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Mainstreaming Framework Conditions for Environmental Finance – the Role of the Public Sector

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Abstract

The term “environmental finance” in this paper refers to standard financing products of commercial banks for investments in clean technology. Investments in EE&RE products represent the main potential market for these. Whereas the existence of a potentially large market for investments in EE&RE is beyond doubt, its realization needs unlocking. In unlocking the market potential, the public sector has two roles to perform: (i) to introduce a set of incentive instruments to create a large-scale and long-term demand; and (ii) to coordinate the activities of actors (supply-side actions). Concerted CT deployment programs comprise an integrated package of environmental finance, together with “demand pull” and “technical supply-side” measures to create demand for investments. As incentive to include environmental finance in their product portfolios, banks may require the inclusion of a “bank engagement program”, comprising measures that reduce their risks, their costs of transaction and their costs of capacity building, during the market upstart phase. Successful programs are complex. Yet a large number of instruments exist to customize solutions to local conditions, and the know-how to design and implement integrated packages is becoming increasingly well-established.

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Abbreviations

ANME	Agence Nationale pour la Maîtrise de l'Énergie
CDM	Clean Development Mechanism
CEB	Ceylon Electricity Board
CFL	Compact fluorescent lamps
CT	Clean Technology
DSM	Demand Side Management
EE	Energy Efficiency
EF	Environmental Finance
ESCO	Energy Service Company
GDP	Gross Domestic Product
GEF	Global Environment Facility
IPP	Independent Power Producers
LECO	Lanka Electricity Company
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
OECD	Organization for Economic Cooperation and Development
PROSOL	Progamme Solaire
PPP	Public Private Partnership
PV	Photo-voltaic
RE	Renewable Energy
SEA	Sustainable Energy Authority
STEG	Société Tunisienne de l'Electricité et de Gaz
SWH	Solar Water Heaters
UNDP	United Nations Development Program

1 Demand for CT: a Condition for Environmental Finance

For the purposes of this paper, “environmental finance” is defined as “standardized financing products for clean technology (CT)[1] offered by financial institutions as part of their own business strategy”.[2] Thus, the subject concerns the mainstreaming of finance for the mass market of small scale investments in CT made by small businesses, households and public institutions. Because energy efficiency (EE) and renewable energy (RE) technologies represent the bulk of the CT market, this paper examines only EE&RE technologies. Framework conditions in emerging and developing countries are the main focus, but for reference purposes examples from OECD countries are included also.

In order to mainstream environmental finance, the financial sector requires first and foremost a framework that creates the right market demand for its products. One can gain a good understanding of the ideal market conditions for environmental finance by looking at the characteristics of products that banks in emerging and developing economies are eager to finance: real estate, mobile phone vendors, cars and motorcycles. The most important are:

(i) The annual demand for finance is large and “perpetual”, giving banks good prospects for productivity.

(ii) Bank staff understand the products; hence, banks face low costs for internal training.

Thus, mainstreaming of environmental finance requires a framework that creates a large and long-term demand for standardised CT finance products. Large demand justifies upfront investments in internal capacity building and permits the development of standardised financial products; standardisation reduces transaction costs.

The framework conclusion is confirmed by statements from the financial community. At the "Renewables Conference" held in 2004 in Bonn, the financial community issued the

[1] The term “clean technology” (CT), as shorthand for “environmental technology,” refers to technologies that have a lower consumption of materials and fuels and release fewer emissions into the air, water, and soil than conventional technologies. They comprise: (i) technologies in energy efficiency and in renewable energy systems, (ii) production technologies for saving water and raw material, and (iii) technologies in investments for reducing end-of-pipe pollution that recover materials for reuse.

[2] The term “environmental finance” refers to “commercial financial products that assists the deployment of CT-products”; these finance user investments in CT. However, investments in emission reductions that are enforced by Government regulations (e.g. waste water treatment facilities) fall outside the theme of environmental finance; they form part of general investments in production technology. Corporate investments in the supply chain for CT products and services are not covered by the narrow definition of environmental finance used in this paper.

following statement: “Strength, clarity, and stability are decisive characteristics of the policy that attracts capital to renewable energy: that policy must be specific enough to improve the bankability of projects and provide conditions for steady market growth in the renewables sector. An effective policy framework must be ‘loud, long, and legal’: (i) The signal to the market, through *incentive structures* or other means, needs to be ‘loud’ and clear to attract capital into the sector; (ii) *Rules and incentives need to be stable and sustained* for a duration that reflects the financing horizons of the projects; (iii) A legally-established regulatory framework based around *binding targets or implementation mechanisms* is needed to provide the basis for long-life capital-intensive investments.”[3]

Investments in EE&RE of relevance for environmental finance have long lifetimes and long payback periods. Environmental finance comprises primarily medium and long-term loans; these require longer-term certainty for the continuation of the conditions that motivate investment. This is why the finance community needs signals that are long and legal.

The finance community needs a loud signal because environmental finance is a new and, until recently, was a small niche field for the finance industry. To motivate the entry investments by the finance community into the development of an environmental finance portfolio, the medium to long-term market prospects for environmental finance products must be good.

[3] Hamilton & Sonntag (2004)

2 Clean Technology: a potential Market that needs Unlocking

2.1. A large potential market with a long-term future

A short look at the characteristics of the CT market helps to understand the hesitancy of banks during the initial market development stages. Table 1 shows the British Government's estimates of carbon emissions in the industrial, public and household sectors in the UK.

