Low carbon development in Asia-Pacific: opportunities and challenges

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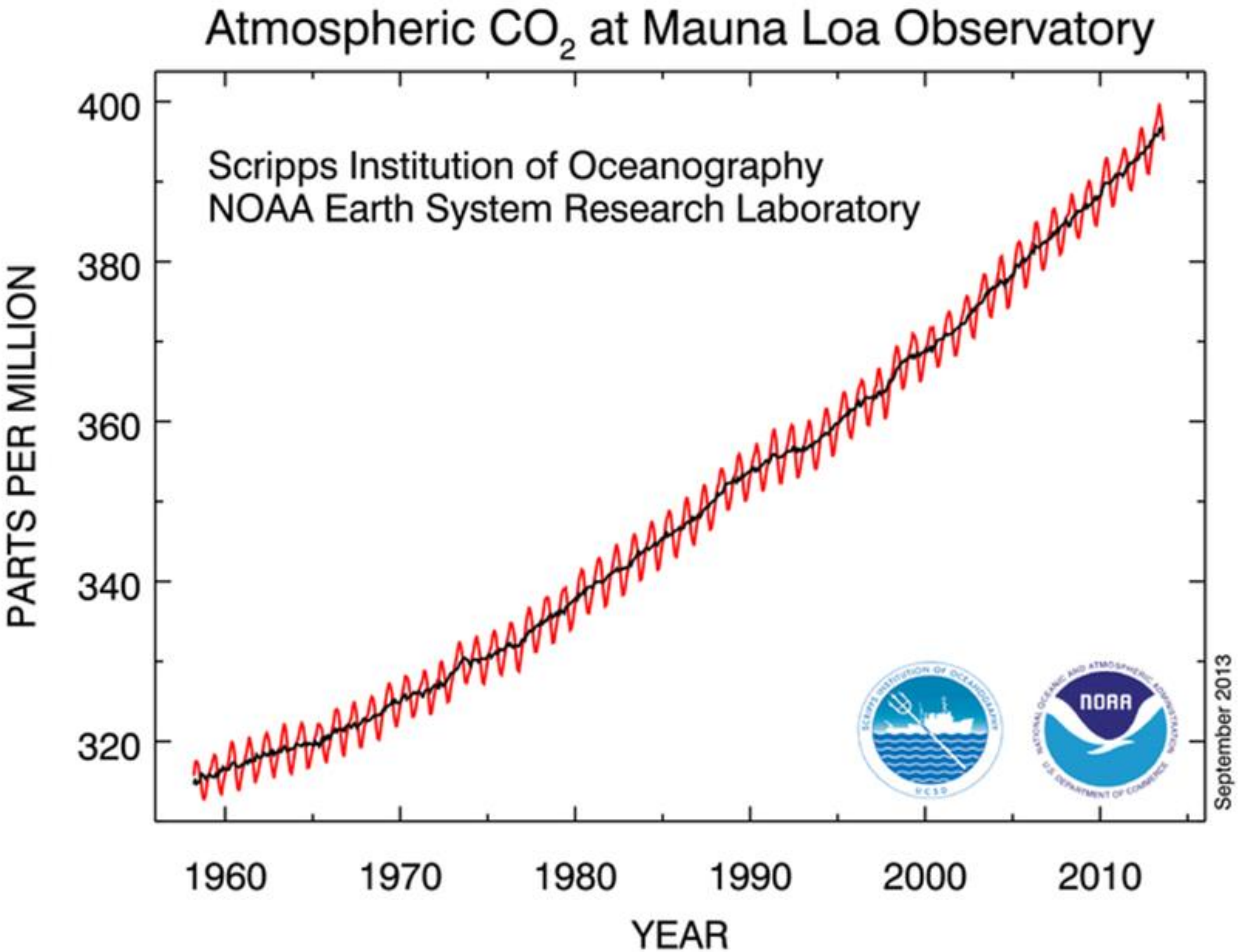

Atmospheric CO_2 at Mauna Loa Observatory
Scripps Institution of Oceanography
NOAA Earth System Research Laboratory
PARTS PER MILLION
400
380
360
340
320
1960
1970
1980
1990
2000
2010
YEAR
September 2013

Low carbon development

- Defined as a development model that is based on climate-friendly low carbon energy and follows principles of sustainable development, makes a contribution to avoiding dangerous climate change and adopts patterns of low carbon consumption and production (Urban and Nordensvard, 2013)
- Requires switching from fossil fuels to low carbon energy, promoting low carbon technology innovation and business models, protecting and promoting natural carbon sinks such as forests and wetlands, and formulating policies that promote low carbon practices and behaviours (DfID, 2009; Urban et al, 2011).
- Less focus on economic growth and exploiting finite natural resources, more focus on fair and equitable human development within the limits of our planet (Urban and Nordensvard, 2013).

