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Chapter I

Introduction

Up-scaling of the good practices, in general, should lead to more benefit to more people in a wider geographic area than the area having such practices (FAO, 2006). However, not all good practices can be scaled up. In some cases, only a part of the good practices can be scaled up. This chapter discusses the up-scaling process and some prerequisites needed in up-scaling process identified in the cases discussed in the Compendium of Good Practices for the Prevention and Control of Air Pollution (hereafter “the Compendium”). Furthermore, lessons learnt from the good practices are also discussed.

5.1 Up-scaling process

In general, the term up-scaling is used with reference to replication, spread, or adaptation of techniques, ideas, approaches, and concepts (i.e., to means), as well as to increased scale of impact (i.e., to ends) (World Bank, 2003). Middleton et. al. (2003a, 2003b) has defined up-scaling of good practice as the process which leads to “More quality benefits to more people over a wider geographical area more quickly, more equitably and more lastingly”. World Bank (2003) further defines scaling-up process as a process “to efficiently increase the socioeconomic impact from a small to a large scale of coverage”. In this report, the general definition of up-scaling process as the replication, spread or adaptation of the good practices (or a part of the practices) has been adopted.

During the up-scaling of the successful practices, the transfer or expansion of experience considered as "successful" impact is critical. Desired outcomes and impacts can be quite different from one place to another, notwithstanding outward similarities. Furthermore, different stakeholders have different perspectives on what they consider success (World Bank, 2003). However, the outcomes, impacts, and costs of scaling-up activities are also important to consider. Although the measure of success can be different when assessed from different perspective, there are cases where a common target is set as a common measure of success. U.N. Millennium Development Goals as well as the targets set by the several protocols discussed in the Compendium are some examples that can be taken as a reference point for the success.

World Bank (2003) states that there are two basic ways for up-scaling:

i. Expansion of experience--i.e., up-scaling impacts within an area or country on the basis of one or more existing useful, preferably successful, initiatives; or
ii. Transfer of experience--i.e., up-scaling impacts in new and unassociated areas on the basis of one or more useful, preferably successful, initiatives.

However, in practice, there may be some overlap between these two. Further, scaling-up also includes broadening indirect impacts by influencing other actors working in the same field. It often requires planned processes of dissemination to new areas/and or target groups. The likelihood of a good practice being up-scaled depends on a number of factors, which are partially determined by requirements of the good practice itself. These factors should be taken into consideration for successful adoption and expansion of good practices (World Bank, 2003).

Pillars of Success

Experiences in scaling-up process of watershed management projects in Southern Brazil have revealed the following factors as the "Pillars of Success" (Lituma et al., 2003):

- Existing technology and adaptive research to address identified problems
- Intensive training and dissemination of new practices and participatory approach
- Incentives to induce adoption of new practices and approach
- Laws, regulations and their enforcement provide the environment for adoption of new technologies and approaches

Some of the lessons learnt during the up-scaling process of the watershed management project are listed below:

- Intensive training in group dynamics and use of participatory methods
- Creative, motivated and well trained extensionists (implementation-supervision)
- Management of natural resources based in technological changes adapted to local needs and conditions (immediate benefits for farmers and local community)
- Participatory methods for selecting municipalities, micro-watershed, and activities to be undertaken: use both technical, environmental and social criteria
- Decentralized implementation with strong local participation (government, beneficiaries and private sector)
- Appropriate technology backed up by research
- Financial incentives to induce adoption of technology and behavioral changes
- Robust monitoring and evaluation systems and strong management units in place to adjust implementation
- Conducive legal framework, including sanctions

There are two approaches, ‘horizontal’ and ‘vertical’ scaling-up approach: Vertical scaling-up is an expansion higher up the ladder. It is institutional in nature and involves other sectors/stakeholder groups – from grassroots organizations to policy-makers, donors, development institutions and international investors. Horizontal scaling-up is the geographical spread and expansion to more people and communities within the same sector or stakeholder group (Middleton et al., 2002).

