Climate & Development Knowledge Network

INSIDE STORIES on climate compatible development

May 2013

Key messages

- Thailand was among the first countries in Asia to introduce incentive policies for the generation of electricity from renewable energy (RE) sources, leading to rapid growth, particularly in solar power.
- Programmes for small and very small power producers created predictable conditions for RE investors to sell electricity to the grid. The 'Adder', a feed-in premium, guarantees higher rates for RE, making the investments profitable. Thailand also regularly updates technical regulations, provides preferential financing, and invests in research and training.
- Civil society involvement strengthened and improved RE policies. In Thailand, outside expertise and links to international networks brought in by civil society experts were crucial for the design and approval of the incentive measures.
- The Thai Government is now adapting its policies to take account of recent technological progress and market growth. It is considering a sophisticated feed-in tariff to better control costs, while continuing to offer an enabling environment for RE investments.

Author:

Lutz Weischer, World Resources Institute

Pioneering renewable energy options: Thailand takes up the challenge

Thailand's support policies for renewable energy (RE) in the power sector have allowed individual small projects to add up to something substantial, attracting more investment and leading to faster growth in the sector than in most other Asian nations. Thai energy policy is complex, and the development of RE has not been without controversy. While this brief provides some elements of the context necessary to understand renewable electricity promotion policies, it cannot cover all aspects of Thai energy policy. Instead it focuses on identifying factors that explain the relative success of Thai policies and highlights some lessons for future development.

Thailand has a large-scale centralised power system with a high electrification rate and high per-capita energy demand compared with neighbouring countries in South-East Asia (Table 1).

The Thai power sector faces several challenges:

1. **Thailand is dependent on energy imports.** The Thai electricity mix is dominated by natural gas, providing around 70% of electricity (see Figure 1). Even though Thailand exploits its domestic fossil fuel reserves, it is still highly import-dependent, importing almost 25% of its natural gas supply and over 50% of its primary energy supply (measured in tons of oil equivalent) in 2011.[1] The dependence on controversial electricity imports from Lao PDR, natural gas imports from Myanmar, and volatile global fossil fuel markets risks undermining the security of energy supply. Energy imports also represent an economic burden for the country, consuming almost 12% of gross domestic product (GDP).[2]
2. **Thailand needs to provide for the growing electricity needs of its citizens and its economy**. On average, over the past 5 years, electricity consumption has grown by 3.3% per year.[3] Civil society and researchers have accused the Government of overstating future demand in order to justify new

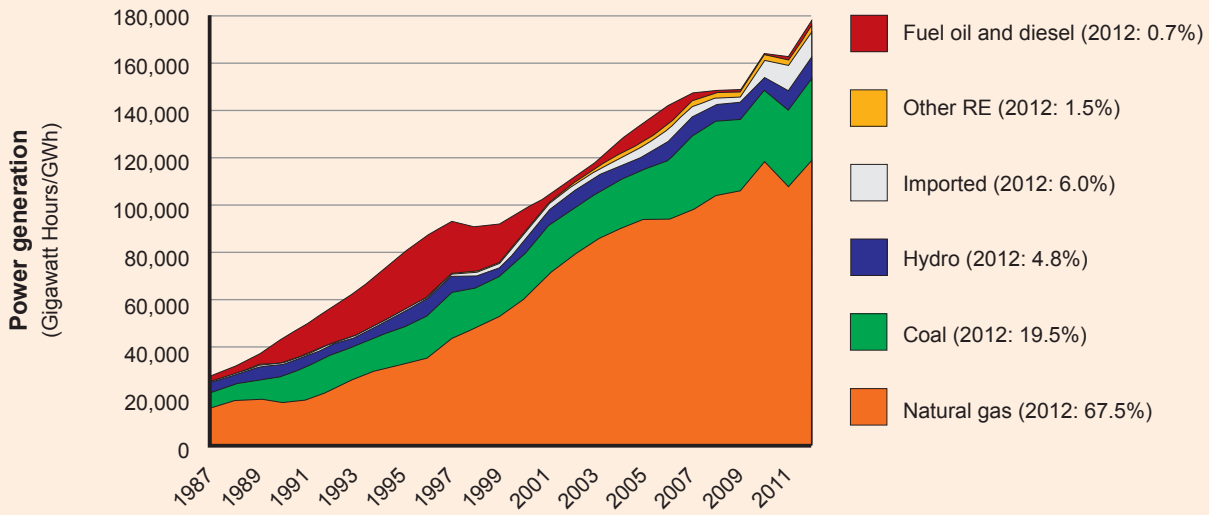
CDKN helps developing countries to design and deliver climate compatible development. When decision-makers in government, business and civil society speak to us about their aims and needs, they often ask about 'best practice' in other countries or, indeed, mistakes to avoid. What are the leading innovations in integrating climate change planning with economic growth strategies and poverty reduction? What are the biggest challenges faced along the way: institutional, financial, political, technical? This paper is one of a series of policy briefs that explore the 'Inside stories on climate compatible development': briefing papers that aim to answer these questions.

