OF OVERALL ENERGY USE

38 % OF ALL CO₂ EMISSIONS

30 % OF WASTE OUTPUT (136 MILLION TONNES ANNUALLY)

14 % OF POTABLE WATER CONSUMPTION

Source: U.S. Green Building Council



Energy security? In January 2009, 18 European countries reported major falls or a cut-off of their gas supplies.

Energy efficiency is energy security

All activity depends on energy - 2009 added yet another clear example of this. When gas supplies to the EU were shut off, important activities simply came to a halt.

Some 86% of the world's energy comes from non-renewable sources – oil, coal, gas or uranium. Most of the oil and gas producing countries are facing, or are already experiencing, declining production. Half of the oil reserves are controlled by just four countries - Saudi Arabia, Iran, Iraq, Kuwait. Three countries – Russia, Iran, Qatar - constitute the superpowers of natural gas.

With energy imports increasing in many of the world's economic drivers, and supplies becoming more vulnerable, en-

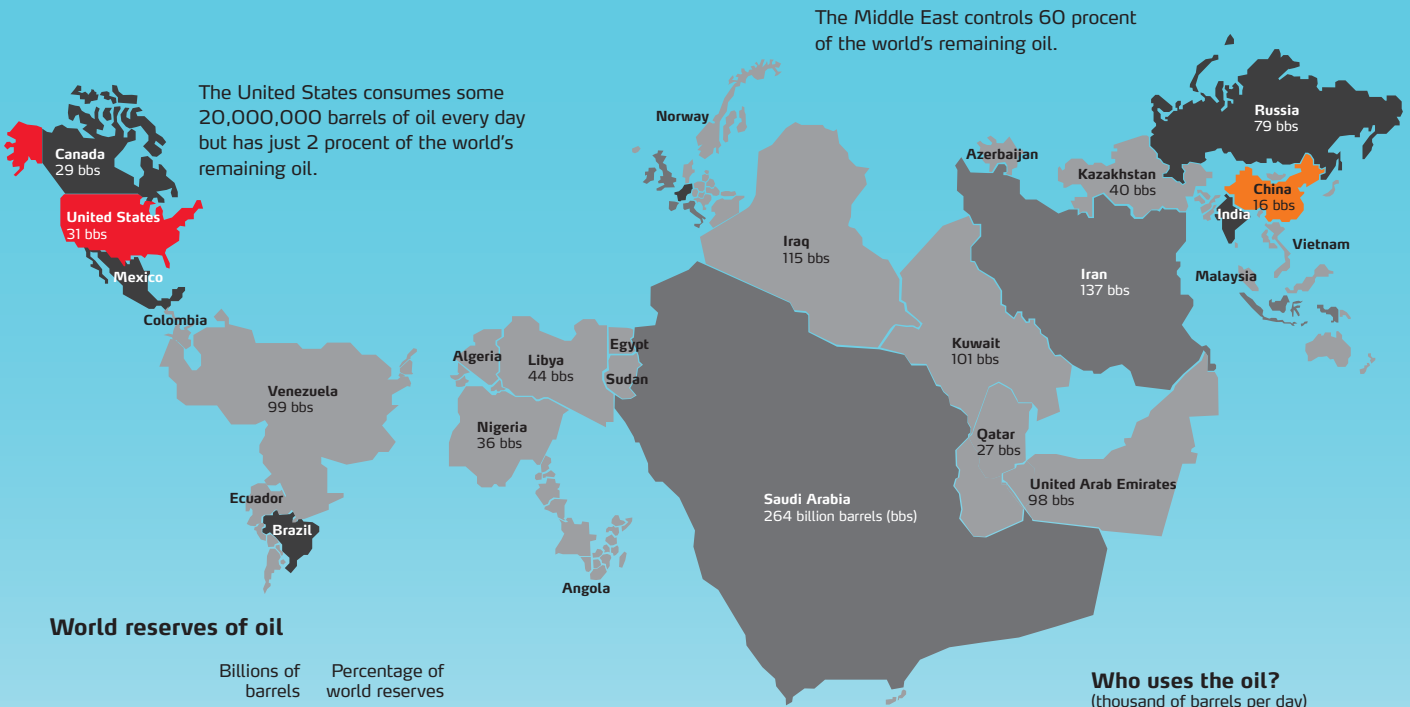
ergy efficiency is an absolute necessity. Not just from a climate point of view. The most sustainable and economically viable energy is the energy we stop wasting.

Golden eggs

Even for energy superpowers such as Russia, better energy efficiency is also a vital matter. In 2008, gas revenues comprise approximately a fourth of Russia's GDP. The quicker the country improves its energy efficiency, the more energy Russia will be able to export. This will not only ensure Russian economic prosperity for many years, but will also fuel economic activity among the energy importers.

Superpowers - who has the oil?

The size of each country reflects the relative size of its oil reserves. The colours reflect high or low levels of oil consumption.



World reserves of oil

Country	Billions of barrels	Percentage of world reserves
Saudi Arabia	264	21.0
Iran	137	10.9
Iraq	115	9.1
Kuwait	101	8.1
Venezuela	99	7.9
United Arab Emirates	98	7.8
Russia	79	6.3
Libya	44	3.5
Kazakhstan	40	3.2
Nigeria	36	2.9
United States	31	2.4
Canada	29	2.3
Qatar	27	2.2
China	16	1.2

Who uses the oil? (thousand of barrels per day)

- 6.000+
- 3.000-5.999
- 2.000-2.999
- 1.000-1.999
- 0-999

Sources: International Energy Agency 2008, BP Statistical Review and the Energy Information Administration.

NEW FRONTIER – NEW FREEDOM

David Braden from Hamilton in Ontario has built one of the most energy efficient homes in Canada. The house is self-sufficient with electricity; it has no furnace and is not connected to the grid. The house is so well insulated and designed that it needs no extra heating. The outer walls have three layers of stone wool, insulating 2½ times better than the standard home in Canada.



From leech to independent

- energy producing new buildings

The buildings we construct today will last decades. Excessive heating and cooling bills – and unnecessary CO₂ and air pollution – are the consequence of far too many new buildings being made without due consideration to insulation and life-cycle costs.

A short-sighted focus on construction costs means that unsustainable and expensive decisions are being taken. According to German studies, the monthly expenses (mortgages & energy expenses) are lower for owners building a well-insulated and energy efficient Passive House instead of a standard construction. Investing a little more in a better home can result in savings of € 100,000 over 50 years.

A Passive House is so well-insulated that solar gain, body heat and excess heat from appliances form the most important, free “radiators” in the house. Building codes are crucial for applying best available technology. From 2013 new homes in the UK must fulfil energy efficient requirements equivalent to Passive House standards. Germany (in 2015) and a growing number of other countries are following suit.

From minus 40% to zero

France, the UK, Ireland and Germany have decided that from 2013-2020 all new homes must be so energy efficient that by adding a solar panel or other means of sustainable energy production the building will require no fossil fuels for their energy needs.