Table 1: UK Carbon Emissions (2002) by Sector

	Number of entities	Annual carbon emissions	In percent of total
Energy intensive industry	2,400	25 Mtc	25,5%
Large non-energy intensive organisations	13,200	13 Mtc	13,3%
SMEs	909,000	10 Mtc	10,2%
Public sector		8 Mtc	8,1%
Households	21,000,000	42 Mtc	42,9%
		98 Mtc	100%

Source: HM Treasury (2005)

Roughly 25% of annual carbon emissions come from the 2,400 large energy intensive entities. EE and use of RE are part of their core know-how in process technology and are financed as part of overall corporate finance; the financing of their investments is not, therefore, relevant to the topic of environmental finance addressed in this chapter. The market segment for environmental finance is made up of the relatively small-scale investments in EE&RE made by the 13,200 large non-energy intensive firms, the 909,000 SMEs, the 21 million households, the public sector and finally, the suppliers for these. The financial situation and specific EE&RE needs of the segments are very heterogeneous.

Cost-of-supply curves for CO_2 mitigation typically show a large cost-effective EE&RE potential. An example is the UK cost of abatement curve shown in the table overleaf.[4] The "*negative cost measures*" in the chart refer to investments in EE&RE which are cost-effective for private investors based on their financial return from energy savings without separate payments for achieved carbon reductions. In developing countries, "*positive cost measures*" are the target for CDM-projects and programs.

[4] Copied from CBI (2007), see also Enkvist & Nauclèr & Rosander (2007)

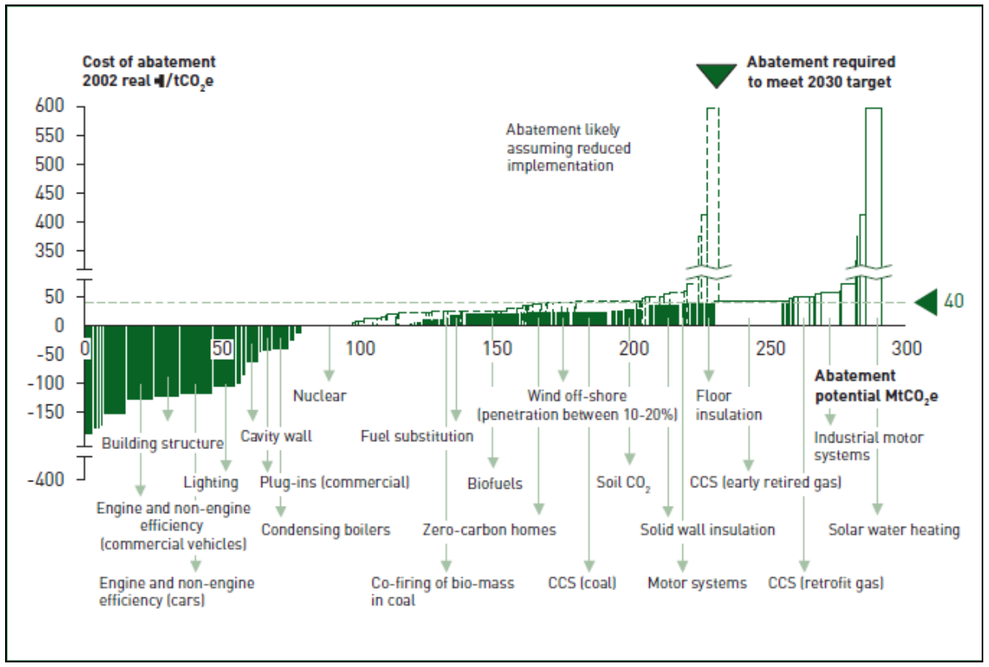

Chart 1: 2030 UK cost curve for additional greenhouse gas reduction measures
Source: CBI (2007)

The combined message from Table 1 and Chart 1 is that the cumulative market for environmental finance for EE&RE is potentially very large.

2.2. A market potential that needs to be tapped

While EE&RE policy has become part of the mainstream in energy policy in most countries, at least since 2004, the potential market in individual countries still needs unlocking. Three major and interlocked obstacles to investments in cost-effective EE&RE measures are listed below:

1. Competing options and needs. During times of rapid economic growth, investments in cost savings ("defensive investments") are lower on the priority list of enterprises than investments in capacity expansion ("offensive investments"). During periods of low growth in demand for their products and services when companies turn their attention to cost saving measures, managers can find profitable efficiency improvements "everywhere": in staffing levels, purchase and stock policies, etc. Managers aim at minimizing overall inefficiency in the company, not just in a specific area such as EE. For investments outside the core activity (i.e. in support services and ancillary

services), firms apply the 20/80 rule: that 80% of a potentially achievable result can be realised with 20% of the effort required to reach 100%. Households show a similar investment optimising attitude: when a new house is purchased, they invest in a new kitchen and/or in a new bathroom rather than in the EE-investments recommended in the energy certificate for the house. The first lead to visible improvements, the latter represent one financial investment opportunity amongst others.

2. Asymmetric information about EE benefits. Due to lack of required specialised technical knowledge, household consumers and small businessmen are unable to know whether a set of cost-saving measures proposed by a vendor or technician really results in the promised financial savings to the investor.

3. CT technologies have *higher upfront investment costs* than conventional technology. This is why terms for "environmental finance" that reduce the level of upfront equity finance to the legal minimum and give investors a positive operating cash flow from the first year after the investment are absolutely essential.

2.3. Generic Framework for Environmental Finance

Banks will engage in lending for clean technologies only if they are convinced that the government's promotion policy is durable. The credibility of that depends on the quality of the implemented framework.

Due to the interlocked nature of the obstacles to market development, effective frameworks to promote environment finance are complex, consisting of packages of complementary and mutually reinforcing instruments. To see what works and what does not, governments, therefore, monitor the outcomes of their support packages and look at international experiences for inspiration.

Best practice is always based on circumstance: concepts for market transformation through public initiatives cannot be copied successfully without significant adaptations to specific local conditions. Although framework conditions vary from one country to another, the contours of a framework for environment finance which is generally applicable can be established. The framework shown in Chart 2 groups government

interventions by three major categories of instruments: “demand pull”, “technology push” and “finance push” instruments.