Table 1. Key energy statistics for Thailand and its neighbours, 2010 (2009 for electricity access)

	Population	GDP (current US$)	Energy use (kg of oil equivalent per capita)	Electric power consumption (kWh per capita)	Access to electricity (% of population)
Thailand	69 million	318.9 billion	1698.9	2243.4	99.3
Cambodia	14 million	12.8 billion	355.4	146.1	24.0
Lao PDR	62 million	7.1 billion	—	—	55.0
Malaysia	28 million	246.8 billion	2557.8	4117.4	99.4
Myanmar	48 million	—	291.8	131.1	13.1
Viet Nam	87 million	106.4 billion	681.4	1034.7	97.6

Source: World Bank, World Development Indicators, World DataBank, http://databank.worldbank.org/

Figure 1. Thailand's power generation mix



Source: EGAT data, as reported in EPPO 2013; not including VSPPs

large hydro, coal or nuclear power plants. Experience from the past shows that demand growth has consistently been overestimated in official projections. And there is significant potential for efficiency measures. Nonetheless, official and alternative scenarios agree that some additional capacity will be needed in coming years as electricity demand grows.

3. **Thailand recognises the need to reduce pollution and greenhouse gas emissions.** The 11th National Economic and Social Development Plan, a 5-year framework guiding government policy, includes the objective to move "toward a low-carbon society".[4] The power sector was responsible for 42% of greenhouse gas emissions in 2011 and will have to make a significant contribution to achieve this objective.[5]

RE sources can be an important part of the answer to these challenges. Resource assessments show a large potential for a number of RE technologies (see Table 2). This is why the Thai Government passed the 15-year Renewable Energy Development Plan (2008–2022), setting a target

Table 2. Renewable energy potential, 2008 capacity and 2021 Alternative Energy Development Plan targets

RE technology	Technical potential (MW)	2008 capacity (MW)	2021 target (MW)
Solar	50,000	32	2,000
Wind	1,600	1	1,200
Small/micro hydro	700	56	324
Biomass	4,400	1,610	3,630
Biogas	190	46	600
Municipal solid waste	400	5	160
Geothermal	—	—	1
Tidal wave	—	—	2

Source: Tongsopit and Greacen 2012; DEDE 2012c.

of achieving 20% of RE in final energy consumption. At the end of 2011, a new plan, the 10-year Alternative Energy Development Plan (2012–2021), increased these targets to 25% in total energy consumption and 10% in electricity consumption (see Table 2). The Thai Government estimates that achieving these targets would:

- avoid over US$19 billion in energy imports annually
- encourage around US$15 billion in private investment
- avoid 76 million tonnes of greenhouse gas emissions per year
- create at least 40,000 new jobs
- generate extra income and employment in rural areas.[6]

A policy mix to promote renewable energy

In 1992, Thailand introduced the Small Power Producer (SPP) programme. The programme obliged the Electricity Generating Authority of Thailand (EGAT) to purchase power from power plants that combined heat and power generation or ran on renewable sources, under transparent and predictable power purchase agreements (PPAs). Power plants with a capacity to export up to 60 megawatts (MW) to the grid – later increased to 90 MW – were eligible. For power plants the Government classified as 'firm', mostly based on fossil fuels as well as biomass, 20- to 25-year PPAs were signed. 'Non-firm' plants, including most RE projects, received 1- to 5-year contracts. The power was purchased at a rate that reflected the avoided cost, i.e. the cost EGAT would have incurred to generate the same amount of power. The programme mainly benefitted co-generation plants using fossil fuels. The SPP programme also allowed the development of some plants using waste biomass, such as bagasse, paddy husks or woodchips, to compete. Other RE sources were not competitive at the offered rates.[7]

In 2001, a Very Small Power Producer (VSPP) programme was introduced for RE plants with an export capacity of up to 1 MW (later increased to 10 MW). VSPPs benefitted from simplified regulations and were able to sell power directly to the distribution companies the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA). The rate they received also reflected avoided costs: the distribution companies paid the same wholesale rate to VSPPs as they would have paid to purchase electricity from EGAT's transmission network.