There are four different types of scaling-up process (FAO, 2006; Middleton et al., 2003b):

i) Quantitative up-scaling: It involves dissemination over a wider geographical area as a result of spontaneous spread or replication of the practice. Quantitative up-scaling involves an increase in the number of people involved in a practice in a geographical area and focuses on adoption of information or practices by the intended population. Such type of up-scaling process would be useful for the promotion of solar water heaters, vertical shaft brick kilns etc.

ii) Functional up-scaling: It involves expansion of the scope of a good practice through addition of new activities. For example, in addition to the domestic water heating, solar water heaters can also be promoted in the industries for their process heating needs.

iii) Organizational up-scaling: It involves deepening or broadening of an organization’s capacities or membership, enabling it to become more efficient and flexible, with the objective of being more sustainable over the long run. Promoting skills development, diversifying and stabilizing funds, increasing the degree of self financing are examples of organizational scaling-up. Such type of up-scaling may be used for establishing a dedicated institution for air pollution control activities and further strengthening its capacity in the sector.

iv) Political up-scaling: It involves an organizational endeavor to influence policies through lobbying, networking or direct entry into policy processes. Establishing a forum of stakeholders as in the vertical shaft brick kiln program in Nepal, lobbying through non-governmental organizations in banning of polluting diesel 3-wheelers in Nepal are some of the examples of the political up-scaling.

5.2 Prerequisites of up-scaling process

Within the scope of the lessons learnt from the good practice cases discussed in the Compendium, the following prerequisites are identified as critical for the scaling-up of good practices:

- Political Will
- Institutional resources (laws/regulations/social organization etc.)
- Human resources and financial support
- Awareness among the stakeholders
- Networking and stakeholders' participation

5.2.1. Political will

A strong political will among the member countries/states is found to be vital for bringing these members to a political consensus in combating transboundary air pollution. In many cases, absence of political consensus hampers the policies at national and local level. Political lobbying at different levels can help to form a political consensus while it also helps in mobilizing available resources at different level.

With a political consensus among the stakeholders, treaties or regional agreements are formed and these results in the form of protocols. These protocols target reducing specific pollutants. These protocols are usually formulated on the basis of scientific knowledge on the cause and effects of the targeted pollutants. The protocols have a clear time line with defined physical boundary and a legally binding target.

5.2.2. Institutional framework

An institutional framework plays an important role in up-scaling the good practices. It gives a momentum to the treaties and protocols to be implemented under stipulated rules and regulations. The existing government structure might be utilized for such a framework. In some cases, special institutions need to be established with adequate human resources and technical handling capacity. Reliable information on emissions and their effects/impacts and their costs of abatement measures are some important aspects needed to be established within the framework for up-scaling process. A comprehensive monitoring system is an essential prerequisite for such measures.

A vision needs to be developed that identifies indicators appropriate for monitoring and evaluation for each of the activities under the up-scaling. This would allow each institution to define their role in scaling-up and to develop relevant ‘scaling-up targets’. Once a scaling-up goal has been identified, a logical planning sequence can be followed; developing appropriate objectives, outputs, activities and indicators in order to full fill the up-scaling goals.

In the good practice cases presented in the Compendium, it has been demonstrated that the mechanisms like command and control, and market based approaches are the instruments implemented by member countries in order to meet the target in the protocol. These approaches require either an establishment of an institution or strengthening of the existing institutions, for example, Environmental Protection Agency (EPA) in the United States, European Environmental Agency in Europe, Dutch Emission Authority (DEA) in the Netherlands etc. Implementing market based approaches like emission trading, a competitive market sufficient enough to conduct trading of pollutants is necessary and this requires an institutional framework to smoothly carry out these activities. Binding laws and regulations will help in enforcing these approaches. Regular monitoring and evaluation of the polluting activities will be an essential activity for implementing such approaches. A dedicated institution would be necessary to oversee these activities.

5.2.3. Human resources and financial support

Skilled human resources are a prerequisite and especially the more sophisticated is the approach undertaken, the more skilled human resources it may require. Implementation of emission control approaches would require various kinds of expertise. It is crucial that there exist necessary human resources to effectively implement an approach or program.

The availability of financial resources is another important factor in a scaling-up process. All the basic activities including pre project planning, institutional strengthening, stakeholders' participation and networking, dissemination of information, capacity building, monitoring and evaluation imply a cost that needs to be met.

