

Peking University 2008 BELL lecture series: the marketing of
environmental technologies & climate change and the future of mankind

2008年度贝迩绿色示范课程“环境技术的市场化，
气候变化与人类未来”课程表

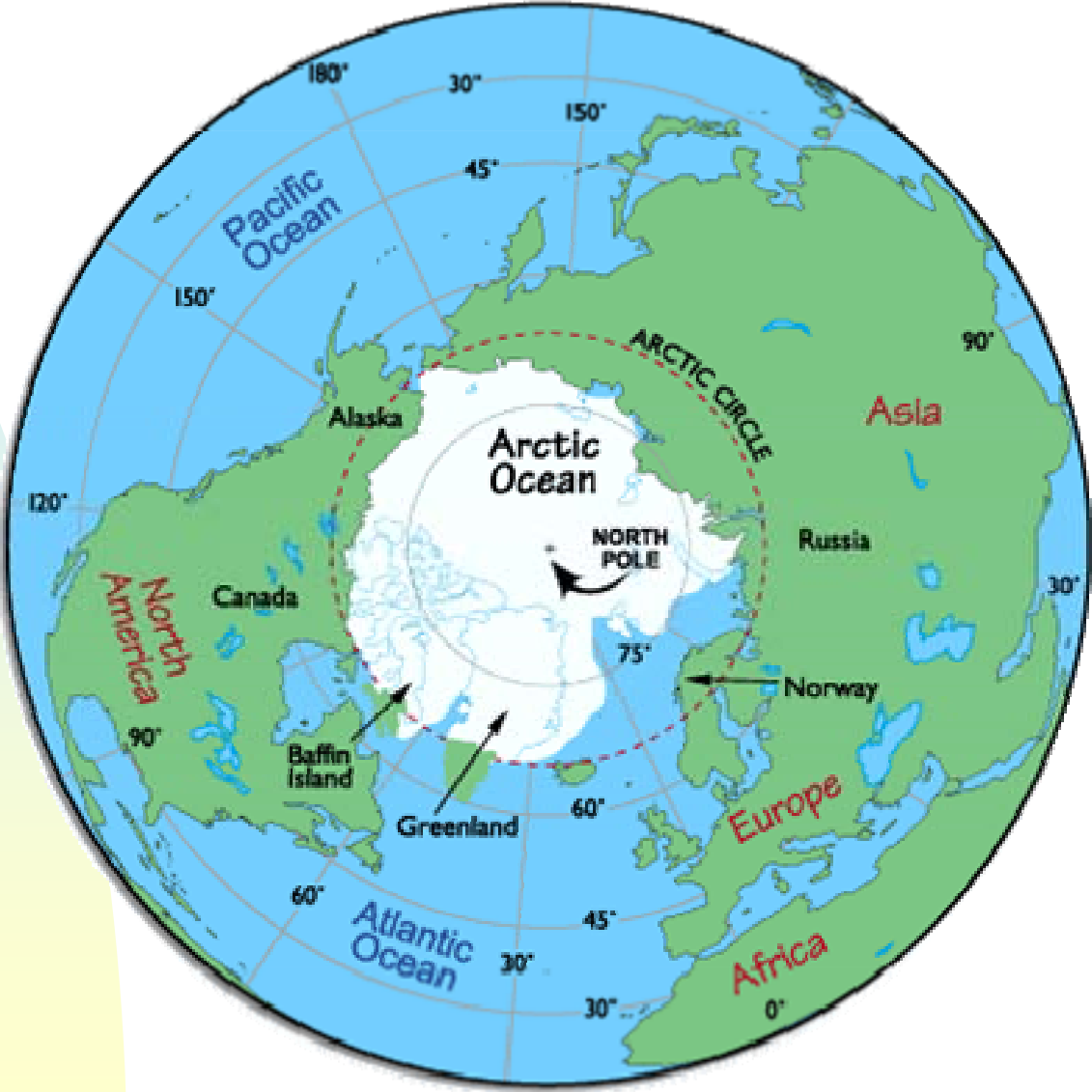
An introduction to Norway's response to climate change