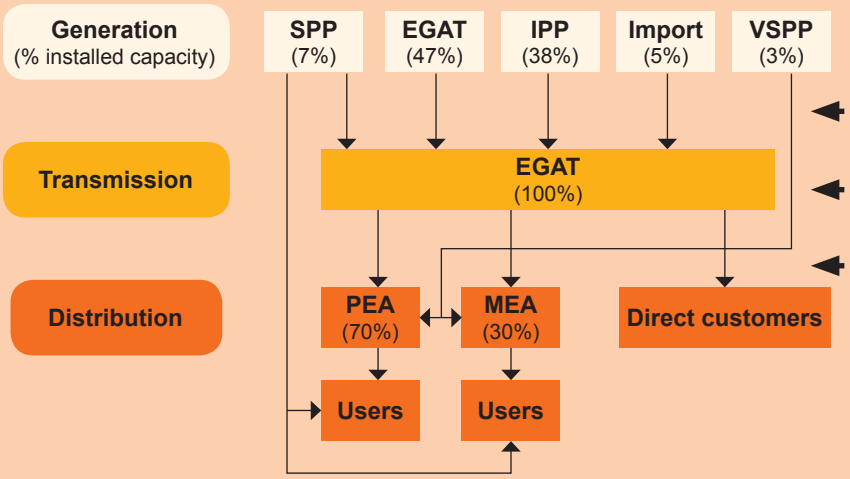
The VSPP programme started slowly, with a few projects with a total capacity of 16 MW being connected to the grid in the first 5 years. This allowed the utilities to become familiar with the programme and showed that RE could work. In 2006, the Government further streamlined the procedures and introduced the 'Adder'.

The Adder is a feed-in premium paid to SPPs and VSPPs using RE, on top of the avoided cost rate. It ranges from around 8 to 21 US cents per kilowatt hour (kWh) and is paid for 7 to 10 years, depending on the technology. It is funded through a small surcharge per kWh paid by all electricity consumers. The Adder is technology specific, reflecting differences in generation cost. For example, the Adder for solar

The structure of the Thai electricity sector

Since the 1990s, successive governments have taken steps to open the Thai electricity market to private investors. Attempts to privatise the state-owned EGAT met with resistance and were eventually abandoned.[8] As a consequence, Thailand's electricity market is now characterised by both a contribution from private power generators and a strong role for the state-owned utilities. EGAT owns around 50% of electric generation capacity, purchases electricity from Independent Power Producers (IPPs) and SPPs and operates the country's entire transmission infrastructure. Electricity is distributed to consumers by two public distribution companies: the MEA, serving the Bangkok area, and the PEA, serving the rest of the country.

Figure 2: The structure of Thailand's electricity sector



Source: Tongsopit and Greacen 2012.

energy is higher than for biomass. An additional premium is paid to projects that replace diesel generators in remote areas or are located one of Thailand's three southern provinces.

The SPP and VSPP programmes provided power producers with certainty that they would be able to sell their power to the grid. The process was simple, using standardised PPAs and interconnection procedures. Utilities were the single point of contact, responsible for processing and approving applications, based solely on the availability of the grid. The Adder provides additional certainty by providing a fixed additional payment. The attractive rates, coupled with a simple rate structure, make it easy for investors to develop viable business plans.

Other government measures complement these programmes. Regulations dealing with the technical challenges of RE sources are being updated periodically.[9] Public universities and research institutes are exploring improvements in RE technology.[10]

Through incentives administered by the Board of Investments, eligible RE projects can get a corporate income tax break for up to 8 years and are exempt from import duties on equipment.[11] A revolving fund, capitalised through a tax on all petroleum products sold in Thailand, provides financing to local banks so that they can pass on low-interest loans with a maximum interest rate of 4% to RE projects. Another government fund provides equity investment or venture capital of up to 50 million Baht (US$1.7 million) for smaller RE projects, as well as technical assistance and support for developing and selling carbon credits. International financial institutions such as the World Bank or the Asian Development Bank also finance RE projects in Thailand.