5.2.4. Awareness among the stakeholders

Scaling-up requires that the concepts and principal of scaling-up are fully understood among the stakeholders. Stakeholders at all levels require a clear understanding the purpose of scaling-up and how it can be done. Each should have clearly defined role in scaling-up, and planning, implementing, monitor and evaluating activities. To facilitate this, institutional capacity should be developed and strengthened. Failure to fully understand the implications of the concept for institutional strategies and activities will limit the potential for scaling-up. These require deliberate planning and actions early in the project or programme cycle and need to be understood at all level. To facilitate increased institutional capacity in scaling-up, it is important that concepts are clearly communicated and developed by stakeholders. Awareness can be created using different media like radio, newspaper and television etc.

5.2.5. Stakeholders' participation

Stakeholders' participation has been a key in the success of up-scaling of the good practices. From the early stage of implementation, all stakeholders at different levels need to be involved in the up-scaling process. Participatory approach could be used for sharing of information among the stakeholders. This would ensure smooth decision making at each level during the up-scaling process. The good practice cases discussed in the

Compendium demonstrated that the success of the good practices also lies in developing networks of stakeholders with well-defined roles and responsibilities and legally binding agreements. For example, the establishment of Vertical Shaft Brick Kiln (VSBK) Entrepreneurs Forum was one of the major achievements in the VSBK program in Nepal, which has been successful in disseminating information on the different issues of Vertical Shaft Brick Kiln technology.

5.3 Strategies for up-scaling of the good practices

In this section, strategies for up-scaling good practices discussed in the Compendium are discussed. The good practices presented in the Compendium fall in the following general categories: (i) Emission Reduction Credit Mechanism, (ii) Emission Tax, (iii) Standards on Emission, Technology and Fuel Quality, (iv) Transport Demand Management, and (v) Cleaner energy efficient technology: Transfer, development and deployment.

5.3.1 Emission Reduction Credit mechanism (Cap and Trade mechanism)

In the Emission Reduction Credit (ERC) mechanism, firms are issued an allowance with a maximum emission limit for a given year (emission permit). If a source reduces emission below the allowable emission limit, the additional reduction is credited to the source. The credits earned by the firm can be used by the same firm or another firm in order to comply with the emission limit. As the cost of pollutant abatement may be different for different firms, some firms may opt for buying the credits from other firms if the former’s cost of abatement is higher than that of the latter. This mechanism is called as emission trading (ET). Such mechanisms are in place at United States for SO_2 trading under the Clean Air Act 1990 Amendment and NOx trading under the OTC NOx Budget Program. A NOx trading mechanism also exists in the Netherlands.

Strategies to implement and upscale the ERC mechanism

In order to upscale and implement the ERC mechanism, the following activities need to be undertaken:

5.3.1.1 Enactment of acts/regulations on emissions:

In order to maintain the emissions to be within the desired level, it is necessary to create a legally binding obligation on the part of emission sources not to exceed their emissions beyond the permissible levels. This requires a legal act or regulation on emissions. For example, the Clean Air Act 1990 Amendment is the legal basis for the SO_2 emission trading mechanism under the US Acid Rain Program and NOx emission trading mechanism under the NOx Budget Program in the United States. The act or regulation on emission control could be solely to meet a country's own environmental policy or objective. Alternatively, such act/regulation could be enacted to meet the country's obligation under a regional/international agreement/treaty.

The acts or regulations on emission control should clearly define the target polluting sources on which the act/regulation would be applicable. The target polluting sources may be identified based on the plant capacity in some cases and output levels in other cases depending upon types of polluting sources (e.g., power plants, industrial boilers). The criterion for definition of the target sources may be modified over time or it can be extended phase-wise to cover a broad range of entities over time. In practice, such mechanism should initially target large point sources of pollution, for which the mechanism would be more cost effective in terms of emission reduction management activities. e.g., the US Acid Rain Program had identified 263 units of existing coal burning electric utility plants in its Phase I each having capacity over 25 megawatt and all new electricity plants. The Phase I was expanded by an additional number of units in 1997 and it covered altogether 2000 units in Phase II which was started in 2000. Further the act was stricter in Phase II tightening the annual emission limits to the larger plants and also set restriction to smaller, clean coal as well as oil and gas fired utilities.