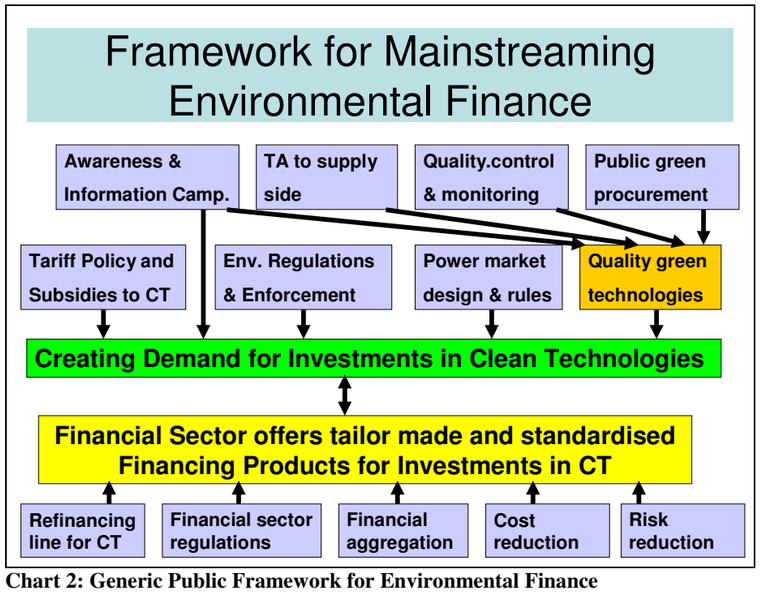

Chart 2: Generic Public Framework for Environmental Finance

“*Demand pull” instruments* increase demand for CTs directly; they are used to overcome the motivation hurdle to investments posed by competing wants and needs. Instruments include pricing/tariff policies, information campaigns to create consumer awareness, environmental regulations and enforcement, and power markets that facilitate entry of generation using renewable energy.

“*Technology push” (or technical supply side) instruments* affect demand for CTs indirectly by strengthening the quantity and quality of CT products and services and reducing their costs. They include information to consumers about the CT-characteristics of products, technical assistance to actors in the supply chain, monitoring and quality control of supply, and public procurement policies favouring CT. The aim of some of these measures is to give consumers confidence in the products and advisory services, overcoming the problem of asymmetric information.

“Finance push instruments” (or bank engagement programs) aim to increase the supply of environmental finance: these are tailor-made products which reduce the hurdle of high upfront investment costs. Instruments comprise refinancing lines, financial sector regulations that facilitate environmental finance, assistance in establishing non-conventional financing channels, and measures to reduce bank transaction costs and lending risks.

Chart 2 shows a coherent national deployment strategy: three packages interact to create a market demand for clean technology. Banks look at the framework from a slightly different angle. For them, the essential aspects of the technical supply side and finance push measures are not that they assist in demand creation. Rather, banks are interested in how technical supply side measures can assist the development of standardised clean finance products and to what extent bank engagement programs reduce initial bank barriers to entry.

The following three chapters look at the framework as seen through the lenses of the financial community. As far as possible, each chapter structures the treatment of subjects to start with those that are the most important for banks.

3 Demand Pull Instruments: Signals that are Loud, Long and Legal

3.1 Legal Signals: Fixing Policy Targets for EE&RE

Long-term government commitment to the development of a CT-market is expressed by lawmakers' adoption of a long-term policy for CT comprised of (i) quantified targets for the penetration of CT by a fixed date, (ii) an action program, (iii) long-term forecasts for the financial implications for the national budget, and (iv) specified budget allocations for the initial years.

Quantified targets without specified commitments and budgeted action plans have little chance of implementation. The risk of underperformance is high in EE&RE and CO2-mitigation policies, because they do not affect the population directly as, say, underperformance in health or education policies. Postponing the achievement of a target by a few years is, therefore, not an election losing exercise. The experience of Egypt's policy targets for RE during the last 20 years illustrates the situation in many OECD and developing countries. In 1986, Egypt adopted a penetration target for new RE equal to 3% of *final energy supply* in the year 2000. Ten years later, the *3%* target for RE was postponed to 2010 and shortly after 2000 redefined to refer to *3% of electricity supply* in 2010.

Because of such experiences, many clean technology advocates prefer to see *long-term quantitative targets enshrined in a law* rather than in the form of a cabinet decision, as the latter is easier to adjust. Turning a quantitative policy target into a legal obligation is happening for CO2-mitigation policies in Annex I countries[5] because of international treatises and conventions. In the EU, directives imposing CO2-emission reduction and RE penetration targets for 2020 are sub-translated into specific targets for each member country. But in the emerging and developing economies, the legal target approach is not likely to be adopted in the near future. In these countries, the financing community will be more impressed by the quality of the framework as a guide to credibility, rather than by the formal adoption in a law of a very long-term goal – such as the UK's 2050 target of an 80 percent reduction in carbon emissions!

[5] The industrialised countries and economies in transition listed in Annex I of the United Nations Framework Convention on Climate Change. Their responsibilities under the Convention include a binding commitment to reducing their GHG emissions relative to 1990 levels by the year 2012.

A more immediate priority, therefore, is to improve the quality of the policy making process which adopts the targets. A major reason for non-compliance with politically fixed targets for EE&RE market shares is that the target is fixed by government in a top-down, ad hoc manner with little reference to detailed economic cost-benefit calculations. A bottom-up approach to fix penetration targets for EE&RE is to set targets for individual sectors according to the economically viable EE&RE potential in each sector. The resulting *overall penetration target is more credible*, because it reflects the marginal cost-effectiveness of EE&RE and because the monitoring of outcomes at the sector level allows planners to react faster with changes in policy instruments when results do not live up to expectations.

3.2 Rational Policies for Energy Prices

A second, immediate priority is the introduction of rational pricing policies that are socially balanced. The elimination of subsidies to fossil fuels and electricity tariffs sends a louder and longer "legal" signal than the introduction of subsidies to EE&RE.