Why did it happen in Thailand?

Thailand is a pioneer of ambitious RE policies in the region. Introducing these policies was not easy in a country heavily reliant on fossil fuels, with growing demand for electricity and very powerful utilities. The factors that explain what made it possible include the following:[12]

- RE policies were aligned with broader political priorities, beyond environmental considerations. Energy security was an important driver for the introduction of the SPP and VSPP programmes. In the context of the struggle over electricity sector deregulation between the government-owned utilities and private companies, the programmes also seemed acceptable to both sides: they encouraged some

Wind turbines in Thailand

private participation in the sector, yet were small enough not to seem threatening to the utilities.

- Civil society groups played a crucial role in the design of the VSPP and the Adder. There was limited expertise on RE within the Thai electricity sector. Civil society input brought in expertise on RE and on regulations that had worked in other countries. For example, Palang Thai, a non-governmental organisation working on rural electrification, convened roundtables of regulators, utilities and RE experts, and organised study tours in Thailand and abroad to showcase successful RE projects. They also prepared studies showing that RE can make a much larger contribution to meeting Thailand's electricity demands than was projected in the official plans. Civil society groups identified the RE champions in government agencies and used meetings and study tours to help break down the silos in different agencies and utilities. Members of this informal coalition of RE proponents were at the table when regulations were drafted and approved.
- The Thai programmes started small and grew over time. When the VSPP programme was introduced, proponents could point to the existing SPP programme as a precedent. Because of their limited size and costs, the first few VSPP projects were seen as easy to manage and integrate into the grid, making utility engineers more willing to accept them. When the extension of the VSPP programme and the Adder were proposed, proponents could point to these existing projects, which were working well. Starting small also allowed the formation of constituencies who benefitted from the programme and subsequently pushed for its extension.

The impact of Thailand's renewable energy policy

Thailand's RE promotion policies supported the emergence of a new type of electricity project: decentralised RE projects that are not owned and operated by large utilities, but by rice mill owners using the energy contained in rice husks, factory managers turning waste streams into a new source of revenue, and domestic and international investors developing solar farms. By the end of 2011, over 260 RE plants were operational under the SPP and VSPP schemes, with a generating capacity of roughly 1 GW. Projects with a further 8 GW capacity are at various stages of the pipeline, though it is not clear that all of them will be built.[13] Taking other sources – such as plants operated by the utilities themselves and off-grid installations – into account, Thailand had managed to develop a total RE capacity of almost 2.2 GW within a few years.[14]

The policy support for RE has encouraged significant investments: US$1.5 billion were invested in the Thai RE sector in 2011.[15] There is also a domestic RE equipment manufacturing industry emerging. For instance, Thailand now has three companies manufacturing solar cells and modules using imported wafers, and another three assembling imported cells into modules. In addition, there are a number of components and services that can be supplied by Thai firms.[16] On average, 70–80% of the equipment used in solar projects (by value) is still being imported and additional steps and policy stability will still be necessary to build a stronger domestic industry.

Current challenges and the way forward for Thailand's renewable energy policy

By 2010, attractive Adder rates and falling global prices for solar power equipment led to applications for more than 2,000 MW of solar projects, exceeding the official target (500 MW at the time) by a factor of four. There were concerns that some applications were speculative and that the impact on consumer bills would be too high if most of these projects were built, because the cost of the Adder is passed on to all electricity customers. In 2010, the Government therefore reduced the Adder for solar projects that had already submitted applications but not signed a PPA, and put a hold on accepting new applications. Final project approval was moved from the utilities to a new committee, composed of government and utility representatives. The committee introduced additional approval criteria, including access to land, financing and necessary permits. For applicants, this change has meant less certainty and the number of applications has essentially stalled.