5.3.1.2 Developing emission database

An emission database or emission inventory containing historical emission activities of the polluting sources need to be established before setting an annual allowance to the sources. In the case of the US Acid Rain Program, the US Environment Protection

Agency (EPA) had used the data of the Energy Information Administration (EIA) of the US Department of Energy (DOE) as the reference point for developing its National Allowance Database. This database was utilized for estimating SO_2 allowance in the US Acid Rain Program. The participating units (i.e., sources) were allocated allowances based on their historical fuel consumption and a specific emissions rate. Each allowance permits a source to emit one ton of SO_2 during or after a specified year. For each ton of SO_2 emitted in a given year, one unit of allowance would be retired so that it can no longer be used.

5.3.1.3 Setting a permanent annual emission limit (Cap)

Permanent maximum allowances for annual emission need to be allocated to the participating polluting sources. Any emission exceeding the maximum allowed limit would be subject to a strict penalty such that the primary objective of setting penalty is not to utilize it as a major instrument in emission reduction. In the case of the US Acid Rain Program, the penalty was set at US $ 2000 per unit of excess emission of SO_2.

5.3.1.4 Establishing a dedicated institution

A dedicated institution need to be in place to oversee the smooth implementation of the mechanism. The institution may be either an existing governmental environmental agency or a new institution dedicated for such purpose. In the US Acid Rain Program, US Environmental Protection Agency (USEPA) has been overseeing the implementation of the program, in terms of real time emission measurements as well as emission trading. In Slovakia, the Ministry of Environment is responsible for such functions. In the Netherlands, the Dutch Emission Authority, a separate entity, has been implementing such activities. But in the case of NOx emission charge mechanism in Norway, competent organizations certified by the Norwegian Maritime Directorate are also allowed to measure emission at polluting sources and these emissions are approved by the Norwegian Maritime Directorate.

5.3.1.5 Dissemination of information on technological options for emission reduction

Dissemination of the information on technological options for emission reduction along with their abatement costs as well as performance will help in smooth implementation of the mechanism. While emission regulations/laws impose an obligation on the polluting sources to emit within the permissible level, information on technological options help the polluting sources in choosing the appropriate technology option. Some of the protocols under the Conventions on Long Range Transboundary Air Pollution (CLRTAP) have provided information on the best available technological options, their costs and efficiency in emission reduction. The polluting sources should have flexibility to choose among the given options based on their suitability, cost effectiveness and their performance. The NOx emission reduction program in the US Acid Rain Program also has provided information on low NOx emitting burners. These information need to be reviewed and updated over time.

5.3.1.6 Raising awareness

A key to the successful implementation of a mechanism or policy for prevention or control of air pollution lies on how successfully the information about the mechanism is delivered to the participating institutions and other stakeholders. An effective mechanism for information dissemination would be helpful to ensure wider involvement of the institutions and individuals in achieving the objectives of the mechanism directly or indirectly. In the US Acid Rain Program, any individual or an institution, not directly relevant to the emission trading mechanism, can show concern to the environment by buying the SO_2 allowances. They can access to the real time information delivering mechanism by using internet. Also stakeholders can participate in emission trading using real time information network through the internet.

5.3.2 Emission tax (Emission/Environmental taxes and fuel taxes)

An emission charge is a fee or tax per unit of pollutant emission and is levied on the level of pollutant emitted. Such mechanisms are a kind of direct economic instrument based on "Polluters Pay Principle". On the other hand, fuel and environmental taxes are indirect instruments that are based on the users pay principle, where the user of a polluting fuel pays a fee, which is either per unit of the fuel used or per unit output of the polluting source's activity (e.g., per unit electricity generation based on coal). Other forms of indirect taxes are annual vehicle tax/registration tax, sales tax, scrappage tax, parking fees, city tolls, road pricing, congestion pricing etc.

