

# Veier mot økomodernitet

Atle Midttun  
Handelshøyskolen BI

*Foredrag på naturfilosofisk seminar  
19 november 2016.*

**Vi lever i en tid  
som høster  
modernitetens  
frukter**



**Moderniteten i det  
21. århundre har  
nådd et omfang  
som utfordrer dens  
grunnvoller og  
trenger alvorlig  
revisjon**

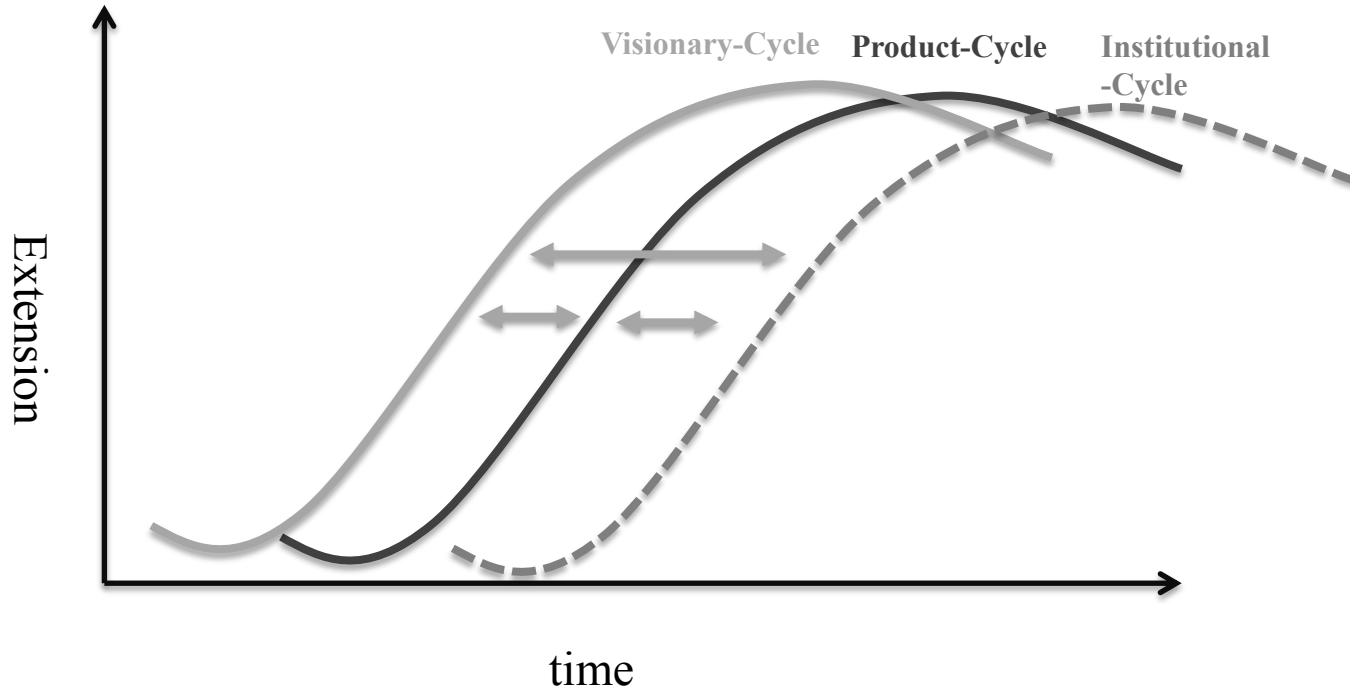


**Moderniteten må over i  
sin neste fase:  
økomodernitet**

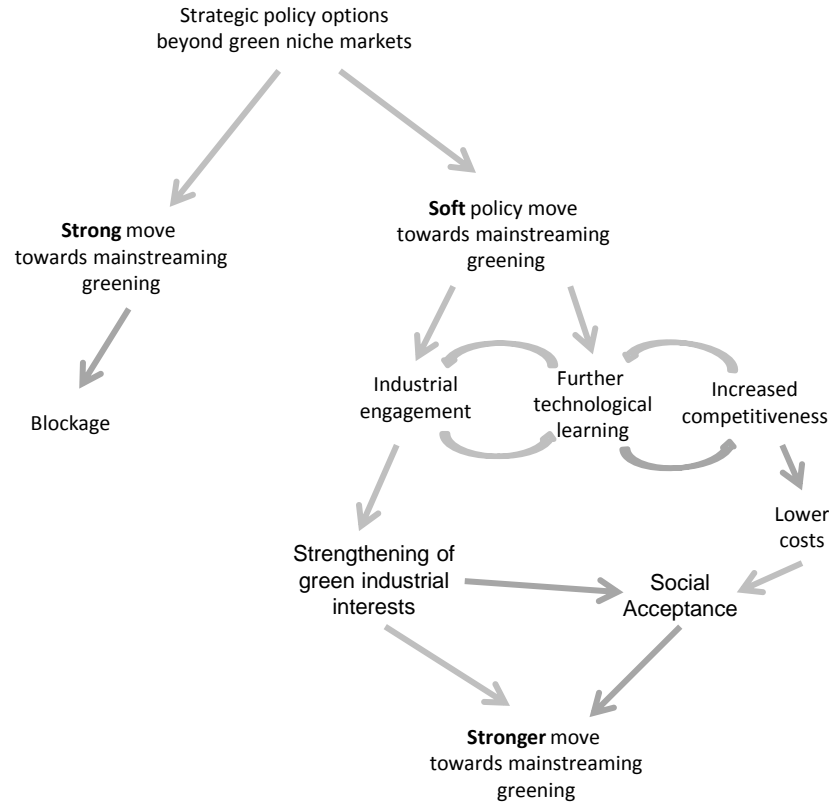
**Moderniteten må  
balansere sitt forhold til  
naturlig miljø og sosial  
kontekst**