Mette Husemoen 美達·霍斯曼

PKU, April 3, 2008

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Norway in the world

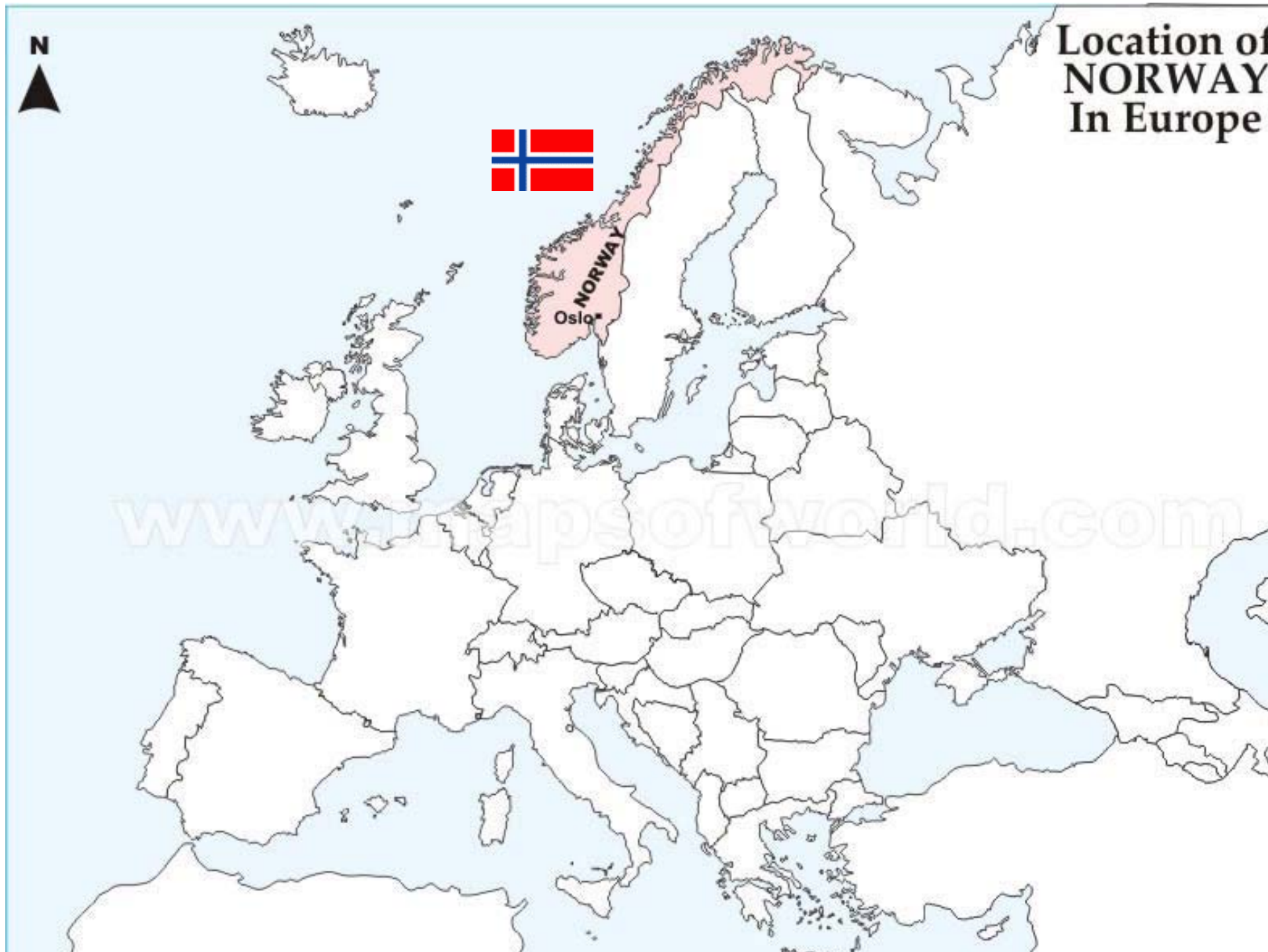


Location of NORWAY In Europe



NORWAY
Oslo

www.maps-of-world.com

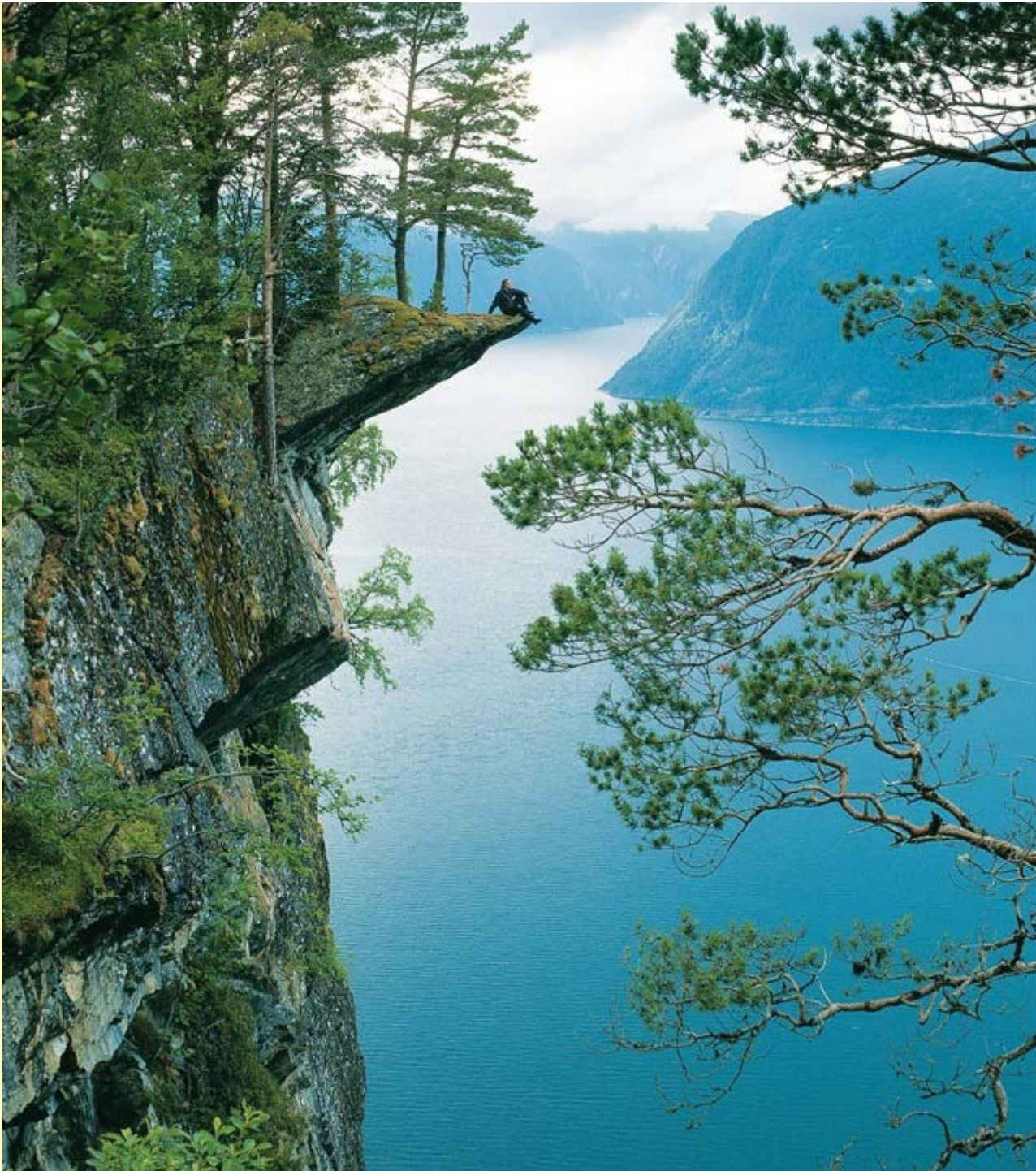












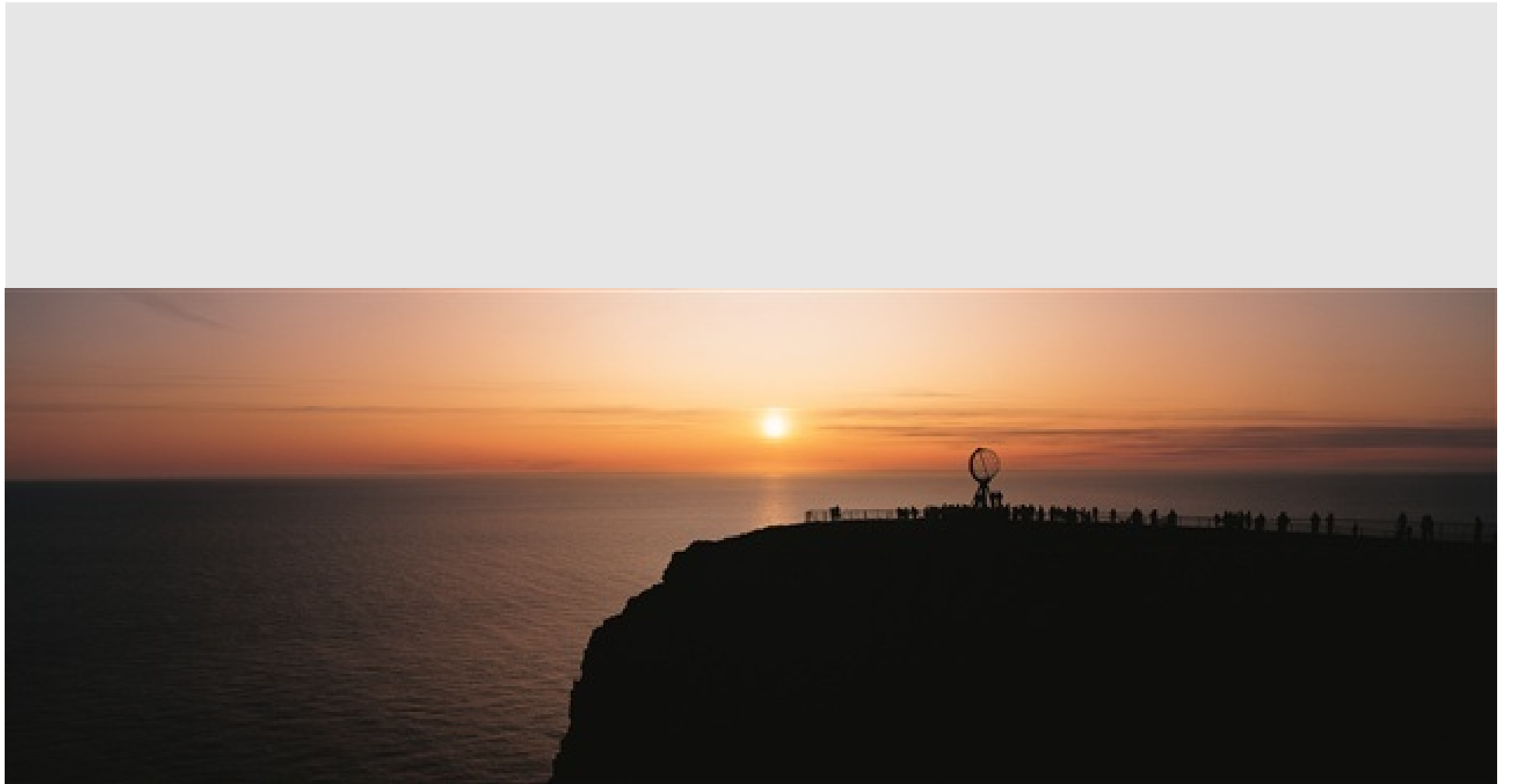
















































Johan Wildhagen/Innovation Norway















Norway today -- one of the richest countries in the world

今日挪威 –世界最富國家之一

- Norway is a welfare state; free health care & education
挪威是福利國家，公民享受免費教育和醫療
- In 2006, for the 6th consecutive year, ranked top on UNDP Human Development Index on national living conditions
聯合國“人類發展指數”國家生活水平2006年連續六年被評為第一
- No extreme poverty, relative poverty level is lower than other OECD countries. 100% literacy & high schooling.
比經濟合作發展組織OECD中其它歐美國家的相對貧困水平都低
100%地消除了文盲和絕對貧困，普及了高中教育
- Life expectancy: 78.7 years, among the highest in the world