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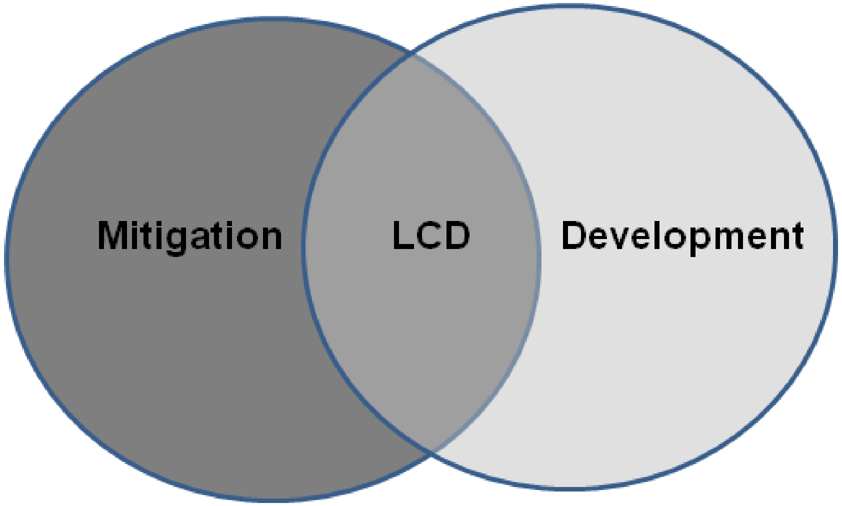
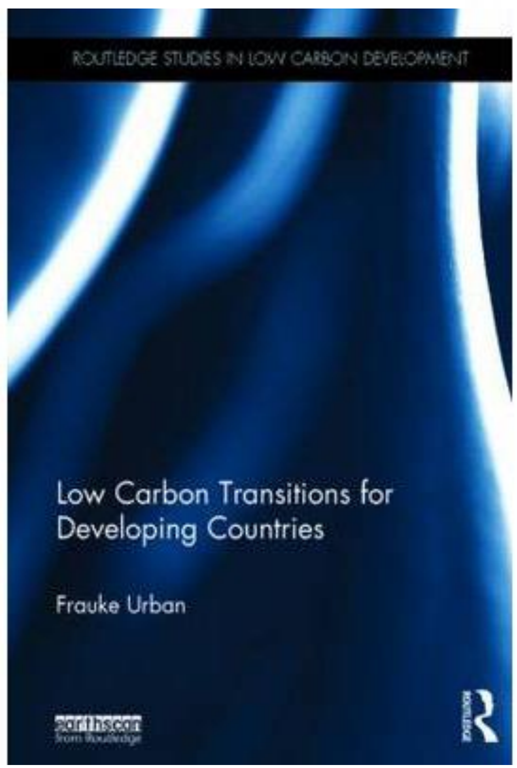
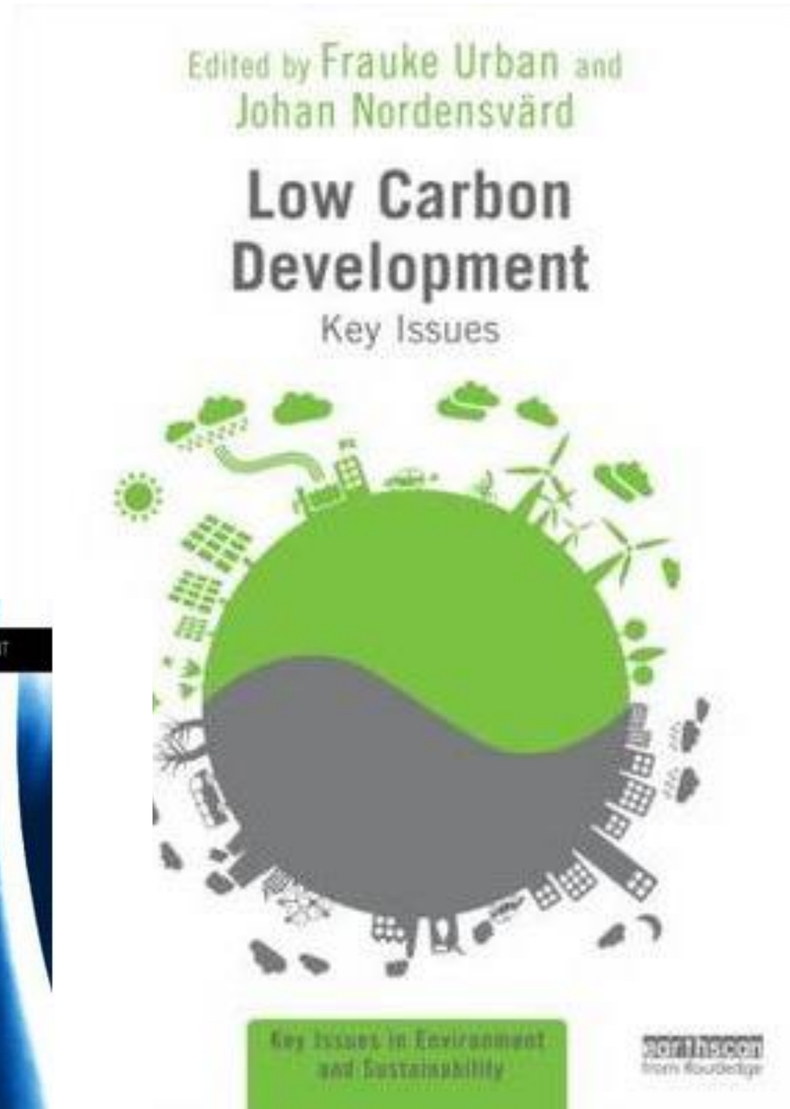