**Og sette fortsatt  
modernisering på en  
bærekraftig kurs**

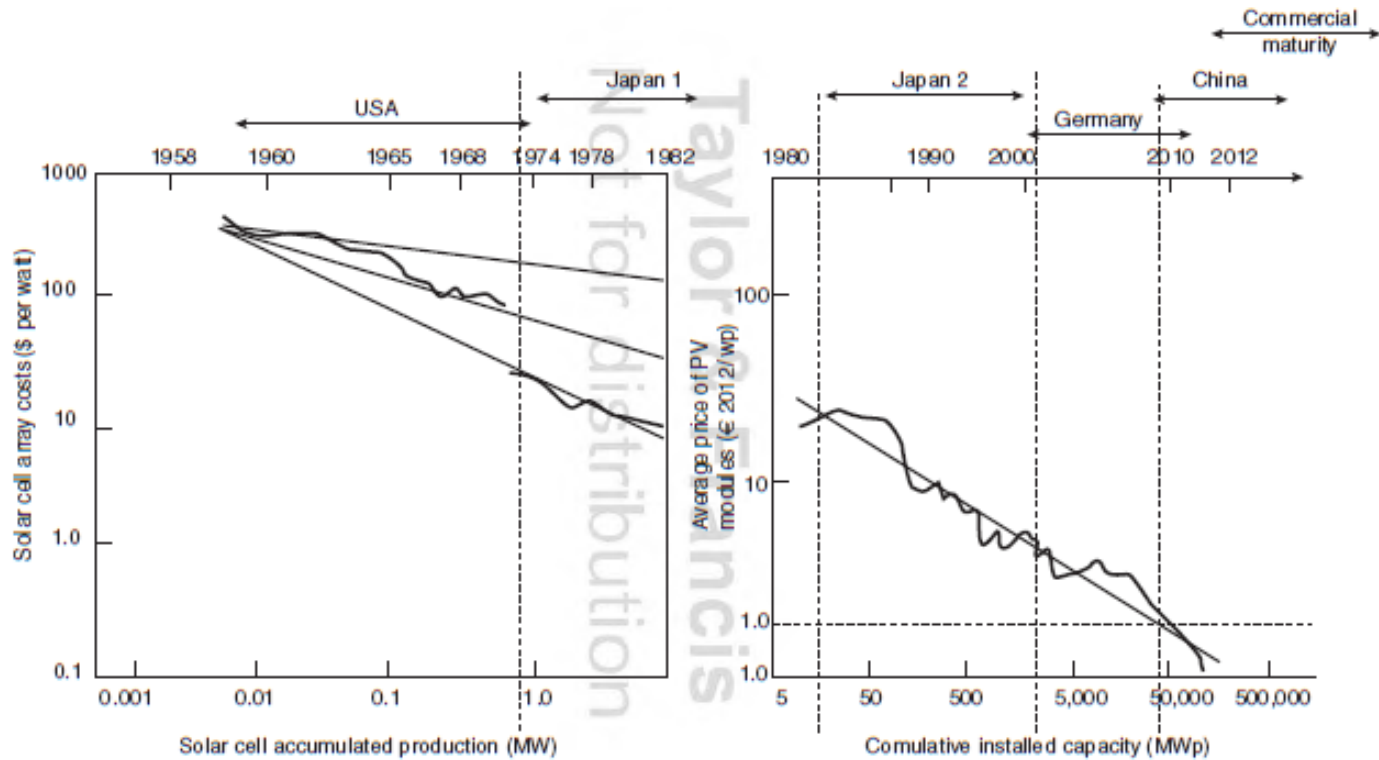




*Figure 1.2: The Visionary, Product and Institutional Cycles*

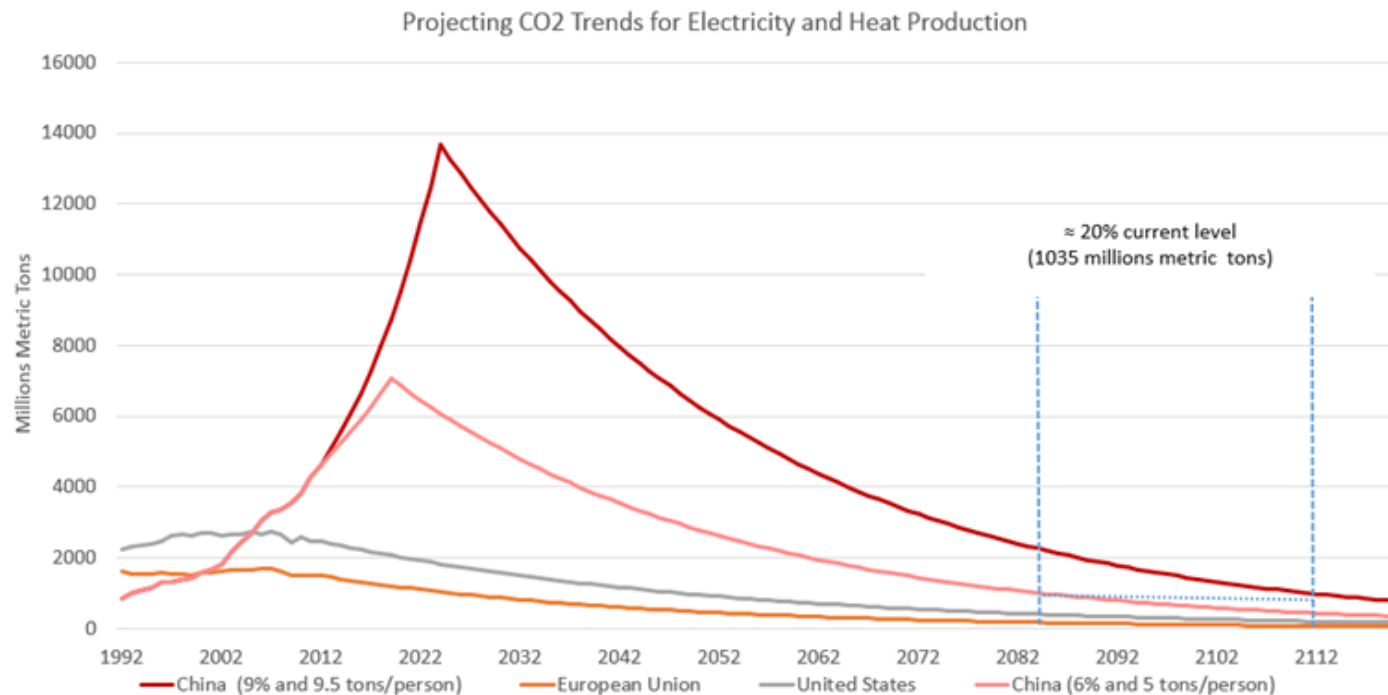


*Figure 1.4: The Relay Model in Open Game Form*



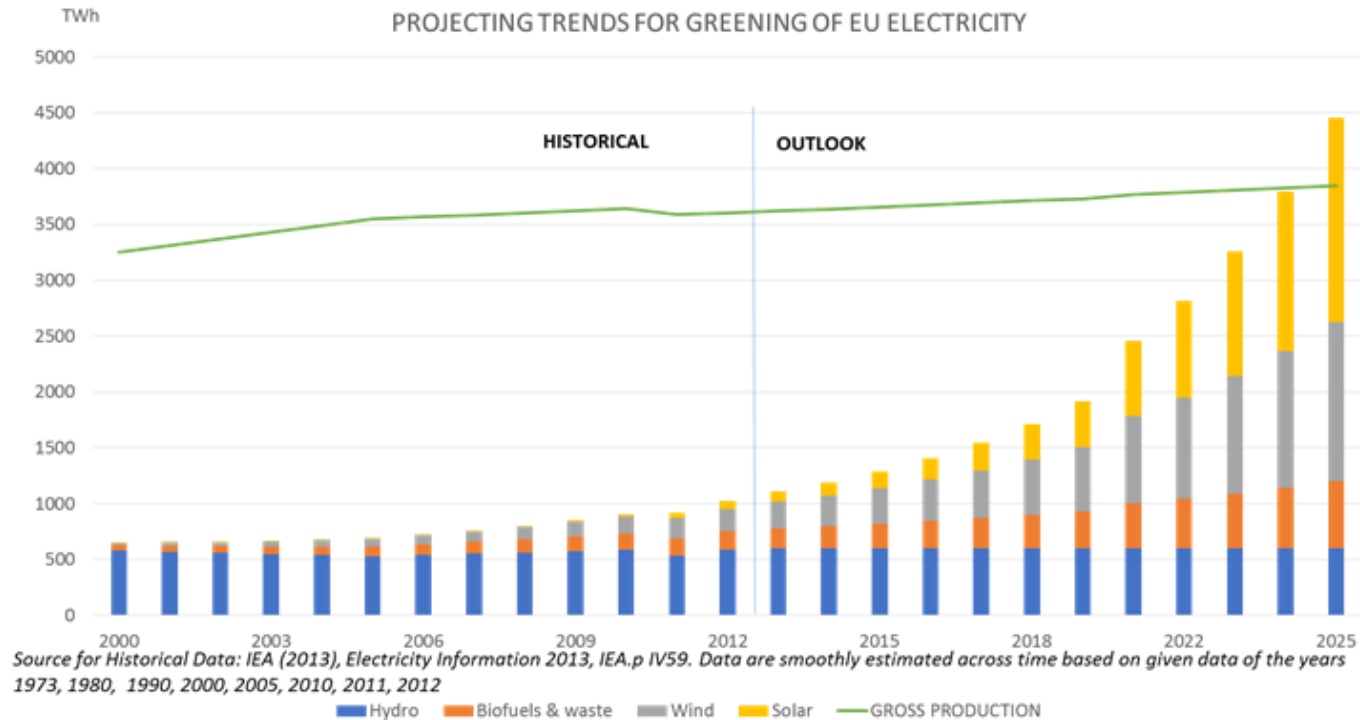






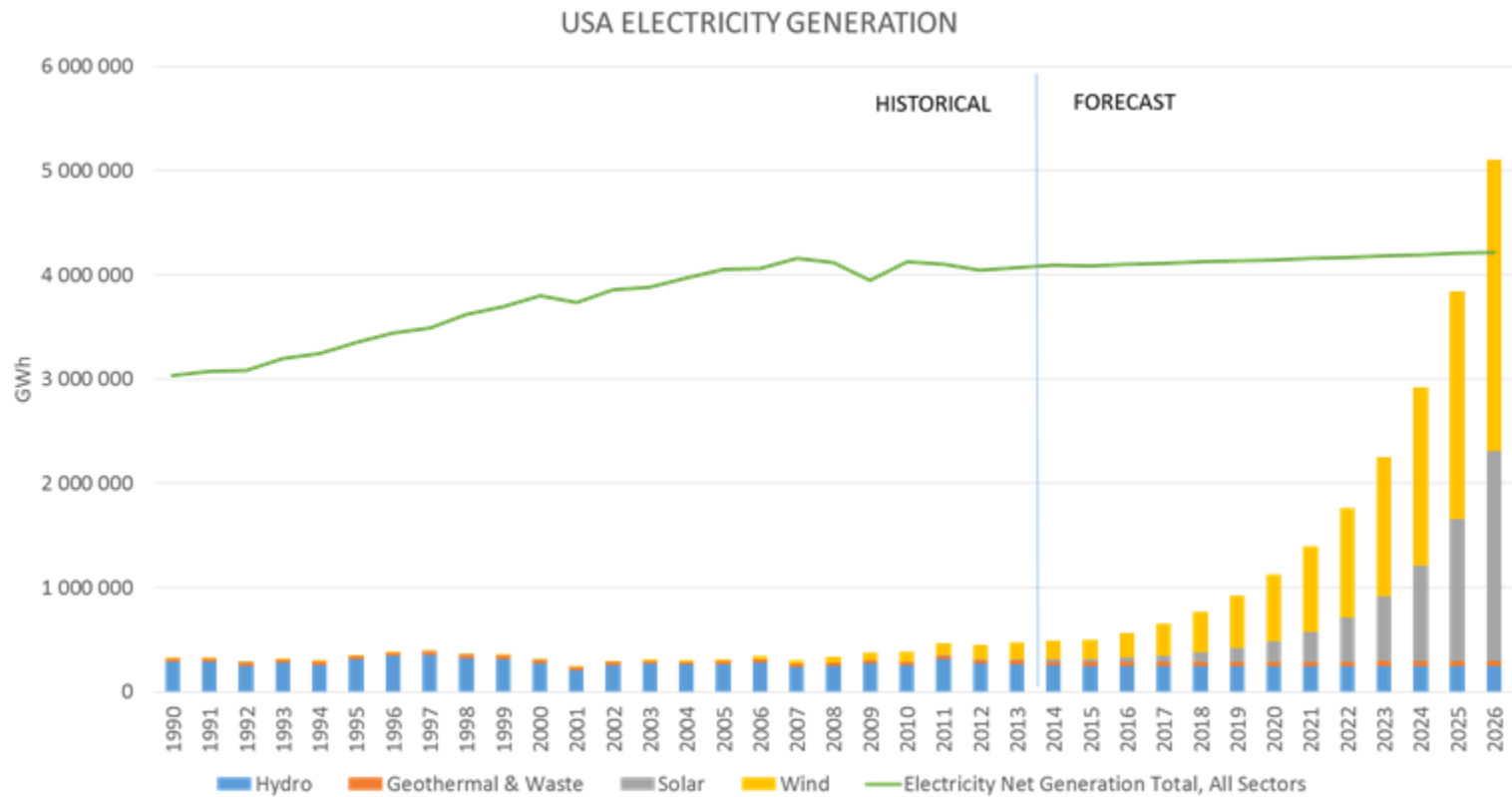
Source: Compiled by authors, based on World Bank Indicator <http://data.worldbank.org/indicator/EN.CO2.ETOT.MT>