How to build a zero carbon home

First – minimise energy waste

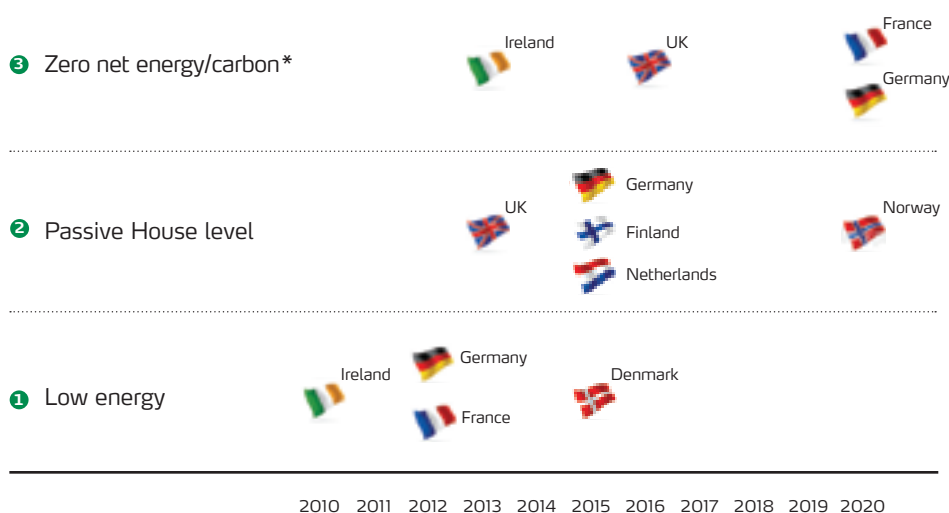
- Efficient insulation (300-500 mm)
- Triple-glazed windows and efficient frames (preferably 0.7 W/m² *K)
- Efficient ventilation system with heat recovery (efficiency of 85% or better)
- Seal gaps, joints and thermal bridges (infiltration max 0.2 times/h)
- Building orientation (cold climates): windows towards S, W, E for solar gain
- Solar shading for hot climates/seasons
- Primary energy for heating/cooling max 15 kWh/m² per year
- Efficient appliances – total energy consumption max 120 kWh/m² per year

Second – install sustainable energy sources

- Solar collectors
- Geothermal (pre-heat or cool air)
- Small wind turbine – energy storage & back-up
- Energy storage & back-up

WHO COMES FIRST?

The race in Europe for very low energy building standards



OUR RECOMMENDATIONS

- all new buildings should be low energy by 2012
- a majority should be zero net energy by 2015
- all new buildings should be zero net energy by 2020

The existing building stock should be low or zero net energy, wherever this is cost-efficient over the lifetime of the building.

The illustration depicts when different European governments intend to introduce stricter energy efficiency requirements for new homes.
* Different terms are used



Nyt foto Karin Adelberth og husprojekt



PlusEnergy

Karin Adalberth in Sweden is building the first PlusEnergy house in her country. Rockwool insulation helps her home consume less energy than it produces.



Read more: www.rockwool.se/inspiration/villa+akarp



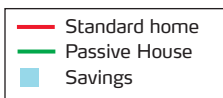
www.energymap.dk/Profiles/Rockwool/Projects/Sweden's-first-energy-producing-house



BETTER INSULATION – BETTER LIFE

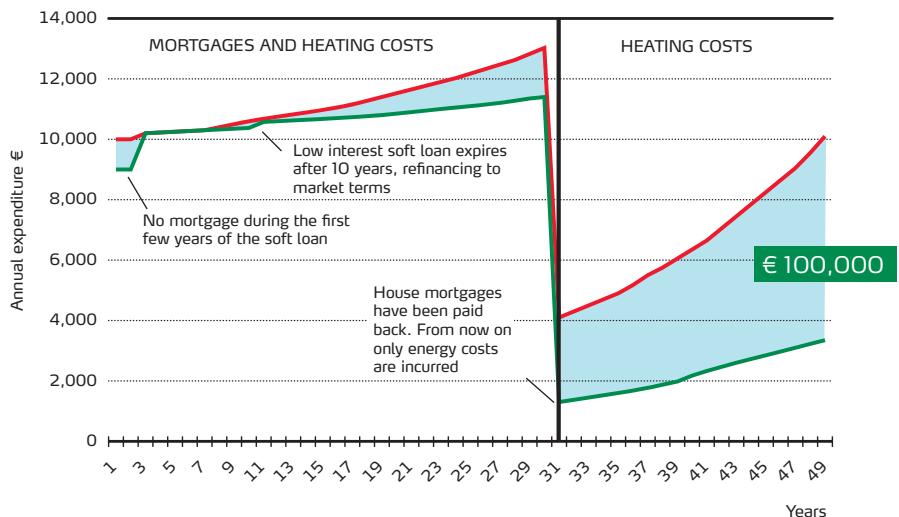
100,000 Euro. That's the lucrative gain a German home owner can get over 50 years if she invests a little more in a well-insulated Passive House with slightly higher mortgage payments, but much lower energy bills than for a standard house. What really makes many residents content, however, is the good indoor climate.

Mortgage plus energy costs:



Life-cycle costs comparison.

Well-insulated German Passive House vs. standard home. The blue area represents the savings.



Source: Klimaschutz in Frankfurt

How to save energy in existing buildings

The greatest potential for energy and CO₂ efficiency gains lies in our existing buildings. Billions of euros are needlessly wasted every year due to inadequate insulation. Many of our buildings – particularly in the developed world – were built before the energy crisis or, in transition economies, before an abrupt awakening to world energy prices. Even in countries with a long tradition for energy refurbishment (such as Denmark), more than half of the audited buildings still have the potential for profitable energy efficiency measures. How can we activate this huge, neglected opportunity for lower energy costs, less CO₂ pollution, better homes – and more jobs?

No renovation without insulation


The best time to make cost-effective retrofit is when the building is undergoing modernisation. When the building professionals are already involved and the scaffolding is in place anyway, it is very economical to add extra insulation – or a better window rather than just a poor, but slightly cheaper one. Modernising to very lowenergy standards should always become ‘a must’. If we miss this opportunity, it may be another 30 years before the next major renovation takes place.

In the EU it is mandatory to bring a building undergoing major renovation up to contemporary (low) energy standards. Not doing so (and controls remain inadequate) means €270bn in

Mr. 80% - a new generation's climate activist

From an annual heating bill of € 2800 to expected expenses of just € 140. Mr. Jul Hørlyk from Denmark owns a number of houses and just wanted to turn one of these draught-haunted buildings into a pleasant, comfortable home for his spouse and himself in their old age. He's no eco-freak and, until recently, was not even Passive House savvy. "I have become really enthusiastic about this principle. Whatever real estate I buy and renovate, in future, I will always retrofit to Passive House levels – or better. This is beyond discussion, for in the long run, oil and energy prices will move in one direction only – upwards."

Follow the Danish retrofit project in Hjørring:

 www.rockwool.dk/råd+og+vejledning/lavenergi-guiden/kort+nyt?kortnyt=1864



 www.energymap.dk/Profiles/Rockwool/Projects/Old-1960-house-becomes-passive-house





wasted energy costs plus 460 million tonnes of CO₂ every year.