Source: Urban and Nordensvard, 2013

LCD: Low Carbon Development





Opportunities

- Low income and lower middle income countries: social justice and poverty reduction are important for low carbon development
- Higher middle income and high income countries: emission reductions are needed, opportunities for low carbon innovation
- Key opportunities for poorer countries is energy access from renewable energy as an alternative to traditional biomass and fossil fuels, reducing energy poverty and contributing to energy security. Link to UN's Sustainable Energy for All targets.
- 1.3 billion people world-wide do not have access to electricity and 2.7 billion people rely on traditional biomass (IEA, 2014)
- Energy poverty 'hotspot' in developing Asia: 800 million people do not have access to electricity and 50% of them live in India (IEA, 2010).
- Renewable energy, particularly solar, plays a large role in providing access to electricity for the poor

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Opportunities

- Improved health, e.g. through reduced indoor air pollution when switching from fuelwood to modern energy options; electricity for clinics and fridges for medications;
- Sustainable use of forest and land resources;
- Increasing the synergies between climate change mitigation and adaptation
- Avoiding carbon lock-in
- Creation of ‘green’ jobs
- Access to low carbon technology and innovation; attracting green investments
- Reducing the costs of carbon liability
- Increasing low carbon competitiveness

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Barriers

- Development vs growth: Growth plays important role, particularly for bottom billion (Collier, 2007), but growth needs to be more equally distributed so the poor can benefit
- Low carbon growth requires decoupling economic growth from carbon emissions
- Physical, technical and geographic limits to decoupling growth from emissions
- China, India and many OECD countries have achieved relative decoupling of growth from emissions due to increases in energy efficiency and the replacement of fossil fuels by low carbon energy.
- Absolute decoupling – unseen until 2015, when IEA announced that global CO_2 emissions had stalled in 2014 for the first time since 1960s

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Barriers

- Many poor countries already have unintentional 'low carbon economies' and face a number of trade-offs in relation to LCD, particularly in relation to hydropower and biofuels.
- A range of political, social, economic and technological key issues have to be addressed before LCD can be implemented at a global scale.
- Politics is often main challenge
- Social practices – e.g. China selling 1 Toyota Prius hybrid car in 2010
- Infrastructure e.g. lack of EV charging stations
- High upfront costs and investment risks