平均壽命達78.7歲

今日挪威 Norway -- size, population, nature

- 6th largest country in Europe (385 155 km²) -- a little smaller than Gansu (7th largest province in China) or California
國土面積385萬平方公里，歐洲第六，相當中國第八大省（甘肅雲南之間）和美國加州
- 4.6 mill people, less than 1% of Europe
人口460萬，佔歐洲不到1%
- Hammerfest -northernmost town in the world
世界最北城市-哈姆菲斯特
- Tromsø University, the northernmost university (70 degrees north)
世界最北大學-特隆姆瑟大學（北緯70度）
- Closeness to nature -- part of Norwegian culture
挪威文化特色之一：接近自然



今日挪威 Norway -- size, population, nature

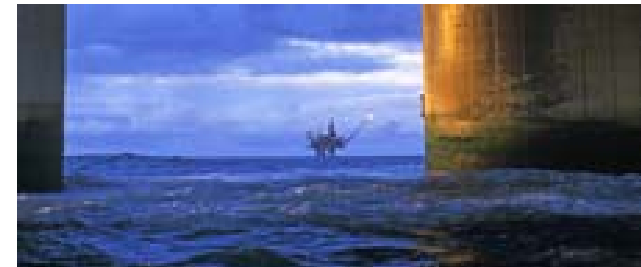
- Long, mountainous land: 70% mountain plateaus & glaciers, 30% forest
國土狹長多山：70%山地和冰川，森林約佔30%
- 20.000 km coastline reaching far into arctic circle
海岸綫達兩萬公里，深入北極圈
- Northernmost country in the world to have open waters -- gulf stream has a major impact
墨西哥灣流使挪威成爲有最北不凍港的國家
- Northern region becoming increasingly important; Nordic cooperation
北歐全地區協作日益升溫