Figure 10 Projecting CO2 Trends for Electricity and Heat Production



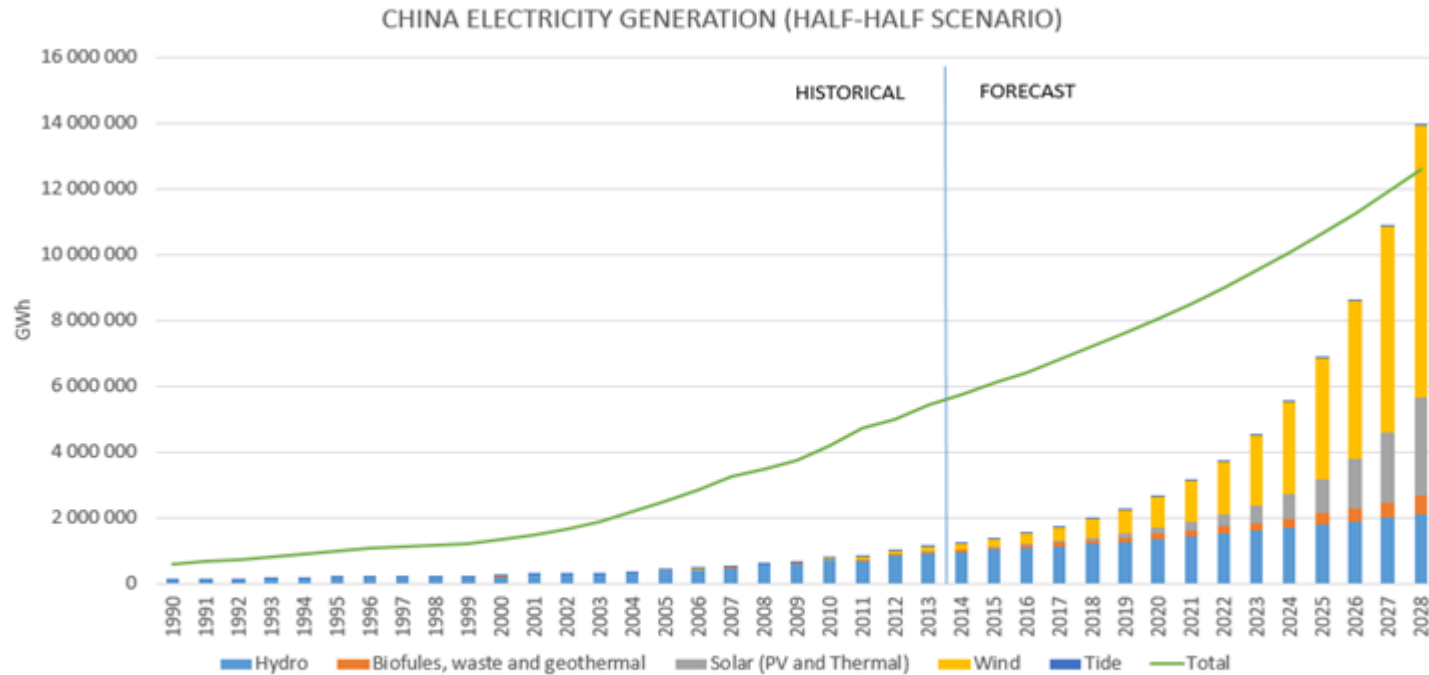
**Figure 11 Projecting Trends for Greening of EU Electricity**

Source for Historical Data: IEA (2013b: IV59). Data are smoothly estimated across time based on given data of the years 1973, 1980, 1990, 2000 2005, 2010, 2011, 2012.



SOURCE: EIA (2016), Available at <http://www.eia.gov/totalenergy/data/monthly/#electricity>

Figure 12 Projecting Trends for Greening of US Electricity



Source IEA (2016) Available at : <http://www.iea.org/statistics/statisticssearch/report/?country=CHINA&product=electricityandheat&year=1990>

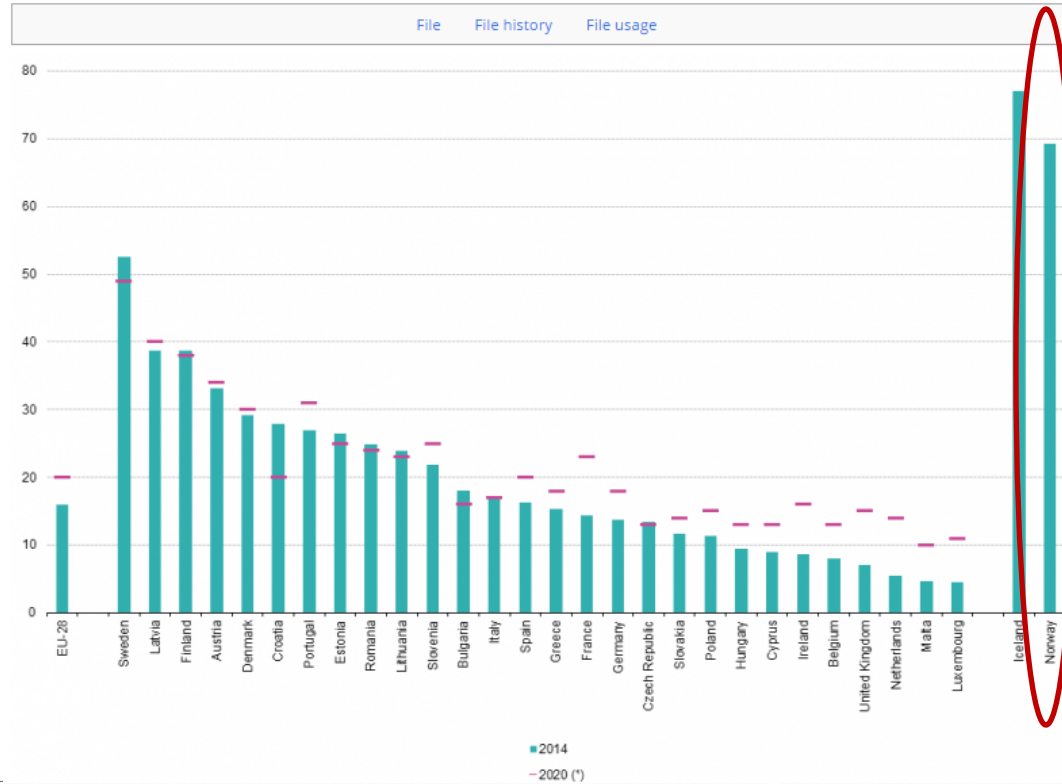
Figure 13 Projecting Trends for Greening of Chinese Electricity

# GGEI 2016 The Global Green Economy Index Measuring National Performance in the Green Economy 5th Edition - September 2016

Perception Rank	Country	Score	Performance Rank	Country	Score
1	Germany	97.74	1	Sweden	77.61
2	United States	94.70	2	Norway	69.11
3	Denmark	93.84	3	Finland	67.83
4	Sweden	93.65	4	Switzerland	67.63
5	Norway	88.95	5	Germany	66.01
6	Canada	85.59	6	Austria	65.23
7	United Kingdom	82.73	7	Iceland	63.68
8	Netherlands	77.58	8	Zambia	62.00
9	Japan	75.94	9	Denmark	61.84
10	Finland	74.47	10	Brazil	60.29