Strategies to implement and upscale the emission charge/environmental tax mechanism

In order to upscale and implement the **emission charge/environmental tax** mechanism, the following activities need to be undertaken:

5.3.2.1 Enactment of an act/regulation on emission tax/charge:

Imposition of emission charge (similarly, environmental tax) as an instrument of pollution control/prevention requires a legal force, which in turn requires an act or regulation authorizing such charge or tax. The difference between such act/regulation and the one related to the emission trading mechanism, is that in the case of an act/regulation on emission charge, the act should be able to identify the polluting sources under the tax/charge while it does not need determine the permissible level of emission from each source.

5.3.2.2 Setting emission charge or fuel tax

An appropriate (i.e., efficient) level of emission charge should be designed to achieve the emissions at the desired level along with a penalty rate for any non-compliance of the emission regulation. Usually, the large point sources (combustion plants, heavy industry) are subject to these charges initially, which can be expanded to other sources over time.

The charge (per unit emission) can be different for different levels of emissions: i.e., a lower charge (or a base rate) for up to a certain level of emission and a higher per unit charge beyond that level. For an example, such mechanisms are in place for SO_2 and NOx reduction in Poland, Czech Republic, Estonia, Latvia, Lithuania, and Slovakia. Such a mechanism can fulfill dual objectives of emission reductions, i.e., preventing the higher levels of emissions with higher charges and generating revenue through the base charge.

In the case of the sulfur tax, , the tax rate needs to be designed on the basis of the sulfur content for controlling sulfur emission whereas in the case of NOx tax, it is to be designed on the basis of either NOx emission rate or the production rate of the NOx emitting facility. In the case of Sweden, there is a tax on coal and oil with sulfur content above 0.1%. There are also other variants of sulfur tax, e.g., differential sulfur related fuel tax charging higher tax on fuels with higher sulfur content as is in practice in Finland, Belgium, Denmark, France, Norway, Portugal, Sweden, Switzerland and United Kingdom; special tax like eco-tax on polluting fuels in Germany; sulfur tax in lieu of fuel tax as in the case of Finland.

5.3.2.3 Providing incentives for reduction of emission

Financial Incentive

Financial incentives could be introduced in order to encourage the use of cleaner technologies for emission reduction. For example, in Sweden, an initial emission charge is applied to all the electricity generating sources using coal and oil fired units, estimated based on their per unit emission. These charges are applicable uniformly to all the polluting sources in order to make them competitive and unbiased. In the following year, a charge per unit electricity generation is estimated using the total collected emission charges divided by total electricity generation of all polluting sources. Then, each polluting source gets a tax rebate equivalent to the charge per unit electricity generation multiplied by its level of electricity production. Such a scheme provides more financial benefits to the source with a lower emission rate per unit of electricity production and encourages the source to use low emission production technologies.

Other fiscal incentives

Incentive in the form of tax incentive may help in further reduction of emission along with the emission tax. Incentives could also be provided in the form of lower import tax on imported cleaner/energy efficient equipments, low emission technologies (e.g., low NOx burners) and emission measurement and monitoring equipments.

5.3.2.4 Ensure stakeholders' participation

Stakeholders' participation is crucial in designing and implementing such a mechanism. In Pakistan, emission tax as a pollution levy on industrial effluents (emission charge) was reviewed after consulting with the industries. The industries agreed to increase the tax level from the half of the scale to its full scale in the following year.

5.3.2.5 Establishment of competent institutions

Like in the case of emission reduction credit (ERC) mechanism, a dedicated institution is necessary to oversee the implementation of such mechanism.

5.3.3 Standards on emission, technology and fuel quality

It is a traditional approach of control, in which a standard is set on the polluting activity. The standard can be of different types: e.g., technology based standard, emission standard, and fuel quality standard. A technology based standard stipulates the use of specific type of technology or equipment (e.g. catalytic converter, SO_2 scrubber mechanism etc.). An emission standard sets the level of permissible emission per unit of output or input: e.g. kg of SO_2/kWh or NOx/kWh). A fuel quality standard sets an allowable limit for the pollutant content in the fuel.