Photo: Arne Nævra

今日挪威 Norway -- social democracy

- GDP per capita highest in the world, wealth relatively equally distributed, high degree of gender equality
世界人均GDP最高國家之一，財富分配相對平均，男女平等程度高
- Social democratic system -- emphasize on taking care of the weak
社會民主政體 —強調照顧弱勢群體
- Oil and natural gas in North Sea in last 4 decades led to sharp increase of wealth & consumption
過去40年挪威北海石油和天然氣使挪威財富和消費水平激增
- Relatively high tax level -- price of gasoline: RMB 15/liter
高稅收，高物價—汽油每升相當15元人民幣



StatoilHydro -- Stafjord A

今日挪威 Norway today -- oil and gas operator

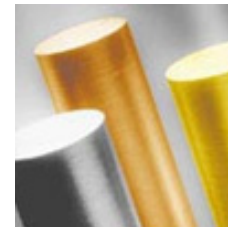
- Petroleum is largest industry, 26% of added value in the country (2006)
石油是最大產業，06年佔全國產業附加值的26%
- 5th largest oil exporter & 10th largest oil producer in the world (2006)
06年是世界第五大石油出口國，第十大產油國
- 3rd largest gas exporter and the 5th largest gas producer, 2nd largest exporter of gas to Europe, next to Russia
世界第三大天然氣出口國，第五大天然氣生產國；對歐洲出口量居第二，僅次於俄羅斯
- Only 20% of total gas resources has been produced
天然氣可開採量目前只消耗了20%



StatoilHydro -- Sleipner

今日挪威 Norway today -- resources, industry

- 75% of European oil reserves, 45% of natural gas, 30% of hydro energy; less than 1% the population
歐洲75%石油、45%天然氣和30%水力資源，不到1%人口
- 6th largest hydropower producer in the world
世界第六大水力發電國
- Power intensive industry, production of light metals and other materials
能源密集產業：鋁等有色金屬和其它材料
- Highly purified silicon metal for the solar cell industry (Elkem)
Elkem公司用於太陽能光伏電池的高純度金屬硅
- Aluminum & light metals -- Norsk Hydro, the world's 3rd largest integrated aluminum supplier
海德魯公司，世界第三大鋁業集團



Norsk Hydro

今日挪威 Norway -- the world's largest pension fund

- State-owned (62.5%) StatoilHydro, world's largest offshore oil & gas operator 國家石油海德魯公司（62.5% 國有股份）是世界最大海上石油和天然氣生產商
- For wellbeing of future generations, the Norwegian Government Pension Fund has been set up from oil revenues 石油收入納入國家養老基金，為未來挪威公民福祉預留
- In 2007, of the State's net oil & gas income around RMB 430 billion, 398 goes to the Pension Fund 07年政府油氣產業淨收入約相當於4300億人民幣，其中3880億被存入國家養老基金
- Largest retirement fund (Dec 2007 RMB 2.6 trillion), one of the largest funds in world, owned by the people, managed by the Ministry of Finance with strict ethical guidelines 該基金是世界最大的退休基金（07年9月市值為相當於2.6萬億人民幣），也是世界所有基金中最大之一；其所有權屬挪威人民，挪威政府財政部負責按嚴格道德標準管理



今日挪威 Norway -- gender equality

- High percent of women in government, parliament, head of political parties, and top-level executive positions
政府、議會、政黨和企業等組織的高級職位中婦女所佔比例很高
- In 1986, Prime Minister Gro H Brundtland had 8 women in the 18 member cabinet, then a world record
1986年女首相佈倫特蘭政府18位部長中有8位是女性，創世界之最
- Norwegian governments has later maintained 40% women 此後各級政府內閣中至少有40%為女性



Prime Minister Jens Stoltenberg 2nd Government, 9 women, 10 men
现任首相组成第二个内阁：10男九女，创女性内阁比例最高纪录

今日挪威 Norway -- gender equality

Norwegian law: women must fill 40% of the country's corporate board positions. Most companies have already complied (Jan 2008)

挪威法律規定企業董事會成員至少要有40%女性，已經被廣泛執行

- Norway offers 12 months paid maternity leave
法律規定帶薪產假12個月

Prime Minister Stoltenberg visit to Peking University –
Nora's Sisters seminar, 2007
2007年现任首相访问北大



今日挪威 Norway -- gender equality, sustainability



Gro Harlem Brundtland to 84 year old Deng Xiaoping: *you're 48!*
布伦特兰女首相对84岁的邓小平说：翻译说您今年48岁！

Noway's Gro
Harlem Brundtland



Mdm Brundtland and the report
"Our Common Future"
《我们的共同未来》



Using nature as an
extended classroom
自然也是课堂

A photograph of three children in a lush forest. The child on the left is a girl with blonde hair, wearing a red jacket, holding a clipboard and pointing upwards. The child in the middle is a girl with blonde hair, wearing a striped sweater, sitting on the ground and smiling. The child on the right is a girl with blonde hair and glasses, wearing a white hoodie, sitting on the ground and looking towards the camera. The background is filled with green ferns and other foliage.

Using nature as an
extended classroom
自然也是课堂



The study of ants, class 1a at
Hallermoen skole, Drammen, Norway
德拉门市一年级小学生研究蚂蚁







小學初中課程 Norwegian Educational System

Some characteristics 長處和特點:

- Closeness to nature
接近自然
- Team learning and inclusiveness
團隊學習和包容
- Participation in governing structures & processes
參與自治管理
- (Gender) equality -- equal opportunities
(性別) 平等機會
- Responsibility for own learning
學習自立和獨立負責任





Carbon Neutral Norway 2030

- Aim: to become carbon neutral by 2030 by significantly reducing own greenhouse gas emissions & by purchasing emission reductions world-wide;
- Two-third of the reduction will be made in Norway;
- Four carbon neutral committed countries (Feb, 2008): Costa Rica, Iceland, Norway, New Zealand;
- Norway accounts for 0.2% of global emissions. However, Norway will take its fair share of the burden.