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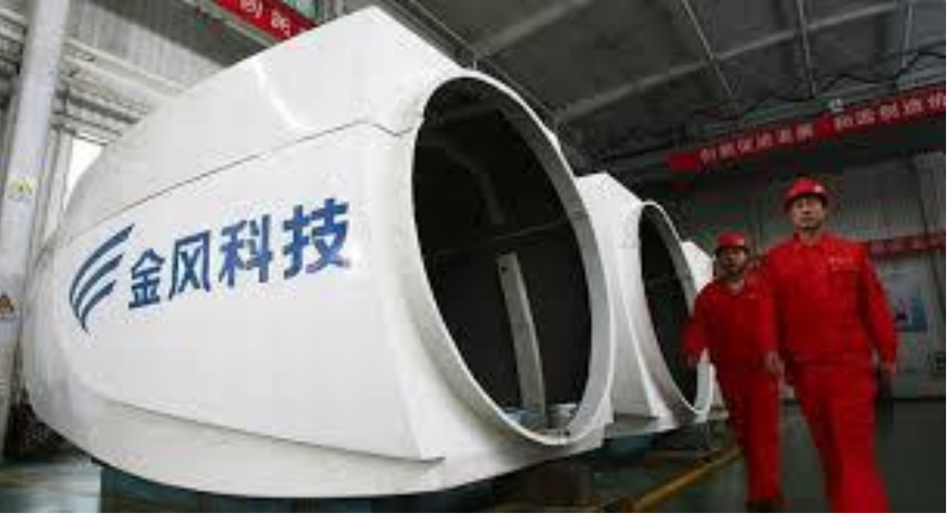
Our projects

- Wind energy: Technological trajectories for climate change mitigation in China, India, EU
- Solar energy: Low carbon innovation in China: the prospects, politics and practice
- Hydropower: China goes global – a comparative analysis of the impacts of China's overseas dams
- Social implications of low carbon development, particularly indigenous people



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Our projects: Wind

- Technological trajectories for climate change mitigation in China, India, EU
- Wind energy & electric vehicles as case studies
- 950,000 Euros
- Partners: Tsinghua University, China; Indian Institute of Management; German Development Institute GDI; Institute of Development Studies IDS, UK
- Drawing on innovation studies
- Fieldwork included interviews with firms & business associations, government agencies, academia and NGOs in China, India, EU
- Main research questions: a) how and why do the emerging technological trajectories for climate change mitigation in Europe, China and India differ, and b) what are the implications for strategies of international competition and cooperation at the enterprise and government level.

Our projects: Wind

- China is currently the world's largest wind energy market.
- Domestic installed capacity of more than 91 GW by early 2014 (GWEA, 2014).
- Doubling of installed capacity for 5 consecutive years between 2005 and 2010, then lower and more stable growth (Urban et al, 2012)
- Currently 5 of global top 10 wind firms are Chinese (Li et al, 2013).
- Compared to Europe and US, Chinese wind turbines are cheaper, quality varies according to specific turbines and firms, medium to large wind turbines, operating mainly onshore, although some offshore wind farms exist.
- Opportunities for South-North technology cooperation with Chinese-led mergers & acquisitions in Europe

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The stuttering energy transition in Germany: Wind energy policy and feed-in tariff lock-in

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HIGHLIGHTS

- Feed-in tariff favours specific wind innovation, rather than energy transition.
- Wind energy incorporated into a slightly modified socio-technical regime.
- The outdated grid infrastructure is a bottleneck for the wind energy sector.

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ABSTRACT

This article aims to examine whether the formulation of specific low carbon policy such as the feed-in tariff for wind energy in Germany can partly be a barrier to a comprehensive energy transition (Energiewende). Despite their short and medium-term success, these policies could create a long-term lock-in if they are formulated in a way that leads to a stagnation of systems innovation. The research finds that while the share of wind energy has increased rapidly over time, the feed-in-tariff and other low carbon policies and incentives have not been sufficient to achieve a socio-technical regime transition in Germany yet. We suggest that the German feed-in-tariff has incorporated wind energy (a niche-innovation) and wind energy actors (pathway newcomers) into a slightly modified socio-technical regime that is rather similar to the earlier 'fossil fuel dominant' socio-technical regime.