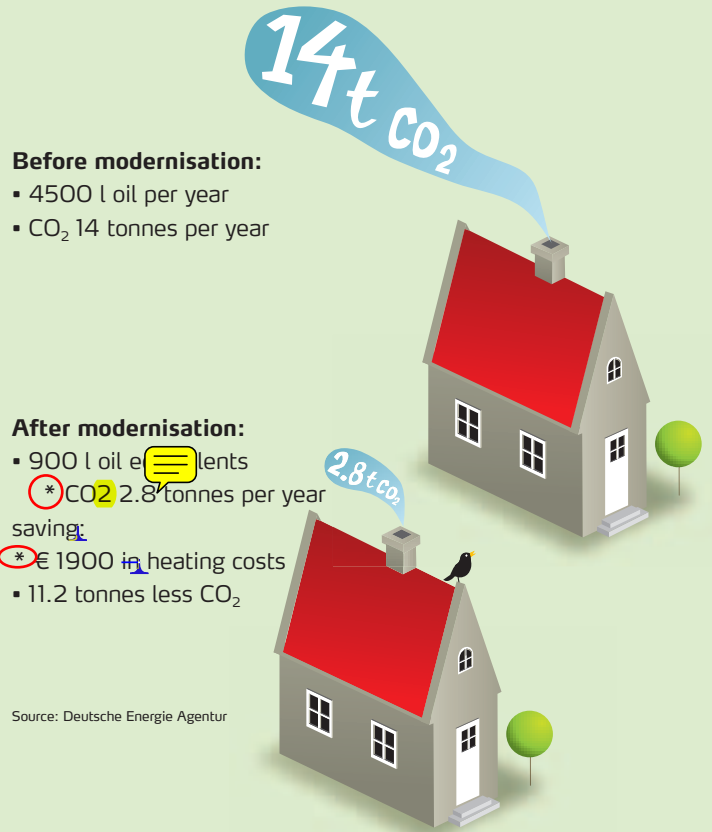
The EU Commission is therefore preparing to improve its directive on the energy performance of buildings, demanding that member states make plans as to how they will achieve building modernisations incorporating very low energy levels such as Passive House standards.

Retrofit to Passive House standards

An astonishing 80% less primary energy for heating can be realised. This has proved possible by upgrading old, poorly insulated buildings. Right now the Rockwool Group is involved in retrofitting three different types of homes to Passive House standards. A combination of energy efficient insulation, windows and geothermal ventilation systems make this possible. The additional investment not only ensures a better home with a more attractive real estate price, it also means that the extra energy savings will make it profitable for the householder. Over the next 30 years a bonus of more than € 12,000 is expected.

Insulate happily – or make tough sacrifices

11 tonnes – that's how much CO₂ a family can save annually if they retrofit their 150 sq m home (built before the oil crisis) to low energy standards. They will also enjoy a better indoor climate and up to €1900 in annual energy savings, all without having to change their daily routine.



In order to save (almost) the same amount of CO₂ the family of four people could choose to:

STOP USING BOTH THEIR NEW CARS -6.4 TONNES/YEAR (AT 40,000 KM/YEAR)



SKIP 2 HOLIDAY FLIGHTS -2.4 TONNES/YEAR (MUNICH – MALLORCA)



STOP EATING BEEF -1.4 TONNES/YEAR



TAKE COLD SHOWERS -0.6 TONNES/YEAR





Stopping the waste of tax payers' money. France is energy renovating 800,000 public buildings. Social housing will also be improved.

Combat energy poverty

Being poor can be expensive. For millions of people around the world, energy expenses account for a worryingly high proportion of their strained personal finances. Even in a rich country like the UK, an estimated 16% of the population needs to spend more than 10% of their household expenses on utility bills. Investments in profitable energy savings require up-front financing. Instead of merely subsidising energy waste – as far too many governments do unsustainably – funding for insulation and other forms of energy efficiency measures is now provided for less affluent Britons. An additional benefit is a better, healthier indoor environment for vulnerable households which includes less condensation, less mould and fewer draughts. The US is also increasing such funding through its 'weatheriza-

tion program'. In the EU, part of the regional funds can now be used for energy efficiency projects in buildings, yet the need remains massive.

Public buildings – good or bad role models?

Poor insulation of public buildings is a waste of tax payers' money. According to research in Denmark by the Technical University, more than 70% of the nation's public buildings have profitable energy and CO₂ savings that are still waiting to be activated.

One of the most progressive countries in this field is France. All its 800,000 public buildings (12% of the building stock) are being upgraded for energy efficiency.

'The most effective way of reducing your CO₂ emissions, and indeed reducing your energy bills, is to insulate. So first and foremost we say to people, put in loft insulation, draught-proofing, cavitywall insulation – because this will enable you to save about £300 a year, every year. It will also be the biggest contributor to reducing your CO₂ emissions.'

Philip Sellwood, CEO of the Energy Savings Trust, UK

How to create a Green Job-Wunder

How should a country stimulate green jobs in an effective way? An inspiring example is Germany's stimulus package that for years has used improvements of its old building stock to fight unemployment, dependence on expensive energy imports and carbon emissions. The KfW CO₂ building rehabilitation programme that supports energy efficient modernisations – and new-build – has helped reach impressive results. In just 7 years, Germany has reduced its energy consumption for heating by 16% per sqm floor area. More than 2.4 million tonnes of CO₂ have already been saved per year. More than 50 billion Euros of heating costs can be saved before 2020, provided that the full savings potential is used.

The home of the Hohenbild family from Germany has been energy modernised.



THE PROGRAMME ADDRESSES 7 VITAL VIRTUES OF A GOOD STIMULUS PACKAGE:

1. focus on energy efficiency - don't just spend unsustainably

2. Support improvements that are better than minimum requirements for new buildings

A retrofitted 'EfficiencyHouse 85' is eligible to either up to €-15,000 in subsidies OR €-11,250 in subsidies plus €-75,000 in low-interest loans (app 1.4%). It is renovated to use 85% of the energy that a new home may use - the maximum being app 50 kWh per sqm per year in primary energy for heating. A new home fulfilling the 'EfficiencyHouse 55' criteria can get a low-interest loan (at about 2.5 %) for up to ~~50,000-EUR~~. Buildings that reach less ambitious reduction levels are eligible to less funding. An 'EfficiencyHouse 100' that is (only) renovated to the same level as a new home (about 70 kWh per sqm and year in primary energy) is eligible to either €-13,125 in subsidies OR €-9,375 in subsidies plus € 75,000 in low-interest loans.

3. Ensure sufficient funding for both materials and professionals

€-2.25 billion per year have now been allocated.

4. Make the programme long-term – avoid stop-and-go

Energy modernisation programmes for buildings have

existed for years and have broad political long-term support. Programmes where renewed funding becomes insecure during fiscal budget negotiations every few years are poison to job security.

5. Train competent and authorised consultants

A strong network of professional energy advisors help homeowners reap the benefits.

6. Set-up a comprehensible, efficient, non-bureaucratic support procedure

Quick funding is provided by the KfW governmental bank. With an energy demand calculation from an authorised consultant the home owner can apply directly for the subsidy and low-interest loan.

7. Document improvements

The homeowner receives an energy certificate which can help the owner improve the value of the building and make it more attractive for potential buyers.



Read more:

www.kfw-foerderbank.de/DE_Home/Bauen_Wohnen_Energiesparen/index.jsp

www.kfw-foerderbank.de/EN_Home/index.jsp



A golden potential

Better insulation of industrial processes holds huge potential for profitable energy efficiency and CO₂ reduction. Temperatures in hot pipes can reach 200°C or more. Yet no international requirements exist for the insulation of pipes and industrial processes. Too often hot pipes are only insulated to the extent that workers avoid getting skin burns if they touch the hot surface – that's often only 30 mm. This is a long way from the 300 mm plus needed to take full account of lifecycle costs. In order to allow sufficient space for proper insulation, industrial plants need to be redesigned. To produce a thaw in this inertia, regulatory requirements and senior management actions are urgently needed.

How much energy, CO₂ and money can be saved?

An oil refinery investing €20 million to insulate its 1,375 km of high-temperature piping can save not only 500,000 tonnes of CO₂ per year (equal to the emissions from 62,500 EU households), but also more than €55 million in unnecessary energy costs.