Carbon Neutral Norway 2030



- Norway ready to become carbon neutral by 2030;
- Will over-fulfil by 10% its obligations for emission cuts under the Kyoto Protocol by 2012;
- By 2020 Norway will reduce emissions of greenhouse gases by 30% or more compared to 1990.

Jens Stoltenberg, Prime Minister of Norway



Carbon Neutral Norway 2030



- International emission trading will be an important instrument to reduce global greenhouse gas emissions;
- Norway intends to make full use of the carbon markets to secure effective and affordable reductions in GHG emissions;
- Norway will actively contribute to the development of this market.”

Kristin Halvorsen, Minister of Finance



Carbon Neutral Norway 2030

- 1st carbon credit purchase (Dec. 2007): Dahuashui Hydropower Project, Guizhou, China -- 1 million CERs (Certified Emission Reductions) -- replacing electricity from mainly coal-fired electricity production;
- 2008: purchase carbon credits of up to equivalent of 5.5 billion RMB.





Carbon Neutral Norway 2030

Norway

- has made significant contributions to the development of the international carbon credit market;
- one of the three largest buyer of carbon credits in the world (UNEP); a catalyst for further market development;
- has a long term perspective and is prepared to discuss contracts for post 2012 delivery;
- encourages project owners from countries with limited experience in CDM
- For more information: www.carbonneutralnorway.no



Norway: Carbon Capture & Storage - CCS

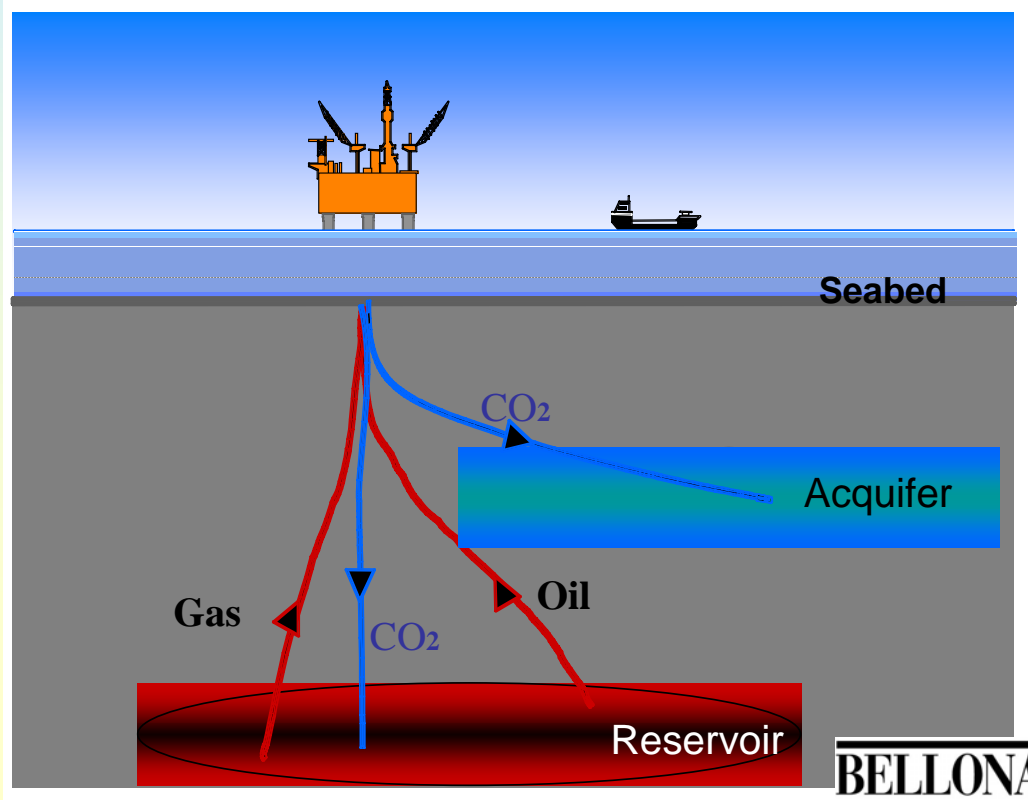
- Norway has a particular responsibility to provide a more climate friendly option for using fossil fuels during the transition to a low carbon energy system.

Minister of the Environment &
International Development, Erik Solheim

- CCS technology can potentially reduce CO₂ emissions by more than 80% of all emissions from fossil energy production;
- Strongly committed to developing commercially viable CCS technologies.
- All new gas fired power plants in Norway shall be based on CCS.

Norway's experience in CO₂ Capture and Storage

- Successfully stored CO₂ underground in offshore petroleum fields since 1996 -- one million ton CO₂ pr year;
- It is safe -- the CO₂ stays in the reservoirs.



North Sea:

500 bill. ton CO₂
storage capacity

Huge potential
for Enhanced
Oil Recovery

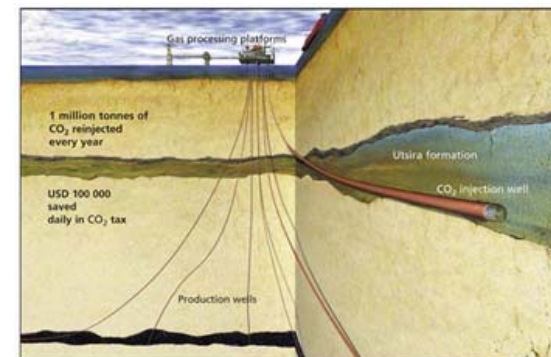
CCS - “moon-landing project” of Norway

- Aim: break-through in CCS technologies for commercial use -- applicable in coal and gas fired power plants globally
- 3 national CCS-projects (StatoilHydro):
 - Test Center Mongstad, two different capture technologies; in place 2011;
 - Full scale CCS plant at Mongstad (oil refinery; crude oil terminal); operational 2014;
 - Full scale retrofit capture plant at Kårstø (natural gas processing plant); final investment decision is to be made in 2009.