Strategy to implement and upscale the standards on emission, technology and fuel quality

In order to upscale and implement the CAC mechanism, the activities that need to be undertaken include the following:

5.3.3.1 Enactment of an act/regulation for emission reduction:

As already explained in earlier sections, an act or regulation is an important component of the strategy to implement emission control standards. Regulations on banning or phasing out of diesel vehicles, converting public passengers to CNG fuel based vehicles, retrofitting of catalytic converters in vehicles, retrofitting of scrubber mechanism for NOx control and maintaining certain percentage of sulfur content in fossil fuel are some examples of such acts. Such acts/regulations also normally have provision for penalty on sources that do not comply with the standards.

5.3.3.2 Setting a standard

A standard needs to be set based on the available scientific information on potential of emission reduction from polluting sources and their cost effectiveness. It has to also foresee the consequences of impact that such standard would have in future on environment and control costs.

5.3.3.3 Establishing an institutional framework

There has to be an institutional set up in order to implement such mechanism. As an authority, the governmental institution will be an appropriate entity to oversee the implementation of such policies. However, some of the functions e.g., measurement and monitoring of emissions as well their certifications could also be delegated to other competent independent non-governmental organizations having good facilities in terms of equipments and human resources for such purpose (e.g., specialized laboratories in the case of Norway).

5.3.3.4 Dissemination of relevant information

Information on technological parameters and costs on desired technologies in the case of technology and emission standards and information on desired fuels in the case of fuel quality standard should be available to help the polluting sources comply with the standards.

5.3.3.5 Availability of technologies and development of necessary infrastructures

In the case of technology and emission standards, it is necessary to ensure that the prescribed technological options are available in the market to the polluting sources. . In the case of a fuel standard, the prescribed fuels have to be available. For example, in the case of fuel switching regulation, such as conversion of public passenger vehicles to CNG in Delhi, it should be ensured that there is adequate number of CNG refueling stations and retrofitting facilities for CNG conversion.

5.3.3.6 Ensuring regular monitoring and inspection

In this type of mechanism, regular monitoring of the emissions from the sources is necessary in order to meet the overall objective of emission reduction. Any change in regulations/standards needs to be based on the feedbacks from the monitoring. For example, a stricter standard can be introduced if the present standard is found inadequate to achieve the desired emission reduction.

5.3.4. Transport demand management

The major objective of this approach is to reduce the travel time by reducing the growing traffic congestion. But it has the secondary effect of increasing average speed of vehicles, regulated private vehicular ownership, promotion of public passenger transport facilities which result in reduced fuel consumption and lower vehicular emissions.

Strategies to implement and upscale the transport demand management measures

Strategies to upscale and implement the transport demand management include the following components:

5.3.4.1 Development of public transport facilities as an alternative

In order to reduce vehicular emissions through adoption of good practices on transport demand management, it is essential to develop adequate facilities for public transport system, e.g. buses, mass rapid transport system/railways etc as an alternative to private vehicles. This implies increased investment in public infrastructure e.g., bus stations, bus network, expressways, mass rapid transits, transport network information etc.

5.3.4.2 Promoting innovative schemes

Area license schemes, congestion charges, vehicle quota systems, off peak car scheme, weekend car scheme, as are used in Singapore, are some of the measures that can limit the mobility of private vehicles. The economic condition of the city/region, the level of car ridership, the location of restricted zones are few of the crucial factors that need to be carefully analyzed before replicating such mechanism.

5.3.4.3 Establish correlation between commuters' behavior and transport demand pattern

There should be studies to understand the commuters' behavior towards travel demand. Such studies would help to address the real cause and the effect of congestion and will ensure effective design and implementation of travel demand management measures. For example, information on people's willingness to pay a congestion tax will help identify the level of congestion tax.

5.3.4.4 Promoting integrated land-use and transport policies

Integrated approach for land use and development of transport infrastructures can substantially reduce the volume of travel demand. When public transport facilities are developed in a way that effectively reduces the need for private vehicles in high travel density areas, there could be substantial reduction in both fuel consumption and emissions of pollutants. Effective policies to promote integrated land use and transport infrastructure development would be essential towards that end.