Source: Dutch CINI and JQU calculations

What can be saved?

Studies from NCTI and FESI indicate that just by moderately insulating the 5-10% least effective oil refineries in the EU, annual energy costs worth €3.5 billion and 20 million tonnes of CO₂ could be saved. This massive saving equals the energy and emissions from more than 2 million EU households. In less than 2 months the €500 million investment would be paid back. In the US, where the number of refineries with no, or poor, insulation is 2½ - 5 times higher, the potential is even greater.

As free CO₂ allowances will be reduced for plants in the EU, the cost of inaction will increase.



Rockwool insulation protects lives and property

Fire protection means better sustainability. Rockwool insulation cannot burn - it can withstand temperatures of more than 1000°C. This makes it ideal as a fire barrier that protects lives and property, and reduces toxic emissions from fires. Not only in buildings, but also in process plants, on oil rigs and on ships.





Every week new power plants see the light of day. The growing need for electricity could be served better, cheaper and more sustainably if industry and power plants – new and old – were properly insulated. Beijing, China.

How to make Rockwool insulation

The Rockwool process resembles the natural action of the volcano: stone wool is made by melting rock, lime stone and recycled briquettes with other raw materials at 1500°C in a coke-heated cupola furnace. The resultant liquid stone melt is spun into fibres. Binder and impregnating oil are added to make the material stable and water-repellent. The stone wool is then heated to about 200°C in order to cure the binder and stabilise the material for final processing into a variety of products. Environmental equipment – filters, pre-heaters, after-burners, and other cleaning and collection systems – makes the 'tamed volcano' an environmentally responsible process.



See the video 'People & Environment'

www.rockwool.com/about+the+group/the+group+in+brief/profile+video

A better climate – in your home

Better insulated buildings will not just reduce global carbon emissions. First and foremost good insulation can improve your own indoor climate, where you spend most of your life. In far too many buildings, the indoor air quality is poor. Without proper insulation, airtight construction and controlled ventilation warm humid air can condense on cold, poorly insulated surfaces. This allows moulds and fungi to grow which is both unsightly and increases the risk of health problems such as allergic reactions. Moisture damage is present in more than 20% of homes, according to a German study from the University of Jena. And it's not just homes - many pupils are reported to suffer headaches, because their schools still need to be renovated with proper insulation and ventilation.

Good insulation helps provide a pleasant and stable indoor temperature between 20-26°C, whether during freezing winters or scolding hot summers.

Ventilate

Unless you live in a modern building – such as a Passive House – with an automatic ventilation system, you have to open your windows briefly several times a day to refresh the air. During the cold winter months, 5 minutes (with radiators off) may be enough for a complete air exchange without a dramatic cooling of the warm surfaces in the building. On windless summer days, 30 minutes may be necessary.

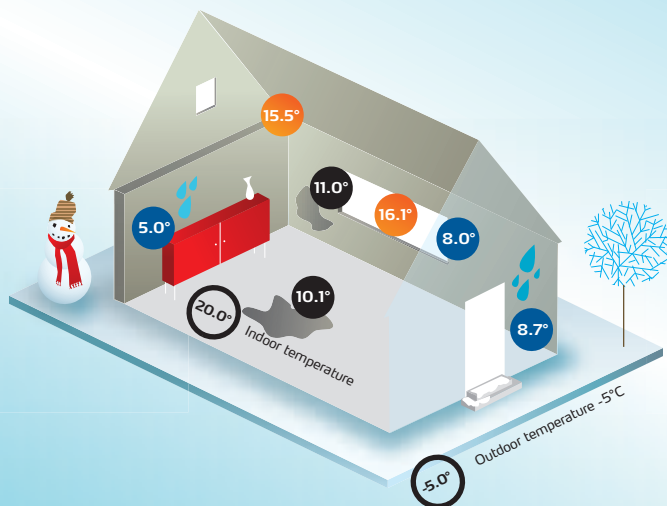
Indoor climate labelling

Rockwool products are qualified to use the Finnish 'M1' indoor climate label that has the strictest requirements in Europe, meaning no critical emissions of odours or volatile organic compounds. Furthermore the Danish Indoor Climate Label has been given to a number of Rockfon acoustic ceiling products. With regard to personal safety, Rockwool insulation in buildings has been closely monitored to show that it does not involve critical emissions into the indoor environment.

HOW INSULATION PREVENTS CONDENSATION AND MOULD

Old building lacking insulation

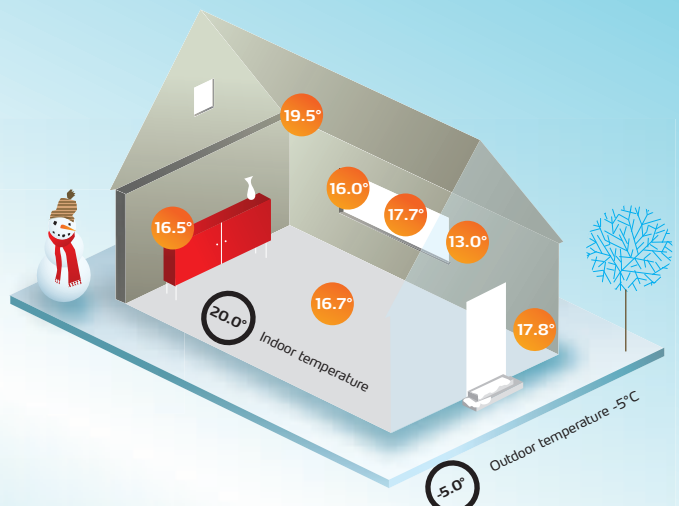
Despite new windows, condensation and mould problems can occur around window frames, the foundations, in joints and behind cupboards.