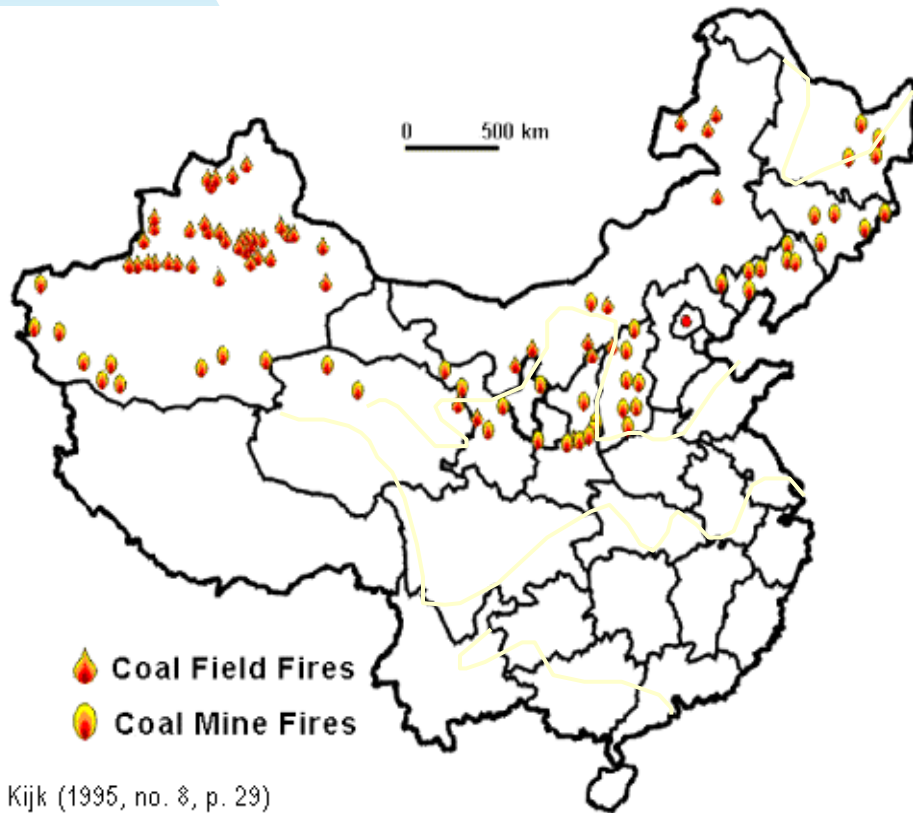
Sargas -- cutting edge CCS technology

- Zero emission power production from gas and coal;
- Systems solution for capture, storage, transportation & commercial use of CO₂
- World's first CCS pilot: 99.6% CO₂ capture, Stockholm, coal fired power plant (Dec. 2007);
- Planning 400MW full scale coal power plant in Norway (ready 2011);
- Global coal mine fire solution;



Coal Fires and CO₂ Emissions

- 100-200 million ton coal lost annually due to coal fires in China
- 2-3 % of global CO₂ emissions



Based on Kijk (1995, no. 8, p. 29)



今日挪威 Norway – clean technology samples

Increased interest in clean technologies, clean energy:
清潔技術、清潔能源迅速成長

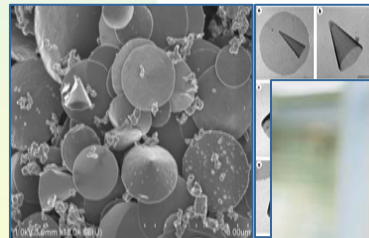
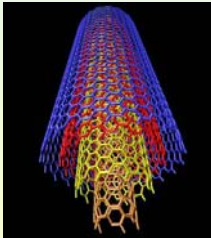
- REC -- one of the world's leading solar energy companies
世界領先的太陽能公司 REC
- TH!NK Global - electric car, working also on hydrogen and solar
市場化領先的電動轎車、氫和太陽能轎車 Think Global
- Hydrogen Highway, Stavanger-Oslo (StatoilHydro, Norwegian Gov.)
斯塔万格-奧斯陸氫高速路，世界首創-國家石油海德魯公司和政府出資
- CO2 capture & storage (StatoilHydro, Sargas)
二氧化碳捕捉和儲藏技術（國家石油海德魯公司、Sargas）
- Shipping -- Norway is a world class shipping nation --
emphasis on developing a cleaner shipping industry
造船航海業 –世界領先、清潔發展
- Bio-membrane to stop desert spreading (Albedotech)
生物膜阻止沙漠化技術 (Albedotech)



Scatec -- focus on industrial macro trends

Advanced materials

- Titanium
- Nano carbon



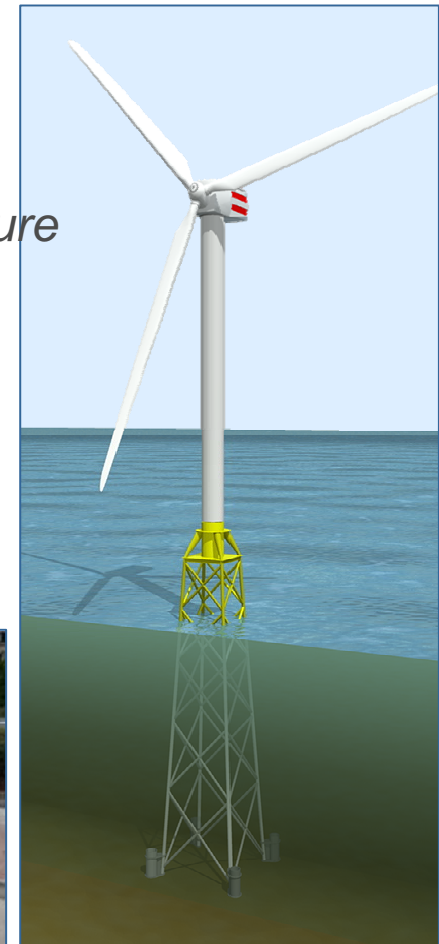
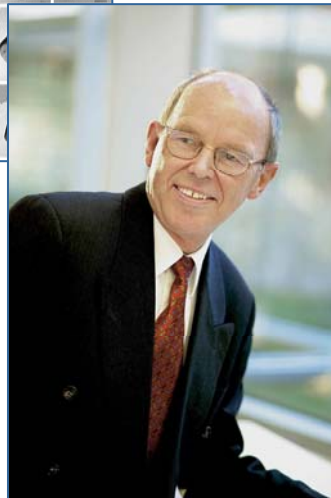
Climate neutral energy