The typical situation in developing and emerging economies is summarized in Table 2.

Table 2: Pricing of Fossil Fuels and Electricity in Developing and Emerging Economies

	Gas and oil for power stations	Liquefied Petroleum Gas and Kerosene	Electricity for HH	Transport fuels: diesel, gasoline
Net exporters of energy	Subsidized	Subsidized	Lifelines tariffs	Subsidized
Net importers of energy	Full cost	Sales to households subsidized	Lifelines tariffs cross-subsidized by higher consumptions	Taxed

OECD countries usually adopt sensible pricing policies, directly promoting the deployment of CT through "green taxation" (taxes on fossil fuels, electricity, water, disposable containers and waste). Taxation policy may be inefficient – lobbyists can skew taxation in favour of specific interests, but overall, the price signals point in the right direction.

Many *fuel-importing developing countries* use taxes on fossil fuels to save foreign exchange and raise revenue for the state budget. Yet, also in these countries, household fuels are often subsidized to reduce the impact of increasing fuel prices on the financial situation of lower-income groups.

Developing countries that are net exporters of energy tend to give high subsidies to hydro-carbon fuels and to electricity, thereby undermining the creation of a market for EE&RE. In 2008, Egypt spend almost USD 11 billion on energy subsidies, equivalent to 5% of GDP, more than on the government budgets for education (USD 6 billion) and health care (USD 3 billion) combined.[6] Malaysia had one of the biggest fuel subsidy bills in the world, estimated at as much as 7% of GDP in 2008, before the government took the decision to increase prices by 40% in June 2008.[7]

[6] Friedman (2008)
[7] The Economist May 2008

Governments in developing countries are fully aware of the *damaging effect of high energy subsidies on the economy*: the price distortion leads to inefficient allocation of resources in the free market, while the financial burden on the public budget crowds out high value support to education, health and infrastructure. They also know that the *equity impact of energy subsidies is deficient:* since higher-income households consume more energy, wealthier households receive more subsidy support than poorer households. The exceptions are well-designed electricity lifeline tariffs for small levels of monthly electricity consumption that are cross-subsidized by higher-consuming households and subsidies to kerosene.

To replace energy subsidies with direct social income support is, therefore, in principle attractive to policymakers.[8] Nevertheless, many governments in developing countries believe that they cannot implement such schemes because (i) they cannot identify low-income households that are eligible for a social income subsidy as many live in the informal economy, and (ii) they do not have the local government capability to administer cash transfer schemes. Governments, who during 2008 approved increases in energy prices, therefore tried other avenues to reduce the burden on the poor: imposing price controls on more basic goods, subsidizing public transport and spending on infrastructure investments to create jobs. Yet, social survey methods to pinpoint the poor have been applied successfully in a number of countries and a number of innovative delivery channels are used to overcome the problem of weak local administrative capacity.

3.3 RE&EE Subsidies and Use of Regulation

The long-term credibility of a scheme to support the deployment of EE&RE depends on its cost-effectiveness. It depends on three aspects: (i) the quality of subsidy design, (ii) use of new loan instruments or (iii) use of regulation when this is feasible and more efficient.

3.3.1. Criteria for identification and optimisation of subsidy instruments

Although in principle subsidies are a scarce good, the cost-effectiveness of many national schemes in developed countries, compared to feasible alternatives, is surprisingly low. Too many schemes over-compensate beneficiaries, have high free

[8] Many economies in transition managed the transformation from subsidized household energy prices to full cost prices by letting municipal administrations pay part of the monthly energy bills of low-income households directly to utilities.

rider effects and distort markets unnecessarily. In less-rich developing countries, such RE&EE schemes would have a very short lifetime.

A variety of subsidy instruments are used to strengthen the demand for EE&RE.[9] The *primary objective* of making investments in CT commercially viable can be achieved by "any" subsidy. Optimisation, as illustrated in chart 3, calls for taking into account a number of design criteria

- *Impact effectiveness*: the scheme must lead to a significant expansion of the market and to cost reductions in CT, and generate employment and foreign exchange earnings/savings.

- *Distributional efficiency*: planners do not want to over-compensate investors, create big distortions on the market (e.g. by giving RE-generators too many exemptions from the general rules of the power market) or set up a system that imposes high administrative costs on recipients and on the public administrator of the scheme.

- *Burden sharing efficiency*: the schemes should not impose a heavy burden on low-income households or on energy intensive industries that are subject to fierce foreign competition nor lead to unwanted redistribution of income between firms and social groups.

[9] RE&EE subsidies have three sources of finance: (i) the state budget; (ii) consumers of conventional energy; and (iii) grant funds and soft loans from clean technology funds for international carbon finance. A subsidy can be given to (i) the cost of investment, (ii) to output, or (iii) to costs of operation. get-neutral. See Lindlein & Mostert (2005) for a presentation of subsidy instruments using the "financing source-subsidy target" matrix.