Surface temperature: around 9° C

Renovated building

200 mm insulation (Passive House technique) and new Passive House window

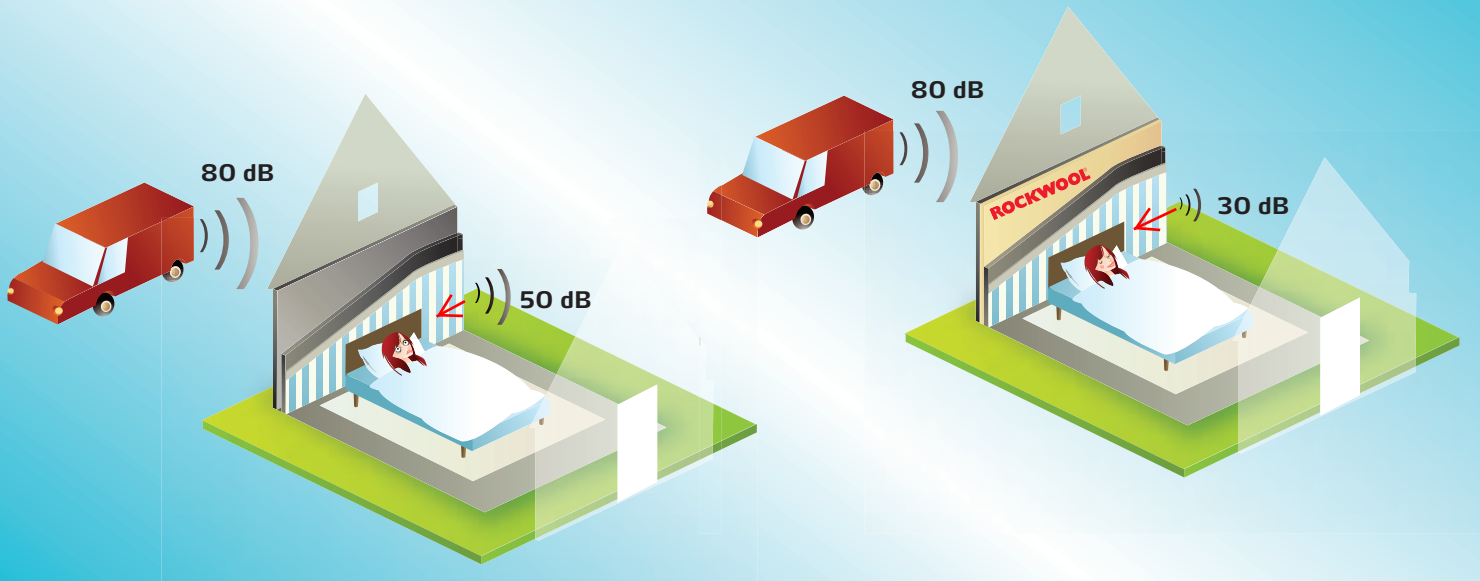


Surface temperature: above 16° C

The relevant surface temperatures are now above 16° C with no condensation or mould problems occurring. Humidity of 62% is no longer a problem.

- Safe surface temperature – well insulated
- Critical surface temperature
- Very cold and critical surface temperature

Source: Passive House Institute



Preventing noise pollution

Stonewool absorbs noise and regulates sound. Better insulation can therefore reduce noise pollution and the misery it causes for millions of people around the world. New research reveals that 38% of the UK population (17.5 million Britons) have been disturbed by noisy neighbours in the last two years. For almost one in ten Britons (7%), this is a regular occurrence. Noise causes stress, loss of concentration and affects well being. The economic impact is also severe. Spoiling a good night's sleep, it can provoke stress-related heart problems and lower productivity generally.

Better sound proofing not only makes it more peaceful for those living next to noisy neighbours, it also enables people freer expression - for instance through their music or other so-called, yet noisy, activities.

Extra bonus

Rockwool insulation in walls, roofs and under floors prevents noise from the outside – or from adjacent rooms - penetrating the building. A good wall construction with Rockwool insulation help reduce noise transmission by more than 50dB (R_w -value) which is about 20dB more than a poor construction without insulation. A 10dB difference is perceived by the human ear as a doubling (or halving) of the audible sound.

Machines that create ear-deafening noise can also be encapsulated with Rockwool insulation. Along busy roads, stonewool in noise screens, or as RockDelta vibration control under rail tracks, helps minimise unhealthy noise and vibrations. Traffic noise affects 40% of EU citizens and can reduce the value of property along major roads by 1.6% for every decibel above 55dB.

With Rockfon acoustic ceilings inside a room, 'noise infernos' with disturbing echoes can be prevented. A poor acoustic environment is not just a problem in offices, concert halls



or cinema theatres. Millions of school years are lost by the disruption of concentrated learning. At reverberation times of just 0.7 seconds only 67% of the spoken word remains comprehensible, falling to just 40% at 1.7 seconds.



Learn more about noise at
www.rockwool.com/acoustics

Sustainability and a positive carbon footprint

Rockwool insulation is one of the few industrial products that can save more energy, CO₂ and air pollutants than are consumed and emitted for its production. This year's production of Rockwool insulation will, in its lifetime, save more than 200 million tonnes of CO₂ from buildings and processes worldwide. That's equal to the annual CO₂ emissions from the Netherlands.

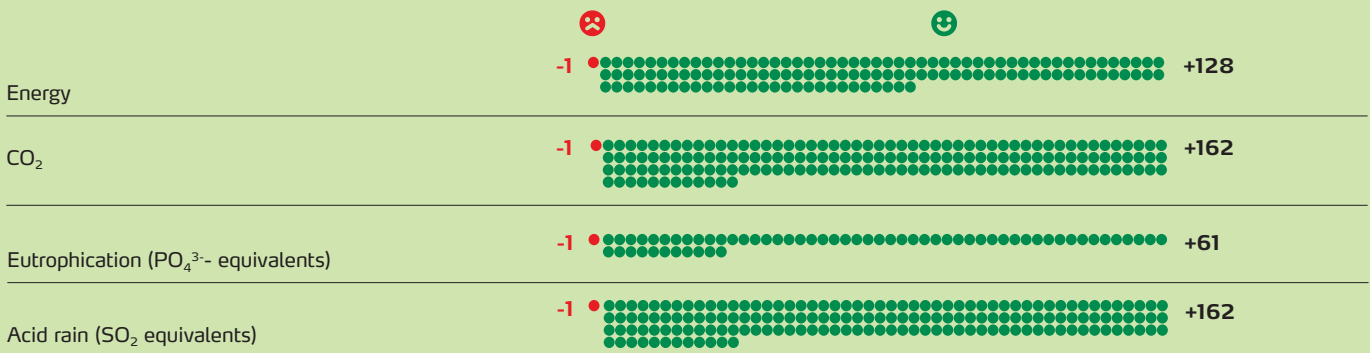
A typical Rockwool insulation product can save more than 100 times the primary energy and CO₂ needed for its manufacture, transportation and disposal. The energy and CO₂ balances become positive only 5 months and 4 months respectively after installation in the building.

Whereas most other companies work diligently to reduce their negative carbon footprint, the goal of the Rockwool Group is to increase our overall very positive carbon footprint: alleviating the climate of many more million tonnes of CO₂ than we emit during our activities.



Sustainability is about fulfilling our needs today without compromising the prospects of future generations. There are many good things we should do, but don't, because they would compromise our quality of life – like giving up private cars. Installing insulation, however, is a profitable way to abate CO₂ that also improves our quality of life indoors.

ROCKWOOL SUSTAINABILITY BALANCE



- Used in life-cycle
- Saved in life-cycle

Source: FORCE TECHNOLOGY/dk-TEKNIK. ISO 14025 compliant, peer reviewed LCA in: International Journal of Life Cycle Assessment, no 9 2004, p.53-56 & 122-129

LifeCycle Assessment (LCA)

Rockwool insulation is a major energy and CO₂ saver. A typical 250 mm Rockwool loft insulation product – manufactured and installed in Denmark and used over 50 years - will save 128 times more primary energy and 162 times more CO₂ and acid rain components than was used for its production, transport and disposal; reduced airborne nutrients come at a factor of 61 times. The energy balance becomes positive only 5 months after installation. CO₂ and acid rain payback is just 4 months, and 10 months for eutrophication compounds. For a product that insulates hot pipes, the energy and CO₂ payback is even quicker. It can be less than 24 hours - the return on invested energy is more than 10,000 fold.