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Our projects: Solar

- Low carbon innovation in China: the prospects, politics and practice
- Solar energy, electro-mobility and agriculture as case studies
- 500,000 GBP
- Partners: Tsinghua University, China; Centre for Chinese Agricultural Policy; Lancaster University, UK; SPRU at University of Sussex, UK
- Project aims to investigate the social and political aspects of low carbon innovation in China, rather than focusing on technical change alone.
- Large literature on low carbon innovation in China, but much of it downplays the social nature of technical change, and questions of political change and power.
- Methods: interviews, focus group discussions, back-casting
- Theory: socio-technical transitions (Geels, 2002), innovation systems (Berkhout et al. 2011), power analysis (Smith & Stirling 2007)
- Main research question: Can Chinese low carbon innovation help address the climate crisis?

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Our projects: Solar

- China is world's largest investor in renewable energy, including in hydropower, wind energy and solar energy; increasing innovative capabilities for low carbon energy in China
- Solar energy: domestic use (SWH) vs export market (PV)
- **Solar water heaters**: used by over 30 million households in China (CGTI, 2009).
- Chinese firms hold 95% of the patents for core technologies of solar water heaters worldwide (CGTI, 2009).
- Evacuated tube design, designed at Tsinghua University in 1990s: low cost, indigenous innovation
- "Undiscussed protagonist" of a transition from fossil fuels to low carbon energy (Annini et al, 2014:152)
- But limited central government support, local government support is fragmented

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Our projects: Solar

- **Solar PV**: Almost 60% of total global solar PV production is from China, with an export value of US$20 billion (NDRC, 2012; Sun et al, 2014).
- Export-oriented: 95% of PV systems exported, mainly to Europe (Germany) and USA (REN21, 2012; Fischer, 2014).
- Domestic installed capacity (5%): 12 GW by 2013, target is to install 35 GW by end of 2015 (Sun et al, 2014), mainly ground-mounted large-scale solar plants
- Domestic problems of regulatory, technical and demand nature
- Currently 6 of global top 10 solar PV firms are Chinese
- Global impact: Historically expensive, but sharp decrease in prices in recent years: 1$/Watt

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Our projects: Large hydropower dams

- China goes global – a comparative analysis of the impacts of China's overseas dams: 750,000 GBP
- First comparative analysis of the environmental, social, economic and political impacts of Chinese hydropower dam projects in low and middle income countries (LMICs).
- Partners: University of Nottingham Ningbo in China, the University of Ghana, Cambodia Development Resource Institute CDRI, the Nigerian Institute of Social and Economic Research, Universiti Malaysia Sabah, Nottingham University in Malaysia, Tsinghua University in Beijing; Open University and International Rivers.
- Conceptual framework: 'Political ecology of the Asian drivers'
- Combining the analysis of power relations over the access to natural resources (Greenberg & Park, 1994; Tan-Mullins, 2007) with assessing China's impacts as a Rising Power and its channels of interaction with LMICs (Humphrey & Messner, 2005; Schmitz, 2006; Kaplinsky & Messner, 2008)

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Our projects: Large hydropower dams

- Comparative case study analysis: 4 dams, 2 in Africa (Ghana, Nigeria), 2 in SE Asia (Cambodia, Malaysia) and fieldwork in China
- SE Asia: Kamchay dam, Cambodia; Bakun dam, East Malaysia
- Africa: Bui dam, Ghana; ‘Zamfara’ dam, Nigeria
- 155 interviews: 83 with institutional actors (policy-makers, firms, NGOs, experts), 72 with affected communities
- 40 focus group discussions
- 142 household surveys
- Stakeholder mappings, data analysis, EIA analysis, literature reviews

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Our projects: Large hydropower dams

- Global renaissance of hydropower under Chinese leadership
- China is the world's largest hydropower dam builder in terms of number and size of dams built, investment sums and global coverage.
- More than 330 Chinese overseas dams, about 40% in Southeast Asia and about 30% in Africa (International Rivers, 2014).
- SOE Sinohydro plays major role, Chinese banks as financiers
- Long history of domestic dam-building, but recently many Chinese overseas dams in LMICs - 'Going Out Strategy' (Bosshard, 2009; McDonald et al, 2009; International Rivers, 2012)
- Chinese domestic dam market is saturated, overseas opportunities for firms, jobs, tax, access to natural resources (McNally et al 2009).