- Solar
- Thorium
- Wind
- CO₂-capture



Electrification of transport

- El car, battery technology



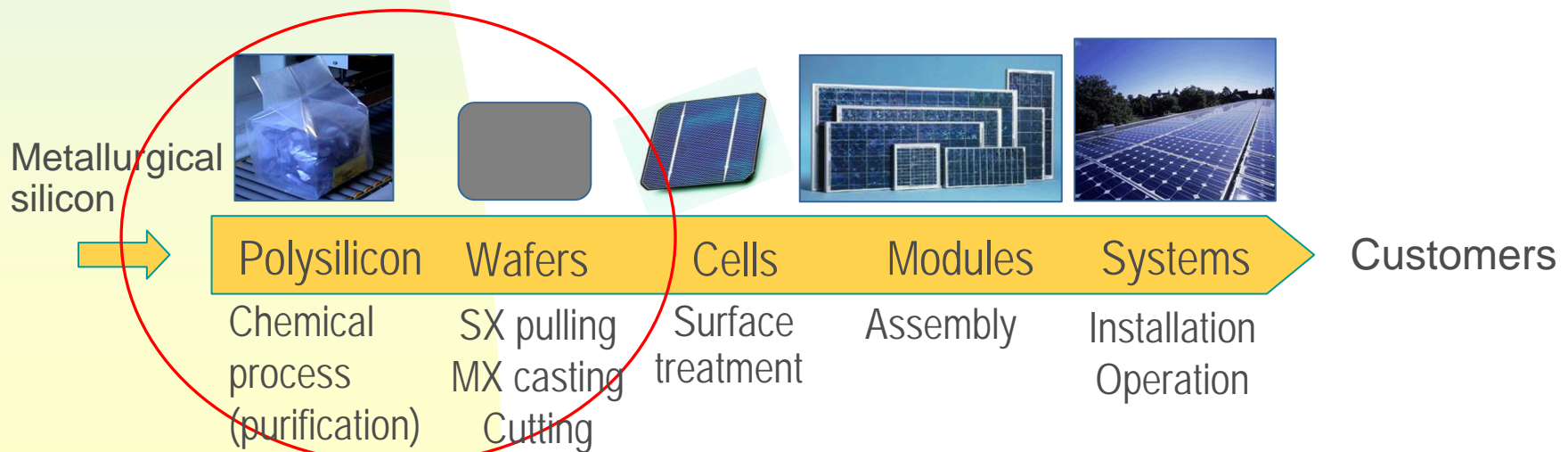
Scatec
Scandinavian Advanced Technology



NorSun
Scandinavian Advanced Technology



- Facilities & people previously employed in abandoned industrial sites;
- Investment in next generation high efficiency thin film based solar modules.



*Granswang in Bayern, Germany (1.67MW)
Grid connected in November 2007*



Scatec Solar
Scandinavian Advanced Technology

Electrification of transport -- TH!NK Global

- Scatec, largest investor in TH!NK. Developed in part by Ford Motors
- Also: battery company with objective to increase efficiency & reduce cost



TH!NK



Vardar AS -- a Provincial Power Company of Norway focus on Hydropower, Wind power, Bio Energy & District heating Hydrogen/ Fuel cell technology -- with projects in Norway the Baltic region -- HyNor partner

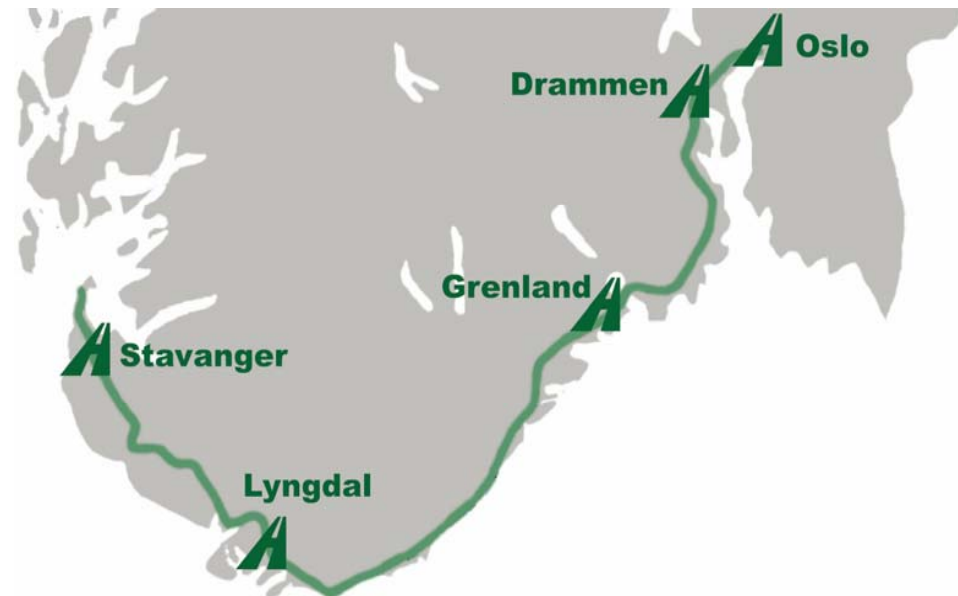
World's first Hydrogen Highway

- a unique Norwegian initiative to demonstrate real life implementation of hydrogen infrastructure along a route of 580km, year 2005 to 2008.
- covers buses, taxis, private cars & other urban, inter-city, regional and long national transport systems.