5.3.4.5 Promote tax incentive to cleaner and efficient vehicles

Besides promoting public transport modes, there could also be policies to promote cleaner and efficient vehicles. Such policies include tax incentives (e.g., lower import tax) for cleaner and efficient vehicles and lower annual registration fees on such vehicles. At the same time there could be policies that discourage the usage of inefficient vehicles (e.g., phasing out of old/inefficient cars, increasing the annual registration fees on inefficient vehicles).

5.3.5 Cleaner and energy efficient technologies: Transfer, development and deployment

Deployment of cleaner and energy efficient technologies reduce energy consumption and help reduce emission of several air pollutants. The use of efficient and cleaner technologies could be considered in both energy conversion and supply side (e.g., power generation) as well as in other sectors of the economy (manufacturing, transport, services, residential etc). , Measures such as energy conservation, fuel substitution/switching, change in production level aimed at the reduction of energy use may also result in the reductions of air pollutants, e.g. efficiency improvement of coal fired power plants would not only reduce coal use and greenhouse gases (GHGs) emission but they also simultaneously reduce sulfur emissions too. Electricity from renewable energy sources is being promoted in several European countries through a wide array of instruments (e.g., feed-in tariffs, tradable green certificates (TGCs) and green pricing schemes). Similarly, in many countries, utilities are required to have certain proportion of electricity generation based on renewable energy resources (popularly known as Renewable Portfolio Standard (RPS)).

Strategies to implement and upscale the transfer, development and deployment of cleaner energy efficient technology

In order to upscale and implement above measure, the strategies include the following activities:

5.3.5.1 Promoting policy of shifting subsidy from polluting fuels to cleaner and energy efficient technologies

Clean and energy efficient technology may be promoted by shifting the subsidy (if any) from the polluting fuel to the cleaner technologies. Such a policy would encourage the utilization of cleaner and energy efficient technologies and discourage/reduce the usage of polluting fuels. As an alternative, there could also be a policy to reduce tax on cleaner/efficient technologies and increase the tax on inefficient technologies. There could also be a policy to provide tax incentive to the existing plants, if they are retrofitted with cleaner/efficient equipments and emission control devices...

5.3.5.2 Policy to develop local technical capacity

Developing indigenous technical capacity to produce cleaner equipments and/or maintain them is also crucially important for successful up-scaling of cleaner and efficient technologies (e.g., solar water heaters, electric vehicles, and cleaner brick kilns).

5.3.5.3 Financing of cleaner and efficient technologies

Often, the high initial costs of cleaner and efficient technologies pose as a major barrier in the adoption of such technologies. Innovative schemes of financing would therefore have to be developed to overcome the barrier. Revenue collected from emission charge/environmental tax could be one of the possible sources of financing the cleaner and efficient technologies.

Clean Development Mechanism (CDM) of the Kyoto Protocol could also be considered as a potential source of financing such technologies, provided they meet the eligibility criteria of the CDM.

Chapter II

Final Remarks

Up-scaling process is considered as the replication, spread or adaptation of the good practices (or a part of the practices). The effectiveness of a good practice could, however, vary from country to country, notwithstanding outward similarities. In the case of good practices based on alternative approaches, it is important to assess the effectiveness of each alternative through careful analyses and identify the most appropriate one in the context of a particular country.

Once the need to control emission of air pollutants is established at the national policy making level, it is imperative to enact the necessary laws and regulations to create binding obligations on the part of the polluting sources. Absence of such laws/regulation can pose in itself a major impediment to the process of up-scaling of good practices on control and prevention of air pollutants. Such laws and regulations may be enacted either to meet a country's own environmental objectives or to fulfill the country's obligation under a regional/international agreement of countries in the region on control of transboundary air pollutants.

In addition to enactment of laws and regulations, it is often essential to establish a dedicated institution to oversee an effective implementation of particular good practices.
Establishment of necessary infrastructures (e.g., monitoring stations, specialized laboratories for measurement and evaluation), technology development and support capacities would also be necessary.

High initial costs of cleaner and efficient technologies present a major barrier to the adoption of such technologies. Any up-scaling program of such technologies would have to include innovative schemes of financing to overcome such barriers.

No less important is the role of raising awareness of stakeholders as to the need to control emission of air pollutants and the rationale behind the choice of a particular approach to reduce emissions as well as the overall benefits of cleaner and efficient technologies.

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