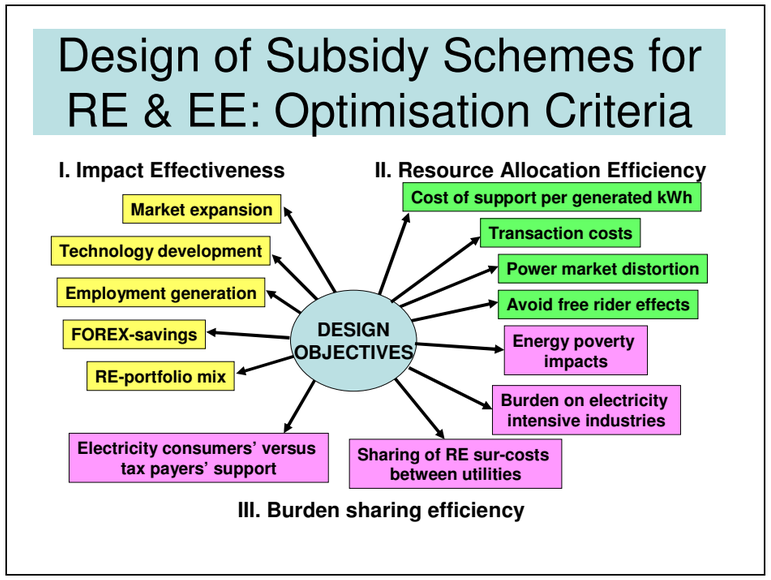

Chart 3: Criteria for Optimisation of Subsidy Schemes to EE & RE

In countries worldwide, one can see a trend towards increasing sophistication of policy instruments for EE&RE.[10] Recent subsidy schemes in emerging and developing economies are remarkably well-designed. Inter alia, they include efforts to identify *budget neutral subsidies;* as such, they touch the core of the optimisation issue, which is subsidy affordability for the government:

- The Ministry of Energy in Tunisia convinced the Tunisian Ministry of Finance of the benefits of introducing a per-system subsidy to solar water heaters. The decisive argument was that solar water heaters replace consumption of subsidized Liquefied Petroleum Gas (LPG) for water heating and that, according to calculations, the reduction in replaced subsidy payments to LPG was higher than the cost of the subsidies to solar water heaters.

- Egypt has a dual price system for its national natural gas production. Natural gas consumed in Egypt is priced at the "cost of production", exports of gas at the "price from export contracts". Output from grid-connected wind farms replaces power generation at natural gas-fired power plants, allowing Egypt to use saved gas consumption to increase its exports of gas (mainly in the form of LNG). The decision was taken to split the increase in gas revenue 50%/50% between the Ministry of Oil and a Renewable Energy Fund, which was created under the Ministry of Electricity. The REF pays a subsidy per kWh to wind

[10] See IEA (2008) and OPTRES (2008).

farms, which they receive on top of the electricity tariff per kWh paid by the national transmission company.

- The *Sri Lanka Sustainable Energy Fund* is funded by a variety of sources, making its long-term viability a high probability.[11] The objective of the fund is to support investments in EE&RE; first and foremost investments in RE generation, which are paid technology-specific feed-in-tariffs by the national power company CEB.[12] The fund reimburses the power company for the difference between (a) the average cost per kWh of conventional generation in the system[13] and (b) the feed-in-tariffs. The strategic objective of the mechanism is dual: to secure sustainable funding for EE&RE investments, yet avoid political opposition from CEB due to costs imposed on CEB by an increased penetration of RE generation.

[11] See Sri Lanka Sustainable Energy Authority Act, No.35, 2007
[12] Technology-specific feed-in-tariffs pay different tariffs for different technologies, reflecting differences in their average costs of production per generated kWh. In order to allow a broader portfolio of investments to enter the market, higher-cost technologies (e.g. solar PV-systems) get a higher tariff than lower cost technologies (e.g. wind turbines).
13 The average cost of the tariffs paid to independent power producers (IPPs) using thermal power and the costs of the production generation plants owned by CEB, which are mainly medium-scale hydropower,

3.3.2. Mixing Subsidies and Long-term Loans

A separate optimisation issue is the balance and interaction between the subsidy instrument and the loan finance instrument. The barrier of high upfront costs of SME and household investments in EE&RE can be reduced by a combination of up-front grants and use-specific long-term loans on favourable terms. Together, these two instruments must bring the up-front cash payment down to the feasible minimum and reduce the annual cash payments during the amortisation period to a level which is below the payments for saved conventional energy.

Often loans are sufficient to overcome an initial purchase hurdle. Some demand side management programs, for example, give compact fluorescent lamps (CFLs) to households free of charge. A more efficient alternative are schemes where commercial banks lend funds to the electricity distribution utilities for purchasing CFLs that are distributed or sold to clients. Clients do not pay for the bulbs upfront; rather, the utility adds a loan amortisation surcharge to the monthly utility bill until the loan is fully repaid. In Sri Lanka, the electricity distribution companies CEB and LECO provided interest-free loans to customers to purchase up to three CFLs. The loans were repayable in 12 monthly instalments and were recovered through the electricity bill. An independent testing facility was established to authorise the different brands of CFLs.

3.4 Balance between market based and regulatory Instruments for Market Expansion

Governments have a large arsenal of instruments to draw from: catalogues of laws, regulations and policy instruments can be found on relevant websites.[14] Instruments for creating a higher demand for EE&RE technologies can be divided into two categories:

1. "Command and control instruments"*:*
    - Regulations imposing use of EE&RE technologies
    - Norms and standards for EE in buildings, appliances and vehicles
    - "Voluntary agreements", negotiated agreements between industry associations and governments to attain specific targets for EE

[14] See IEA's Energy Efficiency Policies and Measures Database http://www.iea.org/textbase/pm/index_effi.asp or American Council for an Energy-Efficient Economy's http://www.aceee.org/energy/state/ for measures in US states.

2. “Market based instruments”:
    - Incentives for action: economic and financial incentives for investing in EE
    - Information: EE labeling, information campaigns, demonstration projects

For every instrument, there exists an alternative. Energy efficient lamps, for example, can be promoted by a package of *market instruments,* e.g. promotion campaigns, grants and utility-based lending; or through use of *regulation*, for example interdicting sales of incandescent lamps. A third optimization issue concerns the balance between the use of grant/market instruments and the use of regulatory instruments. When should which be used?

Market-based instruments have a comparative advantage in “promoting good practice”. They are most effective when incentives for action (investment grants, soft loans, loan guarantees, tax credits, and fossil fuel taxation) are combined with effective know-how building (information on the advantages of EE through labeling, demonstration projects, support to advisory offices, and promotion campaigns). The importance of government-financed *awareness*[15] and *information*[16] *campaigns* is well-established. Whereas information about CT characteristics, availability of advisory services and environmental finance is straightforward, still very little is known about how to design effective awareness campaigns that can change consumer behaviour and lifestyles towards “energy modesty”.