HyNor -- the world's first Hydrogen Highway

- Connecting activities & cities along a major national transport corridor, from Oslo to Stavanger
- Partnership between major industrial, energy, & transport companies, regional & national public authorities, & R&D institutes
- Aim: to demonstrate the commercial viability of hydrogen production and use in the transport sector



BELLONA -- from environmental activists to strategic partners

- Non-profit foundation (NGO), founded 1986;
- Well-known through spectacular actions against Norwegian industrial companies;
- Currently: international focus on nuclear contamination in Russia, and strong focus on analyses and obtaining facts;
- Key strategic partner for Norway's most respected companies;
- Named Hero of the Environment by Time Magazine, 2007, Bellona leader Frederic Hauge; Vice Chair of the EU European Technology Platform for Zero Emission Fossil Fuel Power Plants (ZEP).





Norwegian Government Pension Fund Global

- The Norwegian Government Pension Fund Global: one of the world's largest single-owned funds (currently around USD 375 billion)

Norwegian Minister of Finance, Mrs Kristin Halvorsen

Evaluation of ethical guidelines for the Pension Fund Global, Oslo, Jan. 2008:

- Socially responsible investments used to be a marginal issue for most investors; now we see the beginning of responsible investment becoming mainstream in the investor community;
- We are global investors. We are long term investors. .. We believe social and environmental responsibility creates the best conditions for high, sustainable long-term returns.”



Norwegian Pension Fund Global - ethical guidelines

- An instrument to ensure the country's petroleum wealth benefits future generations.
 - must be managed to generate a sound return in the long term -- which is contingent on sustainable economic, environmental and social development;
 - financial interests to be strengthened by using the Fund's ownership interests to promote sustainable development.
- Should not make investments which may violate fundamental humanitarian principles, serious violations of human rights, gross corruption, or severe environmental damages;
- 27 companies excluded from the investment universe of the Fund (cluster bombs, land mines, nuclear weapons);
- 5 companies excluded due to environmental impact.



Norwegian Pension Fund & the Environment

- Looks at ways in which to raise environmental issues which naturally promotes investors' interests and contribute to long-term value creation;
- Dialogue with the largest portfolio companies on how they seek influence on future climate change legislation;
- will continue to encourage strategies to ensure a good return on investment & also supports climate change;
- In 2007, a number of the Funds portfolio companies altered their public stance on climate change.



International climate policy -- Norway's position

- Enhanced action on technology development, including CCS;
- Increased efforts to prevent deforestation in developing countries (release of CO₂ from deforestation accounts for almost 20% of total global emissions);

Norway has committed to support prevention of deforestation in developing countries by more than 500 million USD a year;

- Inclusion of international aviation and maritime transport in a future global regime;





Norway: Environment and Poverty Combined

- promote combined efforts to meet two of the most formidable challenges of our time: the environmental threat & the totally unacceptable fact that more than one billion people are living in absolute poverty -- must be addressed together, not separately

Minister of the Environment & International Development, Erik Solheim

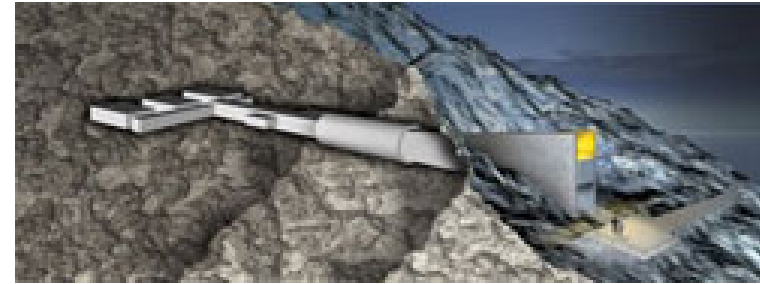
- by setting a price on carbon - and establishing a carbon market - we stimulate the transfer of funds from developed to to developing countries -- carbon trading can address the two most important challenges the world is facing today: climate change and poverty.

Prime Minister Jens Stoltenberg,
March, 2008



Nobel laureates Wangari Maathai &
Prime Minister Stoltenberg

- “A Noah’s Ark for our biological heritage”
Norwegian Prime Minister Jens Stoltenberg, Feb. 26, 2008
- A global seed vault to provide a safe haven in the permafrost of the Norwegian arctic island Svalbard for the world’s biological diversity

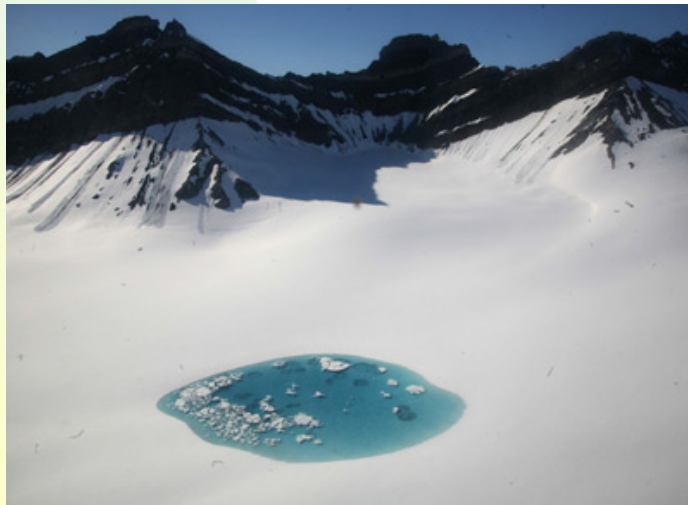


- The Seed Vault has the capacity to store 4,5 million different seed samples.
- If seeds are lost as a result of climate change, natural disasters, war or simply a lack of resources, the seed collections may be re-established using seeds from Svalbard.



Arctic challenges - Nordic cooperation

- Arctic: climate change taking place twice as fast as elsewhere in the world;
- Past few years: average temperature in Svalbard has been more than 5 degrees higher than normal;
- In the Antarctic, even a slight reduction of the ice cap will have massive consequences for sea levels;
- Increased Nordic collaboration.



Sino-Norwegian Arctic climate change project



- Dalian, Feb, 2008: national final -- 10 Chinese undergrad students selected for a study tour to Svalbard & Norway;
- Sino-Norwegian Project on climate change and environmental research in the Arctic region -- 2008 International Polar Year (IPY);
- Emphasis on climate change, global warming, environmental changes, & teaching young Chinese students more about polar research and education, as well as everyday life in the Arctic region.