Energy and CO₂ efficiency in the Rockwool Group

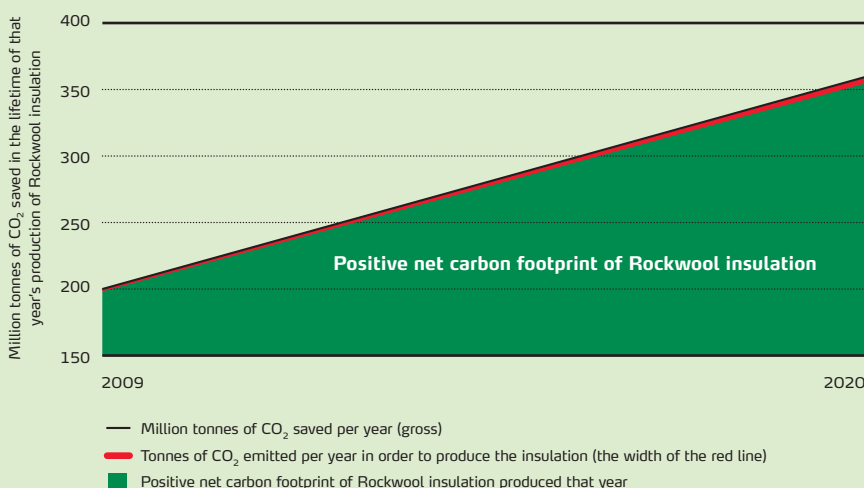
Improved carbon footprint

Using the growth in volume recorded since 2000 as a reference scenario; by 2020 the Rockwool Group could increase its positive net carbon footprint to over 360 million tonnes of CO₂ saved.

Our actions to help enable this are:

- Investing in countries where large and profitable CO₂ efficiency gains can be made and where currently there is insufficient Rockwool production.
- Playing an active role in pushing for better energy and CO₂ efficiency standards in buildings. We want to stop the unnecessary waste of expensive energy and CO₂.
- In developed countries we are aiming for Passive House standards no later than 2015 and [Plus Energy](#) standards no later than 2020 for new buildings. For existing buildings, we want to see energy modernisation to Passive House levels whenever this is technically and 'lifecycle-cost-wise' feasible - but no later than 2020. Meanwhile in developing countries, we will encourage low-energy standards that ensure better and more affordable homes on a lifecycle cost basis.
- Continuing to improve the insulation capabilities of our products and system solutions.
- Continuing to improve the CO₂ efficiency of our own production.

Positive net carbon footprint of Rockwool insulation



The Rockwool Group could improve its positive net carbon footprint: from 200 million tonnes of CO₂ saved from this year's production of energy efficient insulation to 360 million tonnes by 2020. This corresponds to the annual emissions from Mexico - the world's 10th largest emitter - a country willing to take onboard CO₂ efficiency commitments. The positive net improvement scenario assumes an average growth in volume/insulation efficiency similar to that since 2000 (5.1%).

Energy and CO₂ efficiency performance

Rockwool products will, over their lifetime, save more than 200 million tonnes of CO₂ in buildings and processes world-wide. In 2008 the Rockwool Group's production units recorded Scope 1 CO₂ emissions (generated from production) of 1.17 million tonnes and Scope 2 CO₂ emissions (generated from electricity consumed, but produced off-site) of less than 270,000 tonnes.



CO₂ inventory and transparency

All Rockwool factories make detailed monitoring and documentation of their CO₂ emissions. Eleven factories are now part of the EU Emission Trading Scheme which means that their CO₂ inventories are verified by authorised external bodies.

In 2009 the Rockwool Group is participating for the first time in the Carbon Disclosure Project (CDP), which is a golden standard for CO₂ reporting. The reporting is in accordance with the Greenhouse Gas Protocol of the World Business Council on Sustainable Development (WBCSD). Details about the Rockwool Group's carbon emissions, carbon management and strategies are published at



www.cdproject.net

Carbon and energy management

Each factory is actively engaged in improving its energy performance. A catalogue of improvement options for energy consumption has been developed by the Rockwool Group's specialists and is available to all the factories so they can implement Energy Improvement Action Plans on the basis of our energy audits. Each plant is being tracked on its energy performance.

As a result of our energy audits we have reduced our energy consumption equivalent to a saving of EUR 3.4 million per year.

Improved energy efficiency challenged

In the period 2002 to 2007, our total energy consumption (fuels + electricity) per tonne stone wool produced decreased by approximately 11%. This is the result of an energy efficiency focus, as well as the improved utilisation of our production capacity. However, from 2007 to 2008, the energy efficiency declined by approximately 5%. This was due to the financial crisis that reduced our production capacity utilisation, causing inefficient idle-run.

In the period 2002 to 2008, the Group's CO₂ efficiency (tonne CO₂ emitted per tonne produced stone wool) has improved by 3%. In contrast with the period 2002 to 2006, when the CO₂ efficiency improved by 7%, this efficiency has declined particularly in 2008 due to the reduction in production capacity utilisation, causing inefficient idle-run.



Our Gladbeck factory in Germany has achieved a continuous improvement in its CO₂ efficiency since 2002. Better energy efficiency in the cupola oven and the use of secondary raw materials with a lower CO₂ emission have been decisive in delivering improvements of up to 17%.

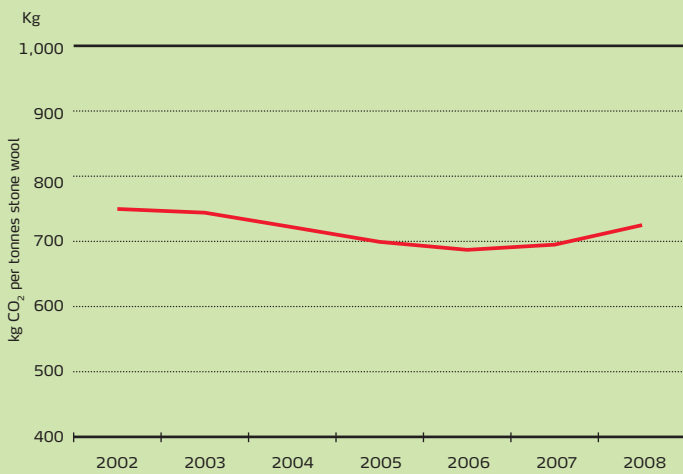


A CO₂ efficiency improvement of 11% since 2006 has been achieved at the factory in Vyborg in the Western part of Russia.



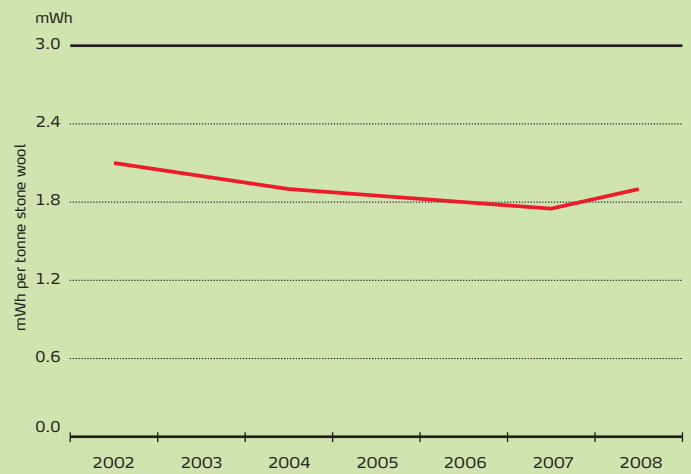
Lean & Green award for efficient transport: 30% less mileage and 50 tonnes less CO₂ per year - that's the ambition for the Dutch Rockwool company now using longer carriers and better logistics.

CO₂ emissions



Improvement 2002-2006	7%
Improvement 2002-2008	3%
Decline 2007-2008	-4%
Decline 2007-2008 after correlation for improved data quality	-3%

Energy consumption (in-plant)





Excess heat from the Rockwool production process is now used as district heating in the Danish town of Vamdrup. 400 homes are supplied in this way.

Further improvements

The Rockwool Group has engaged in a number of development projects which are expected to improve our CO₂ and energy efficiency. The largest proportion of the CO₂ emissions generated by Rockwool activity comes from the energy used in our 21 factories to melt rock at high temperatures and transform it into stone wool products.