<http://dualcitizeninc.com/GGEI-2016.pdf>

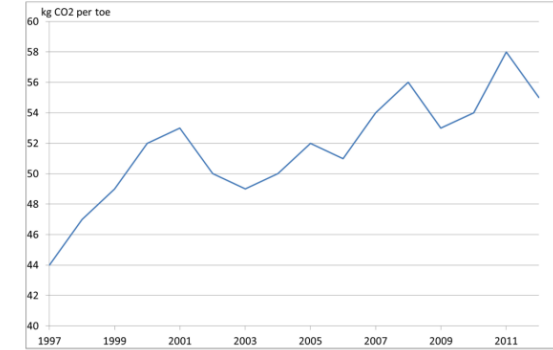
## Share of renewables in gross final energy consumption, 2014 and 2020 (%)



# Petro-Norway – has still to make the change



Figure 1. Development of average CO<sub>2</sub>-emissions per unit of oil and gas in Norway from 1997 to 2012. Kg CO<sub>2</sub> per toe



Source: Own calculations based on data from the Norwegian Environment Agency

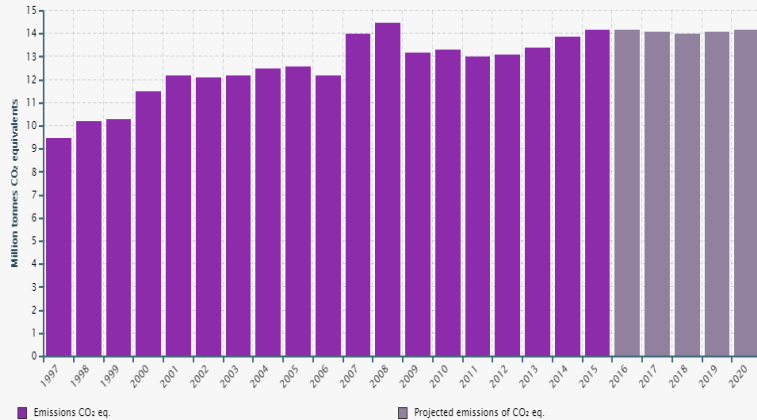
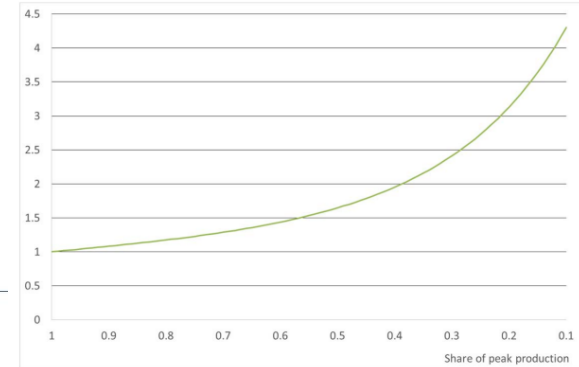


Figure 5. Illustration of the relationship between production level (as a share of peak production) and emission intensity



Source: <http://www.norskpetroleum.no/en/environment-and-technology/emissions-to-air/>

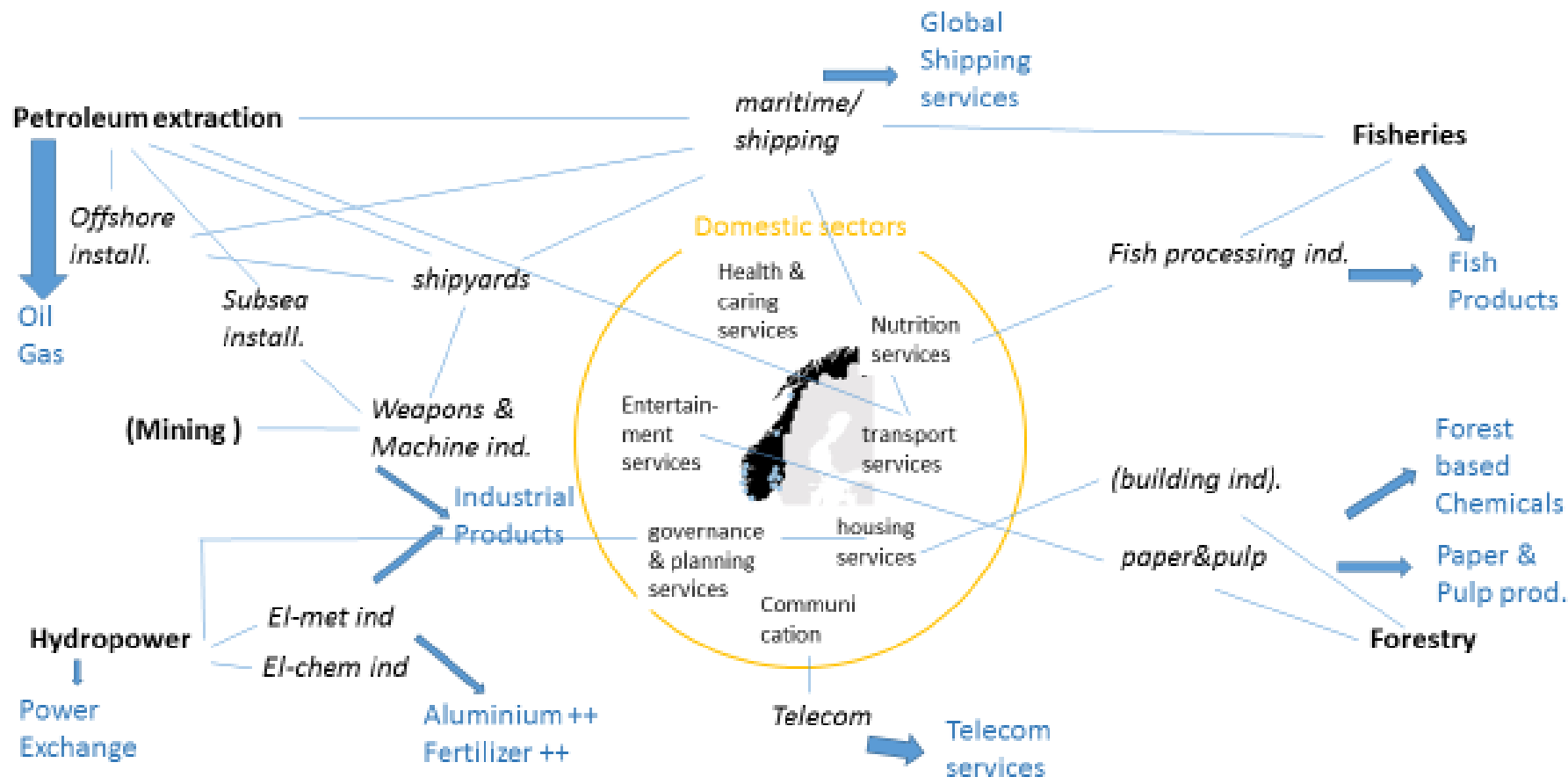
# Towards Ecomodernity?