Command and control instruments are used, above all, to address systemic causes of market failure; their comparative advantage is in preventing bad practices. Examples from EE are (i) norms for fuel efficiency in new cars, where progress in efficiency was undermined by consumer preferences for horse power, acceleration and advanced air conditioning (all promoted by marketing campaigns from car manufacturers); and (ii) norms for EE of apartment buildings, where EE faces market obstacles such as landlord-tenant differences of interest. Regulations imposing energy audits and compulsory investments in non-energy intensive industries, where energy is just one cost factor among many that compete for management attention, are an example of promoting good practice. For environmental finance the most important regulations are:

- Regulations for EE and RE in building codes;

[15] To create interest in EE&RE, most effectively through information on the financial benefits of EE&RE
[16] About technical options, available technical products, service companies and conditions for environmental finance

- Regulations for labelling of appliances; and
- Regulations for the integration of rooftop photo-voltaic (PV) systems in power market transactions.

Building codes[17] impose standards for EE[18] in new construction.[19] EE standards are a good instrument in theory; in practice, they suffer from severe implementation and enforcement problems. Only 40% of new buildings comply with building codes in the UK; this figure is as low as 20% in the Netherlands (depending on effectiveness of monitoring activity by the local municipality) and 5% in China. Since countries increasingly apply full-cost-of-supply tariffs for industrial and commercial customers, there is a potential market for standardised EE packages for industrial and commercial buildings. However, it is prudent to conclude that in most emerging and developing countries the situation is not ripe for the development of tailor-made environmental finance for standard EE-packages in residential building renovations. It is more cost-effective to focus on improving the enforcement mechanisms for the building code for new buildings: annual additions to the building stock in emerging economies are much higher than in developed economies due to the positive growth rates of their national populations and the fact that demand for building space increases with the growth in per capita income.

EE standards are also introduced for *major energy consuming appliances;* yet, the enforcement record here is also mixed. Thailand implemented energy efficiency standards for air conditioning and refrigerators as part of a DSM program. Although similar labelling programs were introduced for refrigerators and air-conditioning systems, significant energy savings were achieved only for refrigerators. In the case of air conditioning, where the number of manufacturers was very high in contrast to the number of refrigerator manufacturers, serious enforcement problems occurred. The air-conditioning market would have needed stricter enforcement and stronger market intervention strategies.

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[17] Building codes for EE exist in two forms. *Prescriptive codes* set separate performance levels for major envelope and equipment components, such as minimum thermal resistance of walls. Due to easier enforcement, they are the most common. *Overall performance-based codes* prescribe an annual energy consumption level per square meter of floor area or an energy cost budget. They provide more scope and incentives for innovation, but require better trained building officials and inspectors. Building codes for RE require instalment of building integrated RE-systems (e.g. rooftop PV-systems, solar water heater systems) in new construction (covering a minimum percentage of the building's energy consumption) or provide for reservation of space for later instalment of RE systems in or on the building.

[18] "EE buildings" are buildings that achieve low levels of annual energy consumption through a mixture of (i) architectural design, (ii) use of highly-insulating materials including EE-glass and window frames, (iii) EE cooling & heating, ventilation and lighting systems, (iv) power supply from building integrated PV (BIPV) and (v) water saving measures.

[19] In the EU codes also apply for existing buildings in connection with major renovations.

The components of a sustainable regulatory framework for investments in small-scale distributed (embedded) generation such as rooftop PV systems are well known:

- Compulsory rules imposed on distribution companies for grid connection;
- Feed-in-tariff for surplus (or total) sales of electricity from the PV-system to the distribution grid; and
- Rules for net metering.[20]

4 Technical Supply Chain: Standardisation through Coordination

4.1 Linking Standardised EE&RE Products to Standardized Finance

A bank can introduce standardised finance products only for standardised CT products. Among relevant EE&RE products one can distinguish between “off-the-shelf” products for stand-alone applications and products that are integrated components of buildings or of industrial processes.

Examples of the first category are solar PV-panels, solar water heaters and, at the micro-scale: compact fluorescent lamps. Standardisation for these means building “guarantees” for quality through equipment specifications and standards for products, and through certification of qualified vendors and installers who participate in government-sponsored promotion campaigns.

EE-equipment for industrial processes and EE-retrofitting of industrial, public and private buildings are examples of the latter. Here, standardisation involves:

1. *Environmental/energy audits in industry* and *energy certificates for buildings*. Standardisation in this case is not in terms of content, but in terms of guaranteed quality: investment packages with CT benefits are identified by specialised experts and have a positive financial rate of return. Because

[20] Net metering allows the building or home owner to sell to the grid any excess electricity generated by the PV installation; the customer's electric meter will run backward when the solar electric system produces more power than is needed to operate the home that time. A special utility-grade inverter converts the DC power from the PV modules into AC power that exactly matches the voltage and frequency of the electricity flowing in the utility line; the system must also meet the utility's safety and power-quality requirements. In the event of a power outage, safety switches in the inverter automatically disconnect the PV system from the line.

audits present a package of individual measures, investors can ask banks to finance either some of the measures or the whole package.

2. *Model ESCO contracts for energy saving contracts and energy supply contracts.*[21] These are particularly important for promoting energy savings in the public sector and for creating sufficient national demand for the operation of ESCO-companies.

4.2 Capacity Building and Quality Control in the Technical Supply Chain

For the future of environmental finance, it is essential that consumers have faith in the quality of promoted products, in their installation and in the availability after-sales-service. Governments use two complementary instruments to promote quality in the supply chain: one is capacity building, the other is regulation.

A number of countries can boast good results with dedicated capacity building programs. Tunisia and Morocco, for example, implemented successful capacity building programs for “solateurs” (installers of water heater systems).