Thailand remains committed to scaling up RE, as reflected in the increased targets approved in 2011. According to the Government, the hold on solar applications is a temporary measure, while a new support policy is being developed. The policy will need to address three issues to ensure long-term success:

1. **Integrating RE in overall energy planning:** The Power Development Plan (PDP) 2010–2030 forecasts future demand and the need for additional generation capacity, with a focus on large hydro, fossil fuel and nuclear plants. The PDP projects relatively low levels of RE that seem inconsistent with the rapid growth of the sector. Since the early 2000s, civil society groups have been calling for a more transparent and participatory planning process and challenging the PDP's assumptions on demand growth and the potential contribution of RE.[18] The Government has agreed to monitor the generation of existing RE plants transparently and the plan might be adjusted as a result.
2. **Adapting to falling costs:** Thailand needs to find a way to manage the cost of its incentive programmes without making a formerly simple support scheme unpredictable. That would stall growth, as has happened since 2010. The Government has decided to move from a feed-in premium to a feed-in tariff. This would be different from the current Adder in that it would guarantee not just the premium paid on top of the avoided cost, but a total rate paid to VSPPs and SPPs, independent of volatile conventional power prices. Thailand is also considering

Thailand is a model for other developing countries; for example, Tanzanian regulators have looked to Thailand's experience when developing their own Small Power Producer programme.[17]

adopting features of successful feed-in tariffs in other countries. For example, the new scheme could provide a pre-determined schedule for reductions in the feed-in tariff rate. Regular reviews, using clearly defined methodologies, could provide a transparent framework for revisions.

3. **Ensuring a balanced RE portfolio:** Table 3 compares the 2011 targets from the Renewable Energy Development Plan to actual installations. It shows that solar power and biogas were well ahead, with all other sources lagging behind. The explosive growth in solar photovoltaics may overshadow the fact that the development of other RE sources has been slower than planned, which will also make it difficult to achieve the positive development impacts in terms of avoided exports or job creation. The incentives for technologies other than solar might have to be increased. Likewise, additional incentives might be needed to encourage projects that benefit smaller projects or rural communities. So far, financing, even from public sources, has focused on existing companies with a strong balance sheet; securing project financing has remained difficult for communities or for new companies focused on RE. The existing policy mix has helped stimulate capital-intensive, private sector-oriented investments. Specific incentives for rooftop solar or rural communities could encourage a more balanced portfolio.

Table 3. Targets from the Renewable Energy Development Plan and Actual Capacity, 2011

RE technology	2011 target (MW)	Actual 2011 capacity (MW)	Difference (%)
Solar	55	110.97	+101.76
Wind	115	0.38	-99.67
Small/micro hydro	165	13.28	-91.95
Biomass	2,800	724.72	-74.12
Biogas	60	98.69	+64.49
Waste/municipal solid waste	78	37.33	-52.14
Total	3,273	985.37	-70.00

Source: Tongsopit and Greacen 2012.
Note: Actual capacity, 2011, 'Capacity' represents the grid-connected SPP and VSPP capacity as of December 2011.

References

Amranand, P. (2008) *Alternative Energy, Cogeneration and Distributed Generation: Crucial Strategy for Sustainability of Thailand's Energy Sector*. Bangkok: Energy Policy and Planning Office, Ministry of Energy (www.eppo.go.th/doc/Piya-RE-in-Thailand.pdf).

Brouwer, B. (2012) *Institutional Aikido: Bringing Power to the People of Thailand*. Climate Campaign Profiles. San Francisco: The Democracy Center.

Thailand Board of Investment (BOI) (2012) *Alternative Energy in Thailand*. Bangkok: BOI.

Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy (2012a). *Annual Report: Thailand Energy Situation 2011.* Bangkok: DEDE (www.dede.go.th/dede/images/stories/stat_dede/energy_2011_1/energy_2011_1.pdf).

Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy (2012b). *Annual Report: Electric Power in Thailand 2011.* Bangkok: DEDE (www.dede.go.th/dede/images/stories/stat_dede/electric54_1.pdf).

Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy (2012c) *The Renewable and Alternative Energy Development Plan for 25 Percent in 10 Years (AEDP 2012–2021).* Bangkok: DEDE (www.dede.go.th/dede/images/stories/pdf/dede_aedp_2012_21.pdf).

Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy (2012d). *Annual Report: Thailand Alternative Energy Situation 2011.* Bangkok: DEDE (www.dede.go.th/dede/images/stories/stat_dede/alternative_54/alternative_54.pdf).