**my suggestion is to benchmark Countries on how they promote ecomodernity at the sectoral level:**

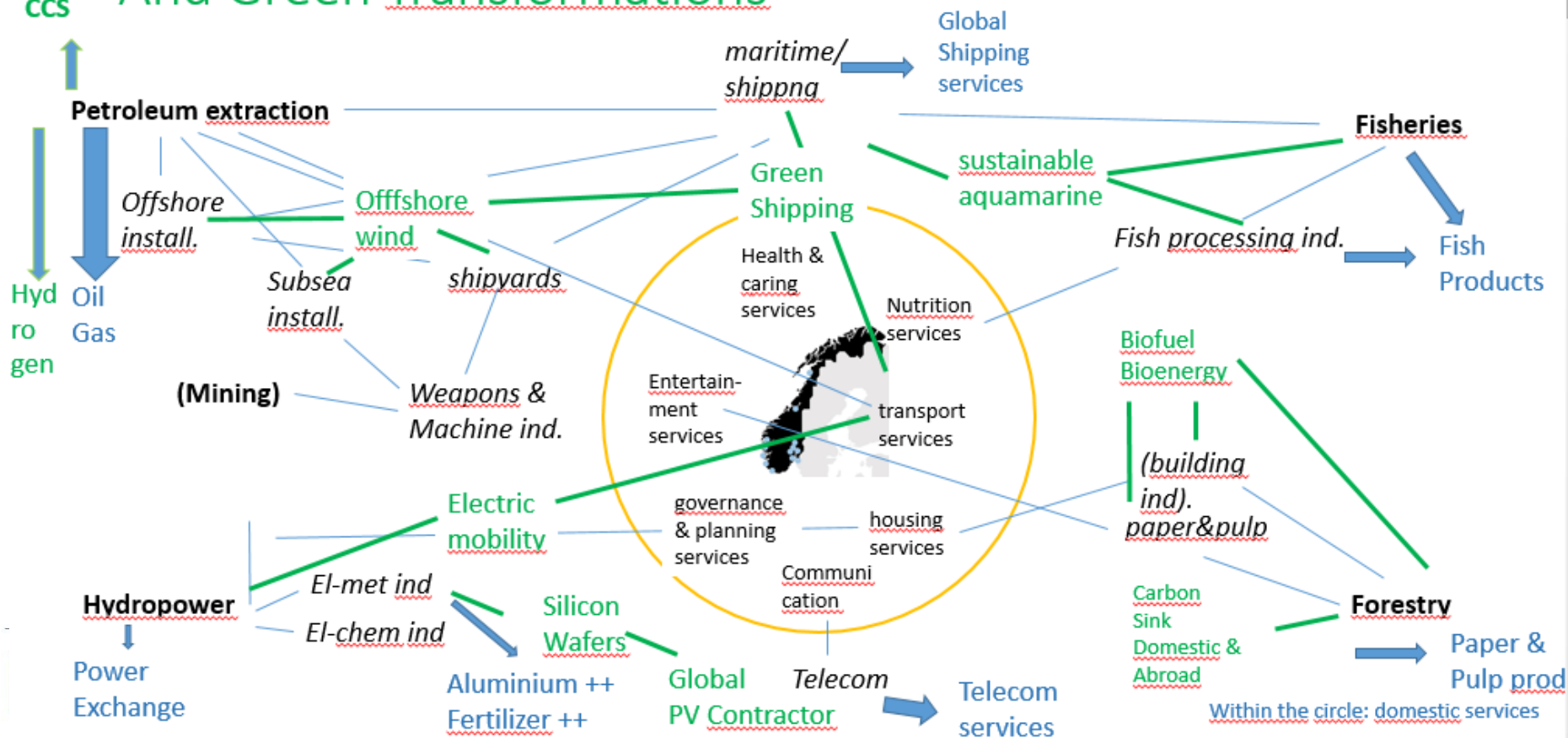
- How specific industries balance economic and ecological concerns
- How transformative change is orchestrated for technologies that need to be phased out because other – more ecologically benign technologies can take over.
- How sectors that we need to continue, economise on their resource use, or target renewable resources and thereby diminish their ecological footprints.



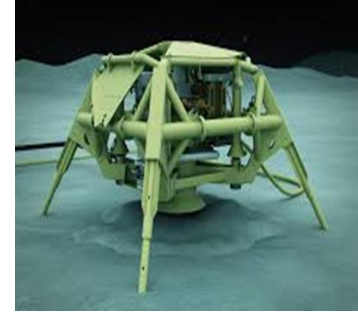
# Norwegian Industry of International Significance



# Norwegian Industry of International Significance And Green Transformations



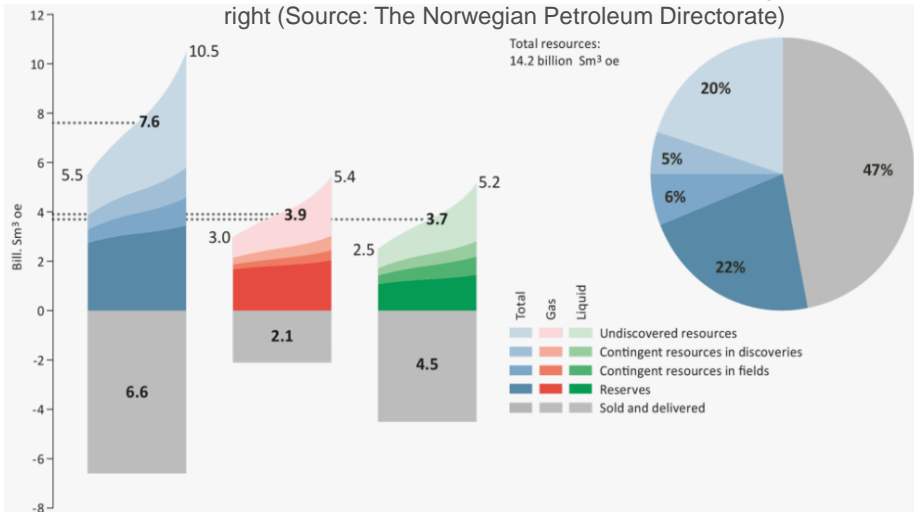
# PETRO-NORWAY



## Petroleum resources and uncertainty in the estimates per 31.12.2015

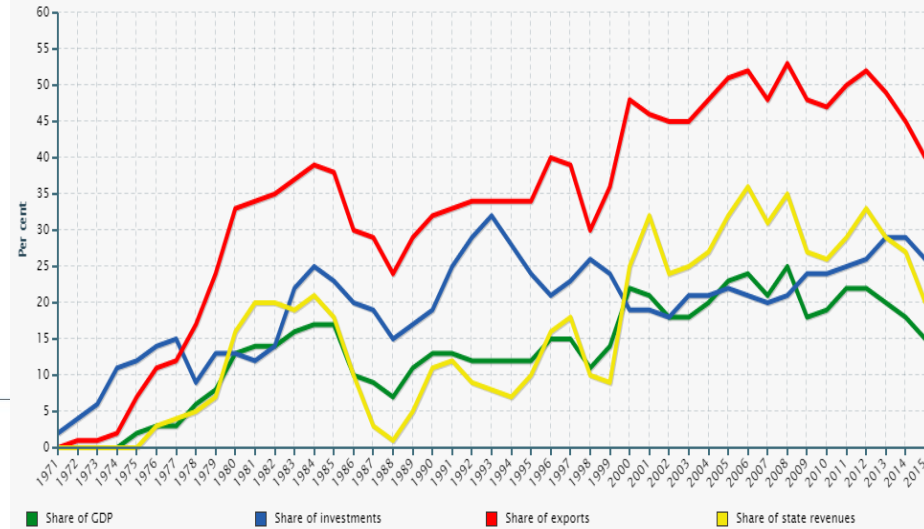
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The figures in each column show expected recoverable volumes and the uncertainty in the estimate is shown in the slanted line; low estimate on the left, high estimate on the right (Source: The Norwegian Petroleum Directorate)

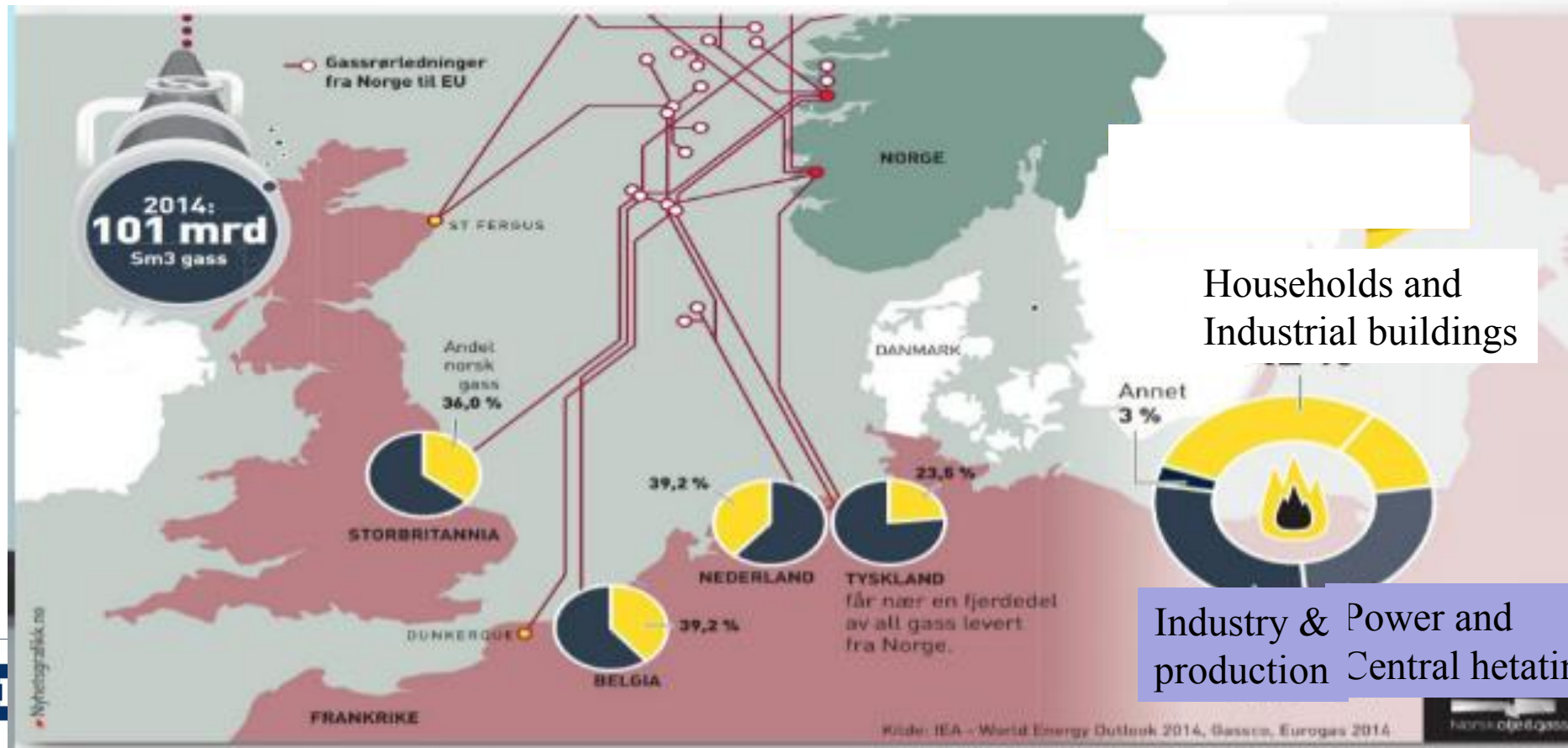


## Macroeconomic indicators for the petroleum sector, 1971-2015

Source: Statistics Norway, Ministry of Finance (National Budget 2016)