A necessary supplementary instrument used in public support programs for EE&RE is regulation: to have access to a subsidy, investors must get the work done by certified experts, vendors and installers who have participated in specialised training courses; often there is a list of qualified vendors and experts for investors to choose from. The system involves random checks of the quality of executed works and withdrawal of licenses for dealers and/or installers that do not perform. In this way, for example, Bangladesh, Sri Lanka, and Nepal managed to create country-wide dealer and retailer networks for solar PV-systems.

4.3 Increasing Supply by Lowering Costs of Entry for Service Providers

Governments use several tools to increase the number of companies providing CT products and services:

- Increase of the supply of qualified experts by introducing Master of Science courses at universities in EE&RE and by offering EE&RE courses at vocational training institutes

[21] ESCOs are companies that perform energy audits and invest in the identified package of EE-measures at the plant of the beneficiary. Beneficiaries have no net cash costs. The ESCO is paid out of a pre-defined share of the value of energy savings during operation until the “loan” is amortised.

- Direct assistance for the creation of specialized companies, e.g. by organising training courses given by foreign specialists in the organisation and financing of ESCOs
- Public procurement of EE&RE services through mandated energy audits and investment programs for public buildings. This is important in particular to build sufficient national demand for the operation of energy service companies (ESCOs).
- Facilitating the rental of high-cost specialised equipment

For example; Sri Lanka eases the entry of new-comers in EE-consulting and engineering through the facilitation of an instrument bank[22] and calibration services, both are rented out on an ad-hoc short term basis by the Sustainable Energy Authority.

4.4 National and Local Governments as Organisers of Supply Chain Networks

Market transformation through public policy is by definition implemented through public-private-partnerships (PPPs). Several sophisticated and successful PPPs for the promotion of EE&RE have been implemented in OECD and in emerging and developing countries. In this section, the first example provided is of a program coordinated under the auspices of central government; the second is coordinated under the auspices of local government.

a. <u>National Government as Facilitator of Financial and Technical Supply Networks</u>

In 2005 Tunisia launched the Progamme Solaire, or PROSOL program, which uses a number of innovative instruments and broad collaboration between government agencies, the national power company, the financial sector and solar system installers to achieve its results. PROSOL is implemented jointly by:

- The Ministry of Industry and Energy,
- The national agency for EE, Agence Nationale pour la Maîtrise de l'Énergie (ANME),
- The national power company, Société Tunisienne de l'Electricité et de Gaz (STEG),
- The financial sector, and
- Solar water heater dealers and installers.

[22] Comprising flue gas analyzer, temperature data loggers, power analyzer, portable power meter, air flow meter, temperature, humidity & TDS meter

Financial and technical assistance support provided by PROSOL is co-financed by the state, the Global Environment Facility (GEF), the United Nations Development Program (UNDP) and the Italian government.

PROSOL focused initially on the promotion of 200 and 300-litre solar water heating systems for residences aiming to install 500,000 m^2 by 2009. Financial support to solar water heaters (SWHs) comprises a direct subsidy as well as an investment rate subsidy. SWHs get a subsidy of 100 DT (EUR 59) per m^2 up to a total sum of TND 400, which amounts to 19% of the installed price of a 200 liter 2 m^2. SWH (price of TND 1100) and to 22-27% of the installed price for a 300 liter 4 m^2 system (TND 500-1800).[23] The purchase of a 2 m^2 SWH costing TND 1100 is financed by the subsidy of TND 200 and a consumer cash payment of TND 150; the remaining TND 750 is financed by a five-year bank loan with an interest rate of 7% instead of the usual 14%, and which is repaid through a surcharge on the monthly electricity bill.

The interest rate reduction is achieved partly by a USD 2 million GEF grant, and partly by STEG administering the amortization of the loan on behalf of the banks, which reduces the costs of transaction for the banks and eliminates the need for collateral. Installers are in principle authorized: ANME gives short-term training courses (1-3 day courses) to installers, but in practice the criteria for authorization are applied softly in order not to slow down the development of the market. ANME also gives training courses to SWH consultants for dimensioning systems for commercial buildings[24] and for supervising the construction work; an authorization system is also used here. Consumers get a one-year guarantee for installation, a 5-year guarantee for the water tank and a10-year guarantee for the solar collector.

b. Local Government as Facilitator of Supply Chain Networks

In many CT promotion programs, a central government agency acts as coordinator. But partly inspired by Agenda 21[25] initiatives, municipalities across the world have become increasingly engaged as local promoters and coordinators of EERE finance. Rooftop PV, solar water heaters, geo-exchange cooling, EE-projects, and water supply and

[23] The state budget provides USD 2.5m to finance the cost of the subsidy, the two donor-financed programs MEREP and MEDREC an additional USD2m. The state provided subsidy amount is, however, compensated by replaced LPG-consumption, which saves the state USD 2.5m per year when the 700,000 m^2 target has been reached!

[24] In the previous GEF project suppliers tended to over-dimension the system to charge higher prices.

[25] The programme action plan that came out of the 1992 United Nations Conference on Environment and Development, the Rio Summit. It was given the title Agenda 21 because of the 21 chapters dealing with a wide range of aspects relating to sustainable development.

waste disposal projects are implemented everywhere; hence the importance of including local government as actors in market transformation programs. Their role can be described as follows:

- To execute their planning and regulatory functions for approvals of CT projects efficiently; this lowers project risk and pre-investment costs;
- Provision of information to consumers;
- Quality control of implemented CT-work; and
- Organisation of PPPs for program implementation. Several successful PPPs can be identified worldwide.

The chart below gives an example of a scheme for promoting EE in the building sector: the “one-stop clearing house” administered by the British municipality of Kirklees. It is composed of: (i) impartial information to consumers about AE, (ii) the administration of subsidy payments to AE, (iii) technical assistance to the supply side, (iv) quality control with performance and (v) bank loans to consumers for investments in environmental finance.