Actions to improve CO₂ efficiency:

- improving the melting technology
- using secondary raw materials as alternatives to fossil fuel
- capturing excess heat from the process for heating or power generation
- implementing energy efficiency action plans
- improving the energy efficiency of our buildings

At present the Rockwool Group does not see a need to buy CO₂ allowances in order to fulfil our EU ETS commitments.

Additional energy efficiency projects relating to our production process have already been organised with an estimated investment of EUR 5.6 million. These projects have an estimated saving of EUR 5.1 million per annum.

Keeping our own house in order

In 2008 the Rockwool Group decided on stricter targets regarding the energy efficiency of our own buildings. New office buildings must be constructed according to low energy building standards or better. For existing office and factory buildings the following now applies:

- Major renovations: the energy performance will be upgraded to meet or exceed requirements for new buildings so far as this is functional, and technically and economically feasible.
- Partial renovations: whenever individual components (such as windows, roofs, walls and floors etc.) and individual systems (such as heating, cooling, ventilation and lighting) are replaced or renovated, these components shall meet the minimum requirements for new buildings
- All buildings should have an energy performance certificate not older than 10 years. All cost effective investments (pay-back period less than 7 years) recommended in the energy performance certificate will be implemented within 3 years.

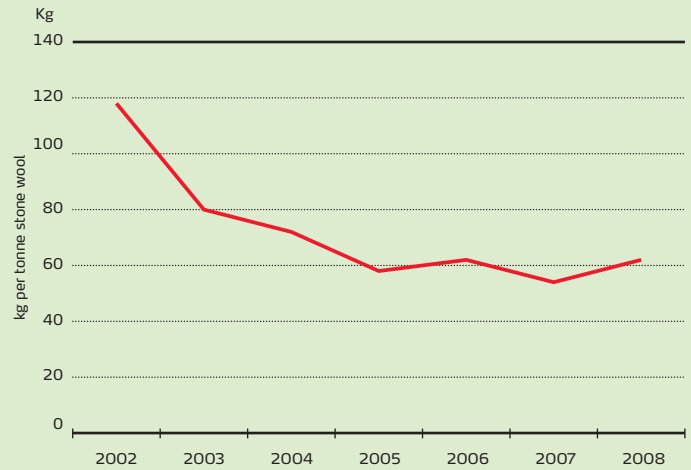
Recycling – using our resources sustainably

The Rockwool Group uses a large and increasing amount of recycled material. In this way we deplete less virgin raw materials like fuel and rock, and need less waste disposal sites. With volcanic activity and plate tectonics, nature creates around 38,000 times more new reserves of rock every year than the Rockwool Group extracts. But although rock is an abundant resource, minimising quarrying helps leave less ‘scars’ in our landscape.

The Rockwool Group has over many years refined the recycling process. Stone wool waste and other suitable residue materials are compressed into recycling briquettes that are melted and processed into new stone wool. This is important because the building industry delivers a major part of landfill waste. To our credit 96% of our stone wool production is either sold or recycled. From 2002 to 2008 our waste to landfill has decreased by 35% – that’s 43,000 tonnes. Stone wool residue is also used in other industries, for instance as raw material in bricks.

The high temperatures of the Rockwool process also enable around 400,000 tonnes of residue materials from other industries to be turned into a valuable resource. For instance, olivine sand that has been used to sand blow vessels or concrete, and some residues from the metal industry can be used. These initiatives are supported by the EU Environment Life programme.

Waste to landfill



Return schemes

The EU Waste Framework Directive aims to see at least 70% of construction and demolition waste recycled by 2020. The Rockwool Group has the technology to take back stone wool off-cuts from building sites. Such schemes already exist in the UK, Germany and Denmark and the Netherlands.



See the film "From waste to resource"

www.rockwool.com/environment/production/recycling

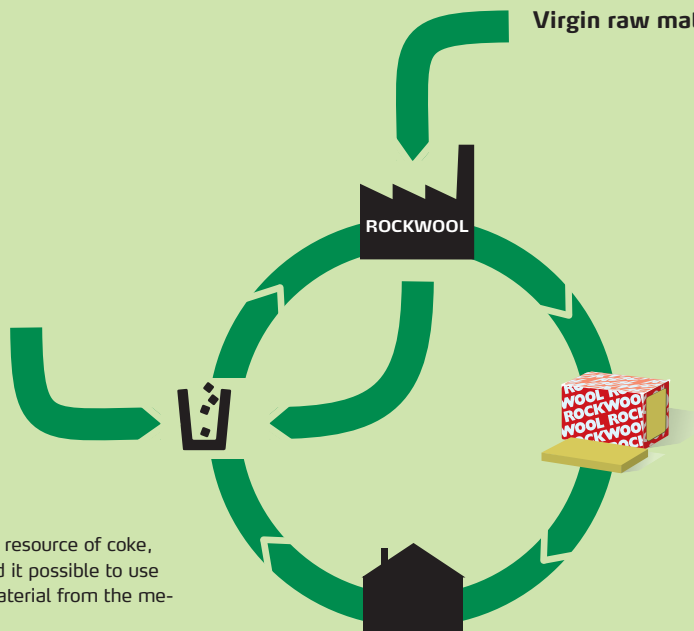
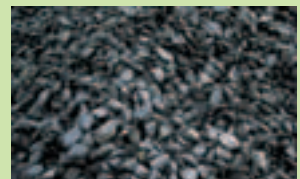
Secondary raw materials



Instead of using the virgin energy resource of coke, the factory in Neuburg has proved it possible to use a carbon-containing secondary material from the metal industry for its furnace.

Each year the Rockwool Group turns some 400,000 tonnes of "waste" into valuable resources.

Virgin raw materials



The Rockwool Group recycles its own stone wool production waste. In some countries off-cuts from building sites are also recycled. Furthermore, we recycle three times more residue materials from other industries than we landfill ourselves.

Environmental performance

Less air pollution

Energy savings improve air quality. By burning less fossil fuel we also achieve less smog, acid rain and eutrophication - an excess of nutrients that may disturb the bio-diversity in soil and water. A typical Rockwool loft insulation product saves 61-162 times more of these air pollutants than were emitted during its production.

Improving our sustainability balance

The Rockwool factories use afterburners and other environmental equipment to minimise emissions such as carbon monoxide (CO) from the melting process, and phenol and formaldehyde from the small amounts of resin binder used to stabilise stone wool fibres. The combustion of carbon monoxide also improves energy utilisation. At temperatures exceeding 700°C, most of the airborne organic remnants from the production process are burnt off.

Good results

The Group's smog components are diminishing: emissions of formaldehyde and phenol have decreased by 56% and 29% respectively since 2002. The third component, ammonia emissions, is 1% lower than 2002 levels, but with a receding trend since 2005. By installing afterburners, carbon monoxide emissions have been reduced by 30% since 2002. Also the potential for eutrophication is diminishing. Sulphur dioxide emissions have risen by 8% since 2002 due mainly to the cross-media effect of recycling more stone wool waste via cement bri-



quettes that contain sulphur components. An action plan is being prepared in order to reduce this acid rain factor.