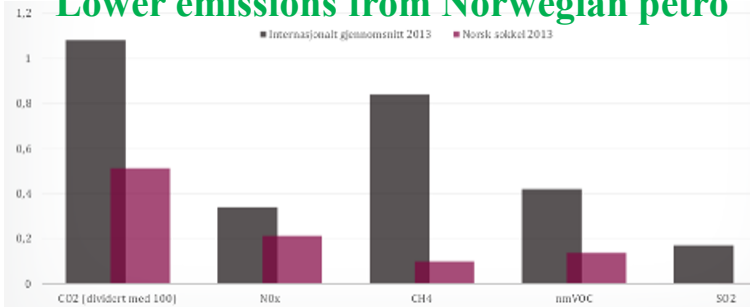
# Norwegian Gas to the EU



# GREENING PETRO-NORWAY?!



## Lower emissions from Norwegian petro

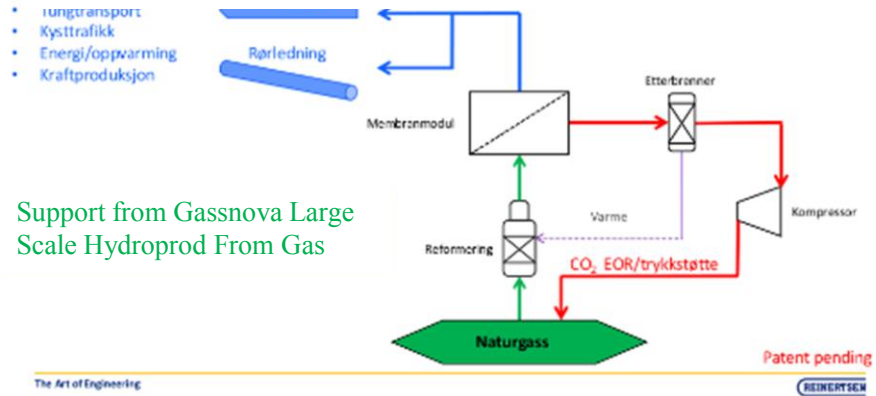


## Test Station for CCS at Mongstad



## Upstream Hydrogen Production with CO2 Capture and Pressure Support

- Rørtransport
- Kysttrafikk
- Energi/opvarming
- Kraftproduksjon



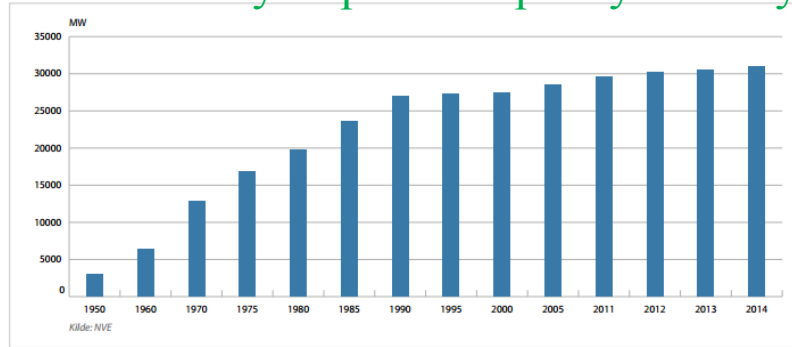
## Offshore Petro-Comp Greening Shipping: OIL -> LNG 25% CO2 e



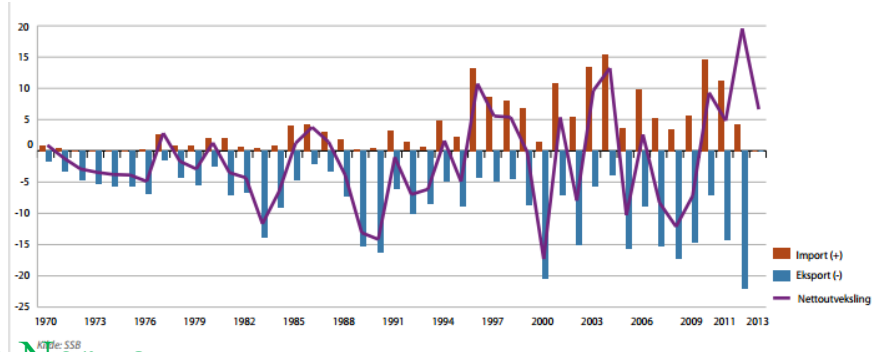
# HYDRO NORWAY



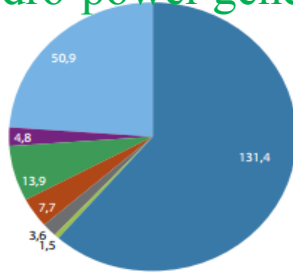
Installed hydropower capacity Norway



Import/export to/ from Norway



Hydro-power generation and potential in Norway





# Norwegian Hydro has European (Green?) Dimensions

## Top 10 largest Hydroelectricity Producer Country in the World

Rank	Country Name	Annual (TWh)
1	China	652.846
2	Canada	369.539
3	Brazil	363.304
4	USA	250.916
5	Russia	167.271
6	Norway	140.437
7	India	115.842
8	Venezuela	85.596
9	Japan	69.630
10	Sweden	65.173

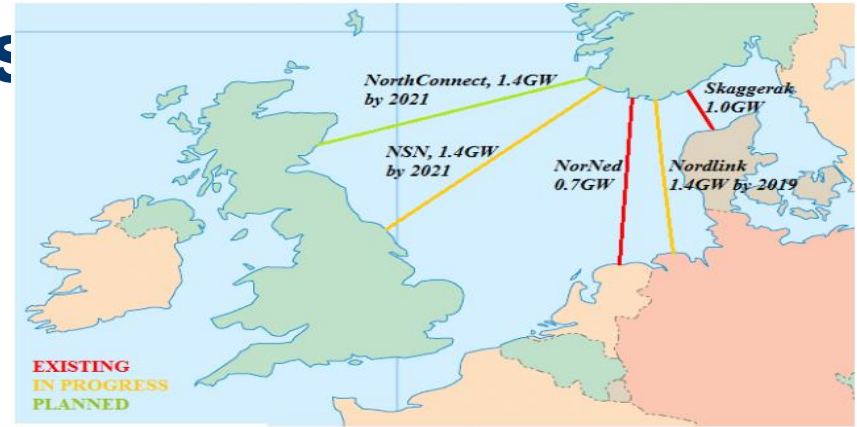
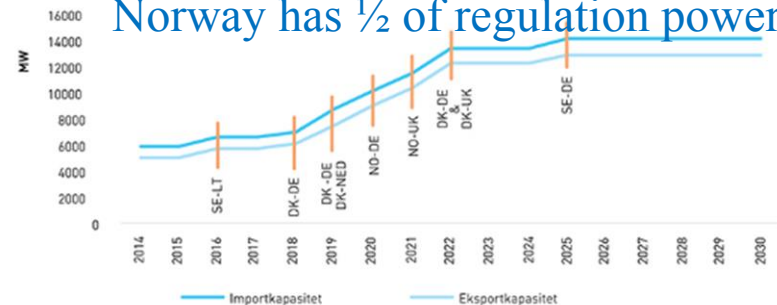


Figure 1: Existing, in progress and planned interconnectors with Norway

Nordic Interconnections with Europe  
Norway has 1/2 of regulation power capacity



# Energy Intensive Industry is relatively green in Norway

Aluminium, Norsk Hydro – Sunndal Plant



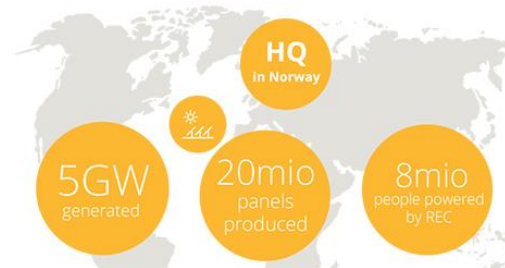
Paper and Pulp, Norske Skog – Skogn



Fertiliser, Yara, Porsgrunn plant



Why choose REC



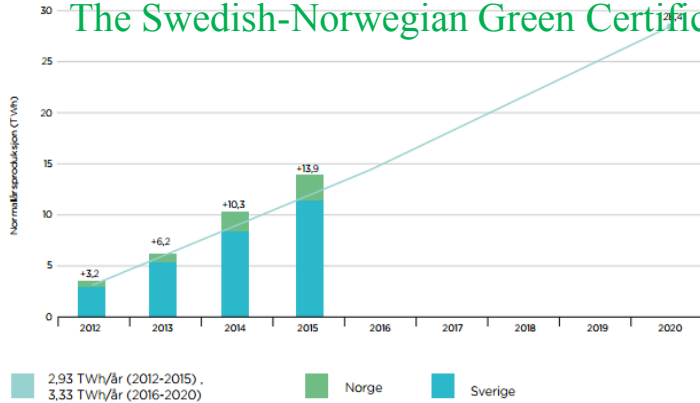
From Wafers to  
Global solar  
enterprise