“Kirklees Energy Services” (KES)

- A ‘one-stop shop’ for householders, accessed by calling a freephone number.
- KES provided householders with advice on energy efficiency measures, discount prices for installation and access to cashback and preferential loan schemes.
- Householders would be referred to an approved installer, from the network set up by KES, who would inspect the property and recommend appropriate energy efficiency work.
- Once the work was completed, the householder paid the installer, and would then be eligible for cashback payments from KES.
- The quality of the scheme was monitored through inspections of 10% of the works, questionnaires sent out with cashback payments, and telephone surveys.
- The installers – of measures such as cavity wall insulation, loft insulation, draught-proofing of doors and windows, heating controls, hot-water tank insulation, floor insulation and condensing boilers – were selected following a tender published in local newspapers.
- The successful installers received specific energy efficiency training to help householders identify the areas where work could be most beneficial. Installers paid a referral fee of 5% to KES, to fund the scheme’s administration.
- Three local credit unions became partners in the scheme, offering preferential loan facilities for householders to install energy efficiency measures. Without this access to dedicated finance, it is likely that many householders would not have been able to improve their homes’ energy efficiency.

5 Bank Engagement Programs: Overcoming Hurdles to Entry

5.1 Justification for Bank Engagement Programs

The financial community is seldom in want of demand for its products. It has alternative business opportunities other than environmental finance to expand into. During the pilot phases of initial market development, transactions are small and start-up costs are high. At this stage, most RE companies in developing countries are frustrated by the lack of bank interest in their businesses, either to finance their operations or to lend to their customers.[26] For this phase, *a bank sector- specific framework to overcome the entry hurdles* is usually required to ensure bank engagement.

A typical support program includes the components discussed below.

5.2 Refinancing

Refinance facilities are found in almost all countries, normally financed by soft loans and grants from donors and international development banks. They may be the most important instrument of all. They give the banks a direct economic incentive to engage in environmental finance: because of refinance, the bank's involvement in environmental finance adds to its overall financial volume and does not reduce its financial engagement in conventional lending activities. Their terms can match the longer tenor of loans for EE&RE.

KfW's environmental finance line for investments by home and apartment owners in the EE of buildings is an interesting example of a well conceived and integrated refinancing program, which is led and organised by a national development bank. A few aspects are highlighted below.

- KfW provides a refinance line for loans by homeowners in EE.
- Households go to their local banks to apply for a loan. Loans have 10 years duration, low rate of interest (subsidized by KfW) and a grace period.

[26] "They claim that banks don't understand their business, their technology or their customers and generally lack incentive to innovate the financial services they have on offer." Usher & Touhami (2006)

- The loans finance only specified packages of typical EE measures in “older houses”.
- A certified energy engineer approves a priori the package and after finalisation of the works, the quality of implementation.
- If the implemented package results in an EE standard equal to the norms of new buildings, the home owner gets a 5% reduction in the repayment of principle, and a 12.5% reduction if the EE standard is 30% better than the building norm for new houses.

5.3 Information and awareness building, capacity building

Information and moral persuasion by government is required in all countries. The process involves multi-actor discussions between, on the one hand the financial sector, and on the other hand the ministries responsible for finance and energy as well as stakeholder representatives from the private sector. The government lays out its EE&RE policy goals and implementation, specifying the roles of each major actor. With the help of the donor community and foreign technical assistance, the government can inform the financial sector about quantified estimates of the future market demand for environment finance once the government policies are implemented.

With the help of the donor community and foreign consultants, governments can provide cost-shared capacity building (i) in the design and administration of new environmental finance and (ii) in basic technical appraisal of EE&RE projects.

5.4 Reducing risks for banks

Guarantee facilities for loans to customers who have little collateral to offer have been developed in several countries. In theory, partial risk guarantees to local banks for loan repayment as a collateral substitute are a god instrument; but in practice they result often in serious moral hazard.

Sustainable Energy Authority (SEA) in Sri Lanka provides a 75% guarantee on loans for RE and EE investments for up to USD 100,000. For this it charges the banks an annual premium of 0.5% of the amount guaranteed or loan amount outstanding. The premium is expected to mainly meet the cost of facility management. The scheme helps to solve the problem of lack of collateral of small-scale investors. The banks perform the financial due diligence review of the investor and the project; if it is positive, the bank forwards the project proposal to the Guarantee Fund to undertake the

technical review and approve the guarantee. Normally, the loan repayment period will be the project payback period guaranteed by the ESCO plus one year; the maximum repayment period is 6 years. SEA's guarantee facility is endowed with USD 500,000. A fund reserve of 15% of loans guaranteed, based on the highest non-performing loan portfolio of leading banks in Sri Lanka, is set aside as a loan loss reserve. Based on this and the 75% guarantee limit, the fund can leverage close to USD 5 million in loans for EE&RE projects.

Guarantee schemes for loans to solar home PV systems, usually with involvement of vendors for the recycling of recovered systems by banks, have also been put in place in Sri Lanka as in other countries.

5.5 Facilitating Financing Channels for Bank Loans to CT-investments

In the Tunisian PROSOL program, the government used its regulatory powers to persuade the state owned *power utility STEG to channel bank loans to consumers for investments in solar water heaters. Consumers paid back their loans, including payment of interest,* through a fee on the monthly electricity bill. This turns a multitude of tiny loan transactions for the financing institution into one single large loan which is given to the utility.

Another and by now well-tested avenue is for the government to act as originator of collaboration and *financial links between established commercial institutions* which provide the basic finance and *microfinance institutions,* which provide loans to small-scale business and households investing in EE&RE.

5.6 Concluding Remarks

The prospects for environmental finance look promising even in the short term. The need for coherent frameworks is increasingly understood by governments, the designers of integrated policy packages can draw for inspiration and evidence on a large number of proven tools and implementation approaches and the financing community sees a market which grows from year to year!

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