Energy Policy and Planning Office (EPPO) (2012) 'Energy statistics: Electricity, Table 5.2-2' (www.eppo.go.th/info/5electricity_stat.htm).

Ferrey, S. (2004) *Small Power Purchase Agreement Application for Renewable Energy Development: Lessons from Five Asian Countries.* Washington, DC: World Bank.

Foran, T. (2006) *Thailand's Politics of Power System Planning and Reform*. M-POWER Working Paper 2006–05. Chiang Mai: Unit for Social and Environmental Research, Chiang Mai University.

Nakhooda, S., Dixit, S. and Dubash, N.K. (2007) *Empowering People: A Governance Analysis of Electricity; India, Indonesia, Philippines, Thailand.* Washington, DC: World Resources Institute.

Office of the National Economic and Social Development Board (NESDB) (2010) *Summary of the Eleventh National Economic and Social Development Plan (2012–2016)* (www.nesdb.go.th/Portals/0/news/academic/Executive%20Summary%20of%2011th%20Plan.pdf).

Sangarasri Greacen, C. and Greacen, C. (2012) *Proposed Power Development Plan (PDP) 2012 and a Framework for Improving Accountability and Performance of Power Sector Planning.* Bangkok: Palang Thai (www.palangthai.org/docs/PDP2012-Eng.pdf).

Sarochawikasit, R. (2009) *Alternative Energy Development Plan (2008–2022), Medium- and Long-term Investment Plan and the Role of the Private Sector.* Presented at the 'Climate Financing: Clean Technology Fund (CTF) and the Role of the Private Sector' workshop, 15 July 2009, Bangkok.

The Solar Club (2011) *Thailand PV Status Report 2011*. Bangkok: The Solar Club and National Science and Technology Development Agency.

Tongsopit, S. and Greacen, C. (2012) *Thailand's Renewable Energy Policy: FiTs and Opportunities for International Support*. Berkeley: University of California, Berkeley Renewable and Appropriate Energy Laboratory (www.palangthai.org/docs/ThailandFiTtongsopit&greacen.pdf).

Weischer, L. (2012) 'Achieving development goals with renewable energy: The case of Tanzania.' CDKN Inside Stories on Climate Compatible Development. London: Climate & Development Knowledge Network.

Endnotes

1 DEDE 2012a, p. 12
2 DEDE 2012a, p. 25
3 DEDE 2012b, p. 6
4 NESDB 2010, p. ix
5 DEDE 2012a, p. 30
6 DEDE 2012c, p. 11; Sarochawikasit 2009, p. 7. Note that the job and rural development estimates are based on the 2008–2022 plan; with the higher targets in the 2012–2022 plan, these effects are likely to be even higher. Throughout this brief, an exchange rate of 30 THB = 1 US$ is used.
7 Amranand 2008, pp. 2–3; Ferrey 2004, pp. 21–29.
8 Nakhooda et al. 2007
9 See, for example, the updated VSPP grid code at www.pea.co.th/vspp/etc/grid_code.pdf
10 See, for example, The Solar Club 2011, p. 17
11 BOI 2012, p. 14
12 For a more detailed analysis, see Brouwer 2012
13 Tongsopit and Greacen 2012, p. 16
14 DEDE 2012d, p. xii
15 DEDE 2012d, p. xiv
16 The Solar Club 2012, pp. 19–20
17 Weischer, L. 2012
18 Sangarasri Greacen and Greacen 2012; Foran 2006

About CDKN

The Climate and Development Knowledge Network (CDKN) aims to help decision-makers in developing countries design and deliver climate compatible development. We do this by providing demand-led research and technical assistance, and channelling the best available knowledge on climate change and development to support policy processes at the country and international levels.

About WRI

WRI focuses on the intersection of the environment and socio-economic development. We go beyond research to put ideas into action, working globally with governments, business, and civil society to build transformative solutions that protect the earth and improve people's lives.

Front cover photo: topten22photo/Shutterstock; page 5: SantiPhotoSS/Shutterstock
Editing, design and layout: Green Ink (www.greenink.co.uk)

Climate & Development Knowledge Network

WORLD RESOURCES INSTITUTE

www.cdkn.org e: enquiries@cdkn.org t: +44 (0) 207 212 4111