# New greening of old green

## The Swedish-Norwegian Green Certificate Market



Kilde: Energimyndigheten, NVE

## Certificate Prices



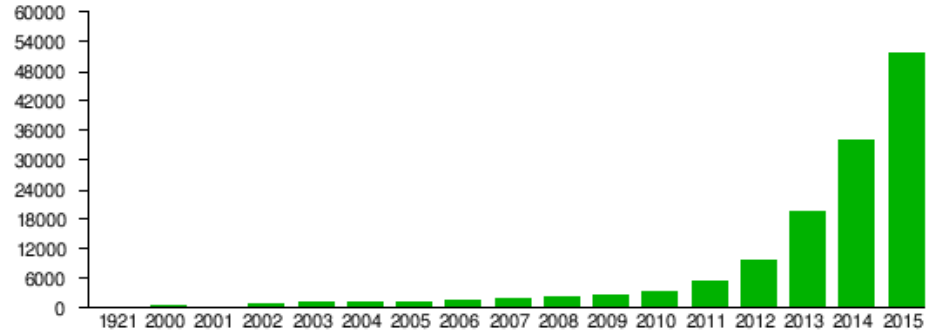
## Critique Against Wind by Nature Conservationists

- Powered by nature

- Norges fremste merkevare i forhold til turisme
- Urørt kystnatur en unik kvalitet for Norge
- Summen av vindkraftprosjekter er svært negativ for kystlandskapet



# Green El-Cars – Pionering Norwegian Policy



# Green EI- Ferries – Pioneering Norwegian Initiative – Rapidly Expanding



# Forest Industry

Forest Based Building Industry- Moelven



Moelven bio-energy



Paper and Pulp, Norske Skog – Skogn



Forest as a carbon sink





# Scenarios For CO2 Reduction Without and With Forest and Land Use Min of

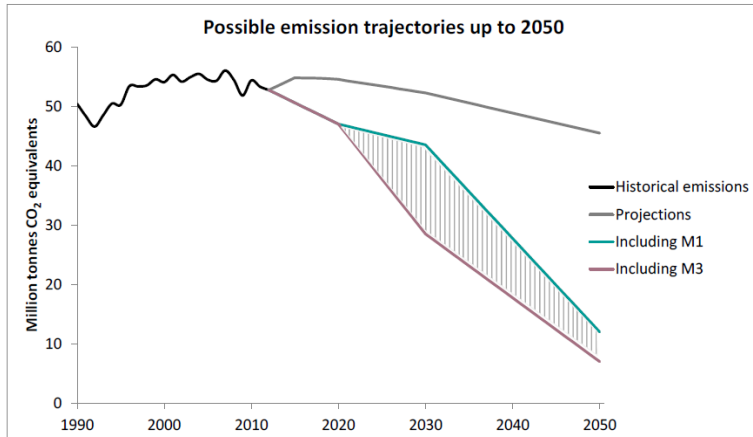


Figure 0-3 Possible emission trajectories up to 2050. (M1=mitigation package 1, M3=mitigation package 3)

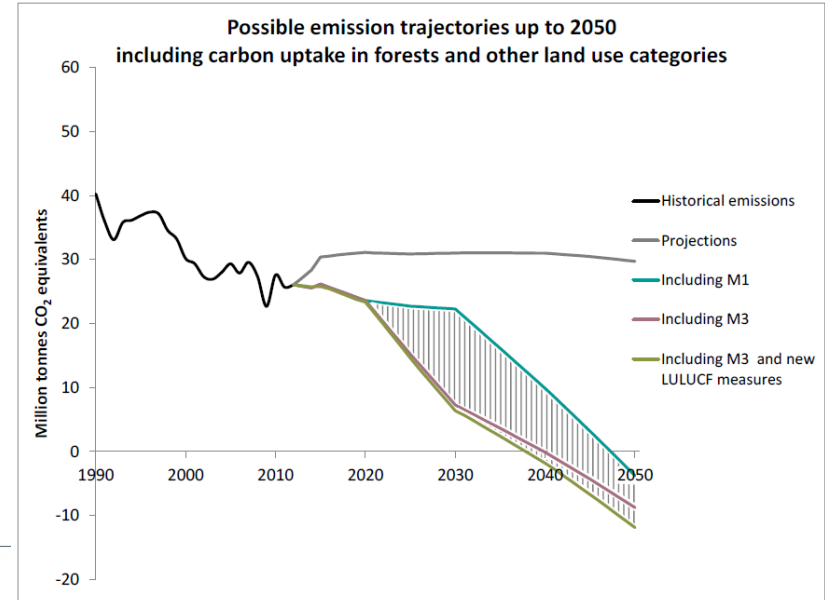
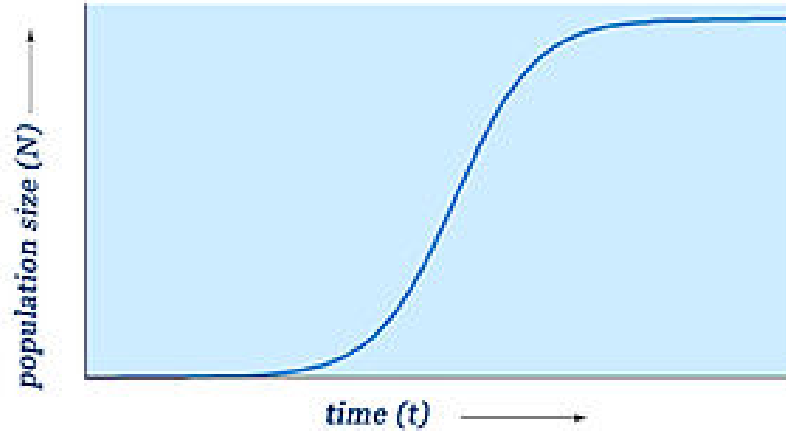
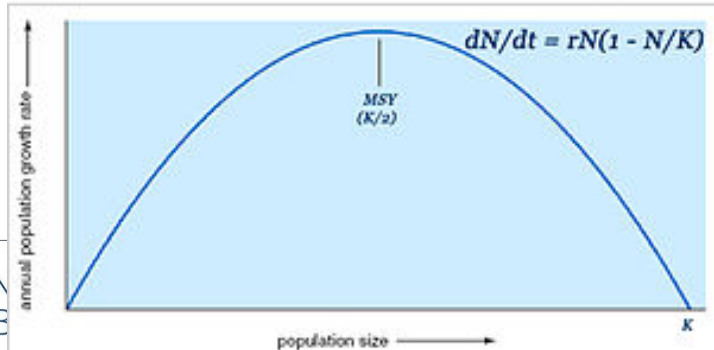


Figure 0-4 Possible emission trajectories up to 2050 including all LULUCF emissions and removals, ignoring the current restrictions on their inclusion under the Kyoto Protocol. (M1=mitigation package 1, M3=mitigation package 3)

# Sustainable Fisheries



- In Norway fishing, aquaculture and processing employ over 30,000 people. With an export value in 2010 exceeding 50 billion, the production of fish and fish products Norway's second largest



# Norway's Financial Greening

Tabell 1. Inngåtte avtaler om kjøp av klimakvoter, forventet levering<sup>1</sup>