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Our projects: Large hydropower dams

- Kamchay dam: first large hydropower dam built in Cambodia
- Opportunity for energy access, alternative to fossil fuels, investments for poor country?
- Generating capacity: nearly 200MW, estimated cost: US$280 million (Grimsditch, 2012; NGO Forum, 2014)
- Financiers: ExIm Bank; builders, developers and contractors: Sinohydro (International Rivers, 2014).
- No resettlements, but severe impacts on poor people's livelihoods
- Environmental impacts are high as dam is built in National Park, habitat of endemic and endangered species
- Disregarding of Cambodia's EIA legislation, EIA only approved after dam already in operation
- Money set aside by Sinohydro for mitigation measures not made available to Cambodian Department of Environment
- Some people living next to dam don't have access to electricity, electricity from dam is mainly dedicated for Phnom Penh

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Our projects: Large hydropower dams

- Bakun dam: large hydropower dam built in Sarawak, East Malaysia
- Opportunity for clean energy and energy security?
- Generating capacity: 2,400MW, estimated cost: US$2.6 billion (Reuters, 2013), plan of supplying electricity to Peninsular Malaysia
- Financiers: ExIm Bank; Developers: Malaysia-China Hydro JV consortium composed of Malaysian Sime Darby, Sinohydro and smaller consortium members; Builder: Sinohydro; Dam operator: Sarawak Hidro. (International Rivers, 2014).
- Resettlements of about 10,000 indigenous people; dam build on customary land of indigenous people
- Environmental impacts are high as dam is located in tropical rain forest, habitat of endemic and endangered species
- Corruption cases, including Sime Darby suing it’s own directors for bribing Sinohydro
- Paved way for other dams, industries, roads into forests used by logging firms
- Expected outcome of research: contributing to improving corporate behaviour of hydropower firms and shaping emerging national and international policy responses.

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Our projects: Social implications of LCD & indigenous people

- WUN: World University Network & ESRC application
- There is a need to research how indigenous people have been coping with and acting towards climate change and natural resource depletion.
- Research on the political mobilisation of indigenous people with the help of social and environmental science.
- The project aims to create a network that will support indigenous knowledge and skills in climate change mitigation and natural resource management. The networks aims to explore different tools that could be used to access funds, knowledge and technologies to support indigenous people in coping with climate change and natural resource depletion.
- The academic outcome is to develop a conceptual framework, focused on social/environmental sustainability and environmental justice and how this could link up with climate science, engineering, computer modelling and web science. The aim is to develop a set of methods that will strengthen research on how indigenous people, traditions and practices that could play a future role in mitigating climate change.

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Book on Social Implications of Low Carbon Development

- The book aims to 1. elaborate the social implications and challenges of low carbon development and 2. explore how low carbon development can be achieved while also achieving poverty reduction and social justice.
- Nordensvärd, J, forthcoming. The Social Challenges of Low Carbon Development, Earthscan, Routledge, Oxford. Monograph.

Conclusion

- Low carbon development offers opportunities for climate-friendly development that is socially just
- Opportunities for energy access, poverty reduction, sustainable development and environmental protection
- Challenges and trade-offs relate mainly to large-scale infrastructure projects (e.g. large hydro dams) that have high environmental and social impacts
- Small, but beautiful may be preferable for hydropower, while large-scale solar & wind projects have major benefits
- Asia-Pacific, particularly China, may hold key to global low carbon transitions due to globalised markets, low costs & scale of environmental impacts

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Opportunities for collaboration

- We are open for joint publications and research bids in the fields of:

- Low carbon development, particularly related to renewable energy as opportunities for energy access and reducing energy poverty
- Social implications of low carbon development
- Indigenous people, low carbon development and natural resource use
- Trade-offs and barriers of LCD
- Water-food-energy nexus

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- Thank you for your attention
- Questions?

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