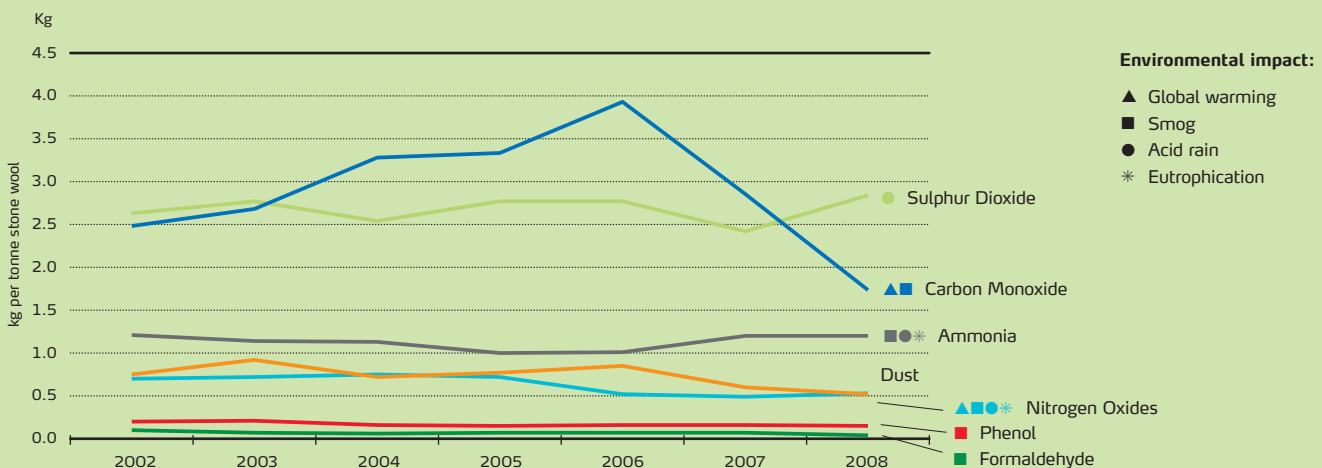
Less dust from production

Dust emissions from the furnaces have been reduced by 31% since 2002 mainly due to the upgrading of filters. The Group recycles and re-melts as much dust as possible.

Water efficiency

In some areas potable water can be a scarce resource and thus a key sustainability factor. The Group's water efficiency has been improved by 10% compared to 2002 levels. Consumption is currently 1.4m³ per tonne stone wool.

Emissions (in-plant)



Responsible environmental management

The Rockwool Group has an important task - to improve the environment for millions of people. This requires local responsibility and respect towards our neighbours who live in the vicinity of our factories. More than 70 years of experience shows that it is safe to live next to a Rockwool factory. However, like any production facility, there is sometimes a nuisance factor. Every year the Rockwool Group makes a great effort and invests millions of euros to minimise noise, odour and smoke from the factories. A number of factories have won environmental awards for their commitment. In 2008, for instance, Rockwool Netherlands won an award for a more sustainable logistics systems, improving energy and CO₂ efficiency.



See examples of green award winners at www.rockwool.com/environment/production/green+awards

Mandatory standards and audits

It is mandatory for all factories to conform to the Rockwool Environment, Health and Safety (EHS) Management System, which is in line with ISO 14001 and OHSAS 18001 standards. A number of factories are certified according to ISO 14001 and EMAS and audited by third-party experts, although this is not a requirement. Group Minimum Mandatory Standards and Guidelines must be respected. One such standard is for a minimum level of environmental abatement equipment. Conformance to this standard means that environmental abatement equipment (such as CO afterburners) must be installed even at some of our factories where there is no regulatory requirement to do so. All 21 factories are subject to regular audits in order to ensure that we live up to our own best practice. On average a Rockwool factory is subject to an audit from the Group on an annual basis covering either environmental performance, Health and Safety or Fire safety. In 2008 22 audits were carried out by the Group, supplemented by 20 external audits.

Neighbour relations

By investing in modern environmental equipment and documenting our environmental performance, we ensure that it remains safe to live next door to a Rockwool factory. But equally important is having open dialogue and sensitive response so that our neighbours also feel at ease with living close to a Rockwool factory. The Rockwool Group has put a great deal of effort into improving relations with those few communities where anxiety has prevailed. The Rockwool Group is not involved in any environmental litigation in the courts.

See the film how the Rockwool Group changed a smoke-stack industry in the former German Democratic Republic into a good, environmentally responsible neighbour in the "clean air health resort" town of Flechtingen



www.rockwool.com/environment/production/environmental+management/the+good+neighbour

Improved safety

The Rockwool Group is committed to safe products and safe workplaces. It is also our policy to inform customers how to install and handle products correctly.

In 2008 we recorded a total of 119 accidents, that resulted in at least one day of absence. This is a significant reduction compared to 2002 and also to 2007. The average Frequency Rate of Accidents (F.R.A.) for the Group was 11.8 which is close to the lowest level recorded in the history of the Rockwool Group. Four factories achieved zero accidents. The Group is active in identifying ways of continuing to lower the number of accidents, for instance twinning workshops between different factories with the main objective of sharing best practice. The Group has set an intermediate goal aiming at a frequency rate of no more than five accidents per million work hours in 2012. This is extremely low for an industrial company. Still, every accident is one too many.

Safety of stone wool

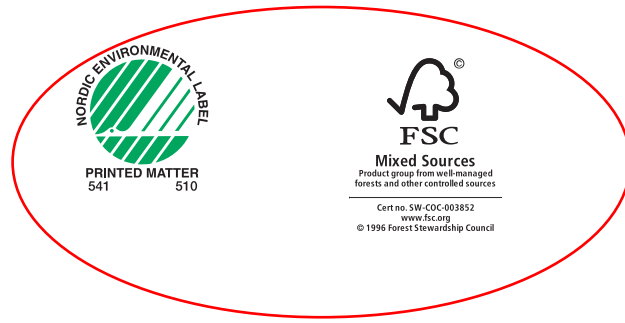
The World Health Organisation concluded in 2001 that rock (stone) wool should be removed from classification as a "possible human carcinogen". This positive re-classification is because epidemiological studies and long-term inhalation studies have provided no evidence of increased risk of lung cancer from occupational exposure to stone wool fibres.

The mineral wool industry has made a set of recommendations about how to handle products in a way that minimises transient itching of the skin.

Rockwool products in contact with the indoor climate qualify as M1 - the best indoor climate category according to the recognised, strict requirements used in Finland. It is also possible to buy Rockfon acoustic ceilings with the Danish Indoor Climate Label. This is attributable to the fact that Rockwool products typically consist of 98% inorganic (stone) materials and only 2% organic material: a highly refined oil makes the insulation water-repellent and reduces dust, and a thermosetting resin binds the fibres.

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The Rockwool Group

The Rockwool Group is the world leader in stone wool technology. Our Mission is to be our customers' preferred supplier of products, systems and solutions for improved energy efficiency, acoustic performance and fire safety in buildings.

Stone wool improves the environment and the quality of life for millions of people. This versatile material is used to insulate against loss of heat and cold. By decreasing the need to burn fossil fuels, stone wool also reduces air pollution.

Made of rock, stone wool is naturally fire resistant. It tolerates temperatures of up to 1000°C and is used as vital fire protection in buildings and for marine applications to protect lives and valuable assets. Stone wool protects against noise pollution and is used in acoustic ceilings, noise screens, around noisy machines, in walls and roofs, under floors and even underneath rail tracks. Stone wool is also used as a growing medium for vegetables and flowers, in facade cladding boards, as reinforcement fibres in cars and for other industrial purposes.

The Rockwool Group has 8,000 employees in more than 30 countries - and customers all over the world. In 2008, sales reached €1.8 billion. The Group has been producing stone wool for more than 70 years and currently has 21 factories across Europe, North America and Asia.



ROCKWOOL®

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