Avtale	Volum 2008-2012	Volum 2013 - 2020	Status	UNFCCC ID
Verdensbanken - Prototype Carbon Fund <sup>2</sup>	1 346 033	100 000		
Verdensbanken - Carbon Partnership Facility		4 700 000		
Nordisk miljøinvesteringsselskap (Nefco) – NeCF <sup>3</sup>	3 593 473	450 000		
Nordisk miljøinvesteringsselskap (Nefco) -TGF	176 321			
Norwegian Carbon Procurement Facility (NorCaP)		17 000 000		
FNs tilpasningsfond	1 260 000	1 000 000		
Tata Sponge Iron, Energieffektivisering	24 896		Kontrakten er avsluttet	274
Gansu Yumen Diwopu Fase II vindkraft, Kina	156 920		Kontrakten er avsluttet	3167
Gansu Guazhou Xiangyang Fase II vindkraft, Kina	201 617		Kontrakten er avsluttet	3253
Zhejiang Cangnan Huangdiping vindkraft, Kina	50 714		Kontrakten er avsluttet	3792
Wulatezhongqi Chuanjing Fase V vindkraft, Indre Mongolia, Kina	180 254		Kontrakten er avsluttet	4689
Saiwusu Fase I vindkraft, Indre Mongolia, Kina	193 784		Kontrakten er avsluttet	3134
Saiwusu Fase II vindkraft, Indre Mongolia, Kina	214 613		Kontrakten er avsluttet	3679
Hebei Shiren Fase II vindkraft, Kina	83 826		Kontrakten er avsluttet	3800
Xinjiang Buerjin Tianrun Windpower Co., Ltd. Fase I, Kina	183 935		Kontrakten er avsluttet	4369
Shangdu Jiqingliang 49.5MW vindkraft, Indre Mongolia, Kina	193 920		Kontrakten er avsluttet	3282
Gansu Tianrun Liuyuan Fase I 49,5MW vindkraft, Kina	195 660		Kontrakten er avsluttet	3919
Tianrun Xianghuangqi 49.5MW vindkraft, Kina	0		Kontrakten er avsluttet	
Goldwind Damao Fase II vindkraft, Kina	170 977		Kontrakten er avsluttet	4222
Tianrun Damao 49.5MW Fase III vindkraft, Indre Mongolia	21 124		Kontrakten er avsluttet	7515
Hebei Chicheng Fase I vindkraft, Kina	207 833		Kontrakten er avsluttet	3371
Hebei Guyuan Huanghualing vindkraft, Kina	140 980		Kontrakten er avsluttet	4405
Tongliao Fase III vindkraft, Indre Mongolia, Kina	175 699		Kontrakten er avsluttet	3264
Tongliao Fase IV vindkraft, Indre Mongolia, Kina	175 529		Kontrakten er avsluttet	3287
Idete Forest Project skogformyelse, Tanzania	0		Kontrakten er terminert	
Sementproduksjon (Indocement), Indonesia	0		Kontrakten er avsluttet	493,526
George Wood Waste to Energy energigjenvinning, Sør-Afrika	0		Kontrakten er terminert	
Kompostering (Santa Marta de Liray), Chile	0		Kontrakten er terminert	
Dahuashui vannkraft, Kina	0		Kontrakten er terminert	
Tapai Sement WHR varmegjenvinning Mitsubishi, Kina	0		Kontrakten er terminert	
Ernslaw One, diverse skogprosjekt, New Zealand	522 235		Kontrakten er avsluttet	

Ernslaw One, diverse skogprosjekt, New Zealand	500 000	Kontrakten er avsluttet	
Green Air Ltd., diverse skogprosjekt, New Zealand	18 046	Kontrakten er avsluttet	
Hulunbeler Yakeshi Xing'an vindkraft, Indre Mongolia, Kina	24 023	Kontrakten er avsluttet	4124
Xinjiang Bozhou Alashankou vindkraft, Kina	169 015	Kontrakten er avsluttet	4001
Wengniute Xiyangshugou vindkraft, Indre Mongolia, Kina	142 627	Kontrakten er avsluttet	4381
Kezuohouqi Bayintala vindkraft, Indre Mongolia, Kina	129 943	Kontrakten er avsluttet	4038
Kezuohouqi Xihailasital vindkraft, Indre Mongolia, Kina	107 060	Kontrakten er avsluttet	4035
Ngong 100 MW vindkraft, Kenya	0	Kontrakten er avsluttet	
West Kenya Sugar Cogeneration Project, Kenya	0	Kontrakten er avsluttet	
Muhoroni Sugar Project, Kenya	0	Kontrakten er avsluttet	
Kinangop Plateau 60 MW vindkraft, Kenya	0	Kontrakten er avsluttet	
Improved Cooking Stoves, Bangladesh	28 551	Kontrakten er avsluttet	PoA4791
Heat Retention Cookers, Sør-Afrika	0	Kontrakten er avsluttet	PoA5174
Shandong Gaotang 30MW bioenergi, Kina	0	Kontrakten er avsluttet	1375
Heilongjiang Wangkui 50MW bioenergi, Kina	142 727	Kontrakten er avsluttet	2561
Jilin Liaoyuan 50MW bioenergi, Kina	37 273	Kontrakten er avsluttet	2563
Baimashan Cement, Kina	60 702	Kontrakten er avsluttet	3368
Wuhu Conch Cement, Kina	149 605	Kontrakten er avsluttet	4592
Yingde Conch Cement, Kina	254 689	Kontrakten er avsluttet	3394
Fusui Xinning Conch Cement, Kina	87 627	Kontrakten er avsluttet	3491
Xing'an Conch Cement, Kina	117 158	Kontrakten er avsluttet	3366
Beiliu Conch Cement, Kina	89 562	Kontrakten er avsluttet	3459
Xingye Conch Cement, Kina	96 337	Kontrakten er avsluttet	4593
Shuangfeng Conch Cement, Kina	0	Kontrakten er avsluttet	5410
Shimen Conch Cement, Kina	0	Kontrakten er avsluttet	5414
Yiyang Conch Cement, Kina	0	Kontrakten er avsluttet	5565
Fenyl Conch Cement, Kina	0	Kontrakten er avsluttet	5507
Laiwu kombinert dampenergi/produksjon, Kina	114 580	Kontrakten er avsluttet	3400
Project of Wugang, Varmegjenvinning, Kina	0	Kontrakten er avsluttet	
Wugang spillvarmegjenvinning fra koksforbrenning, Kina	0	Kontrakten er avsluttet	
Wugang spillvarmegjenvinning fra koksforbrenning, Kina	12 824	Kontrakten er avsluttet	1695
Wugang spillgassgjenvinning, Kina	417 469	Kontrakten er avsluttet	3328
Wugang kombinert dampenergi/produksjon, Kina	1 294 482	Kontrakten er avsluttet	3166
Hindustan Zinc Limited spillgassgjenvinning Chanderia, India	28 571	Kontrakten er avsluttet	855
Chirchind nettlikoblet vannkraft Himachal Pradesh, India	34 197	100 000 Kvoter under levering	2729
Anhui Xuancheng Conch Cement, Kina	116 673	Kontrakten er avsluttet	3522
Hunan Conch Cement, Kina	89 319	Kontrakten er avsluttet	3613
Anhui Digang Conch Cement, Kina	115 022	Kontrakten er avsluttet	3666
Anhui Chizhou Conch Cement, Kina	0	Kontrakten er avsluttet	1611
Anhui Zongyang Conch Cement, Kina	0	Kontrakten er avsluttet	1676
Zhongguochang Conch Cement, Kina	204 878	Kontrakten er avsluttet	3691

# Financial Greening II



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## CLIMATE GOALS

50 % CO<sub>2</sub>-reduction by 2020

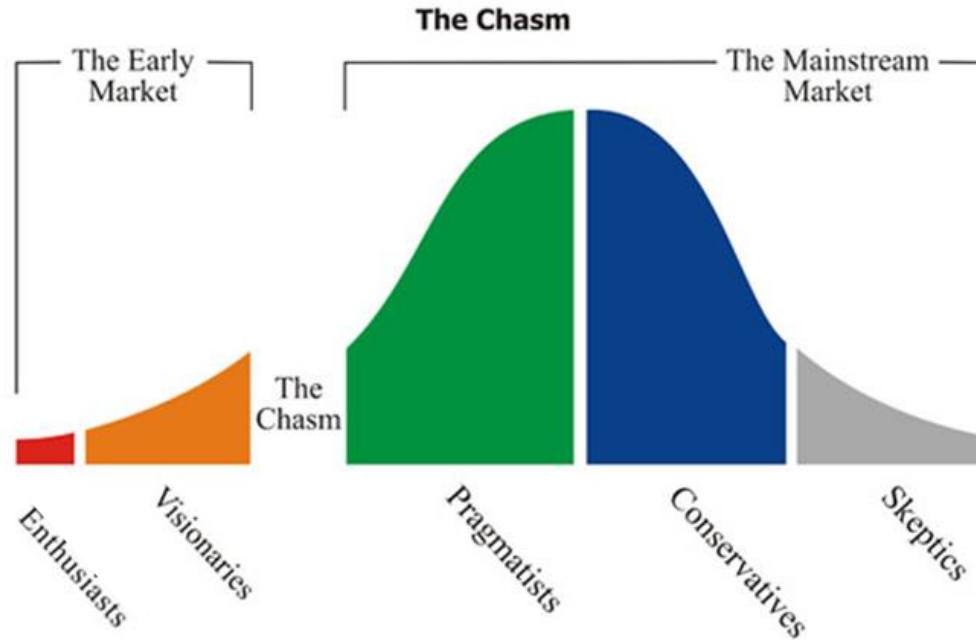
95 % CO<sub>2</sub>-reduction by 2030

## TRAFFIC REDUCTION GOALS

20 % traffic reduction by 2020

33 % traffic reduction by 2030

# Diffusion model for new solutions



# In a Broader Perspective Ecomodernity Is About a Triple Cycle Of Innovation

