

Strategies to Implement and Up-scale the Good Practices on Prevention and Control of Transboundary Air Pollution

**Ram M. Shrestha
Professor
Asian Institute of Technology
Thailand
E-mail: ram@ait.ac.th**

21 August 2008

Presentation Outline

- **Introduction**
 - Up-scaling process
 - Prerequisites of up-scaling process
- **Strategies for up-scaling of the Good Practices**
 - Some common elements
 - Some specific elements
- **Final Remarks**

Introduction

- » **Up-scaling Process**
- » **Prerequisites of Up-scaling Process**

Different Definitions of Up-scaling

- **FAO (2006):**
 - Up-scaling of good practices should **lead to more benefit to more people in a wider geographic area than the area having such practices (FAO, 2006).**
- **World Bank (2003):**
 - 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).**
 - scaling-up process -- a process “to efficiently increase the socioeconomic impact from a small to a large scale of coverage”.
- **Middleton et. al. (2003a, 2003b):**
 - Up-scaling of good practice is the process which leads to “**More quality benefits to more people over a wider geographical area more quickly, more equitably and more lastingly**”.
- 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.

Two kinds of Up-scaling Process

- **World Bank (2003) states that there are two basic kinds of up-scaling:**
 1. **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
 2. **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.**

Approaches to Up-Scaling Process

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

(Source: Middleton et al., 2002).

Types of Up-Scaling Process

- There are four different types of scaling-up process (FAO, 2006; Middleton et al., 2003b).
 - **Quantitative**
 - » promotion of solar water heaters, vertical shaft brick kilns etc.
 - **Functional**
 - » Use of solar water heaters extended from domestic use to industrial process heating applications.
 - **Organizational**
 - » establishing a dedicated institution for air pollution control activities and further strengthening its capacity in the sector
 - **Political**
 - » lobbying through non-governmental organizations in banning of polluting diesel 3-wheelers in Nepal, public litigation demanding court ruling for air pollution control in Delhi, banning of Bull Trench Kiln in Nepal

Steps on Regional Air Pollution Control Strategy

A collective action in the region

- Regional Treaty/Agreement



Country specific commitments through an agreement

Protocol

- Regional Emission Reduction
- National Emission Ceilings
- Time frame



Individual country formulates acts and appropriate measures/strategies/policies to attain the committed emission reduction targets.

- National Acts/Appropriate Measures/strategies/approaches



Command and Control Approach

- Emission Standards
- Fuel quality standard
- Technology standards

Market Based Approach

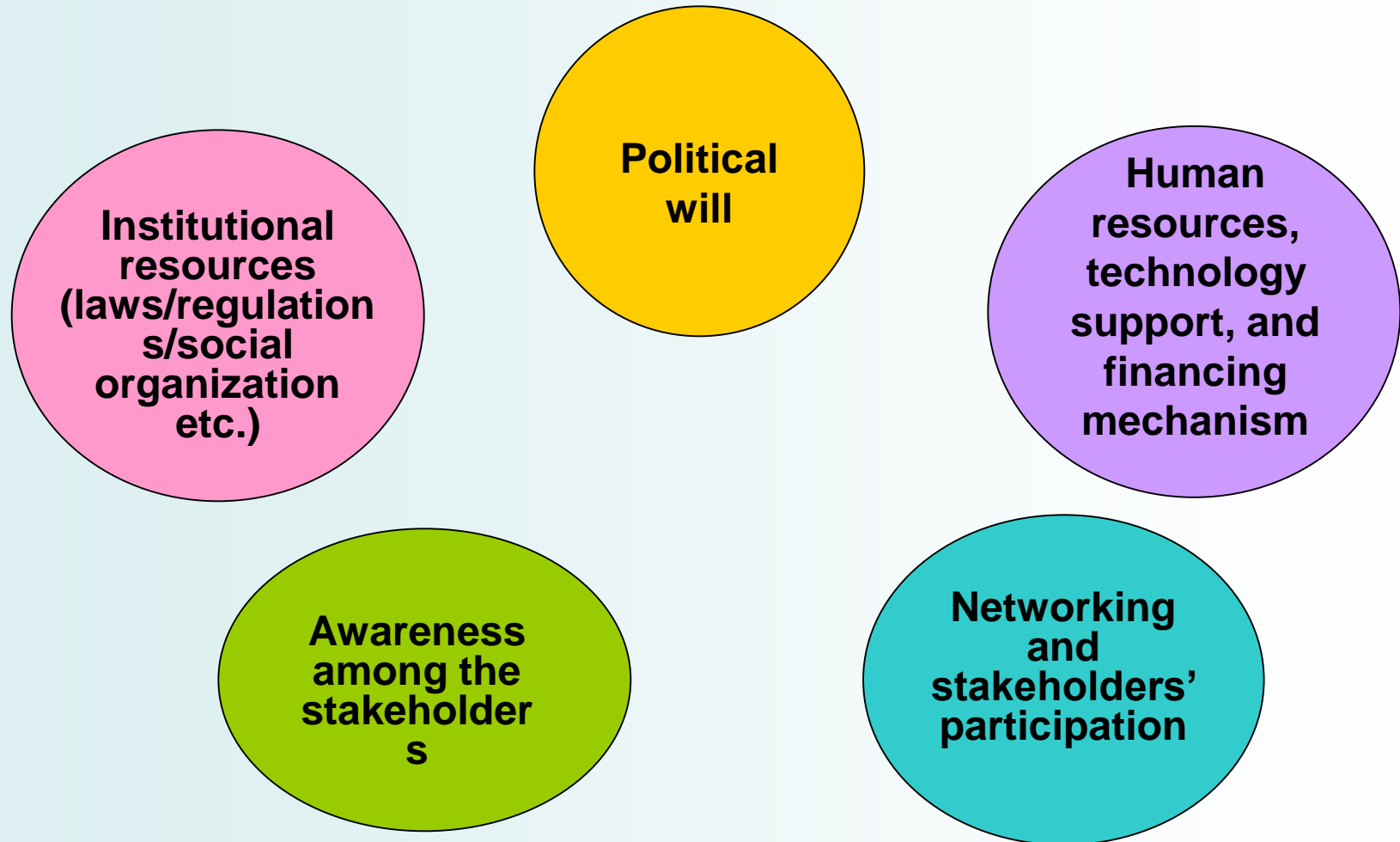
- Emission Taxes
- Emission permits/Emission Trading (Bubble, Netting, Offsetting, Banking Mechanism)
- Fuel Taxes (Indirect)

Other approaches

- Voluntary Action
- Moral suasion

Prerequisites of Up-scaling Process

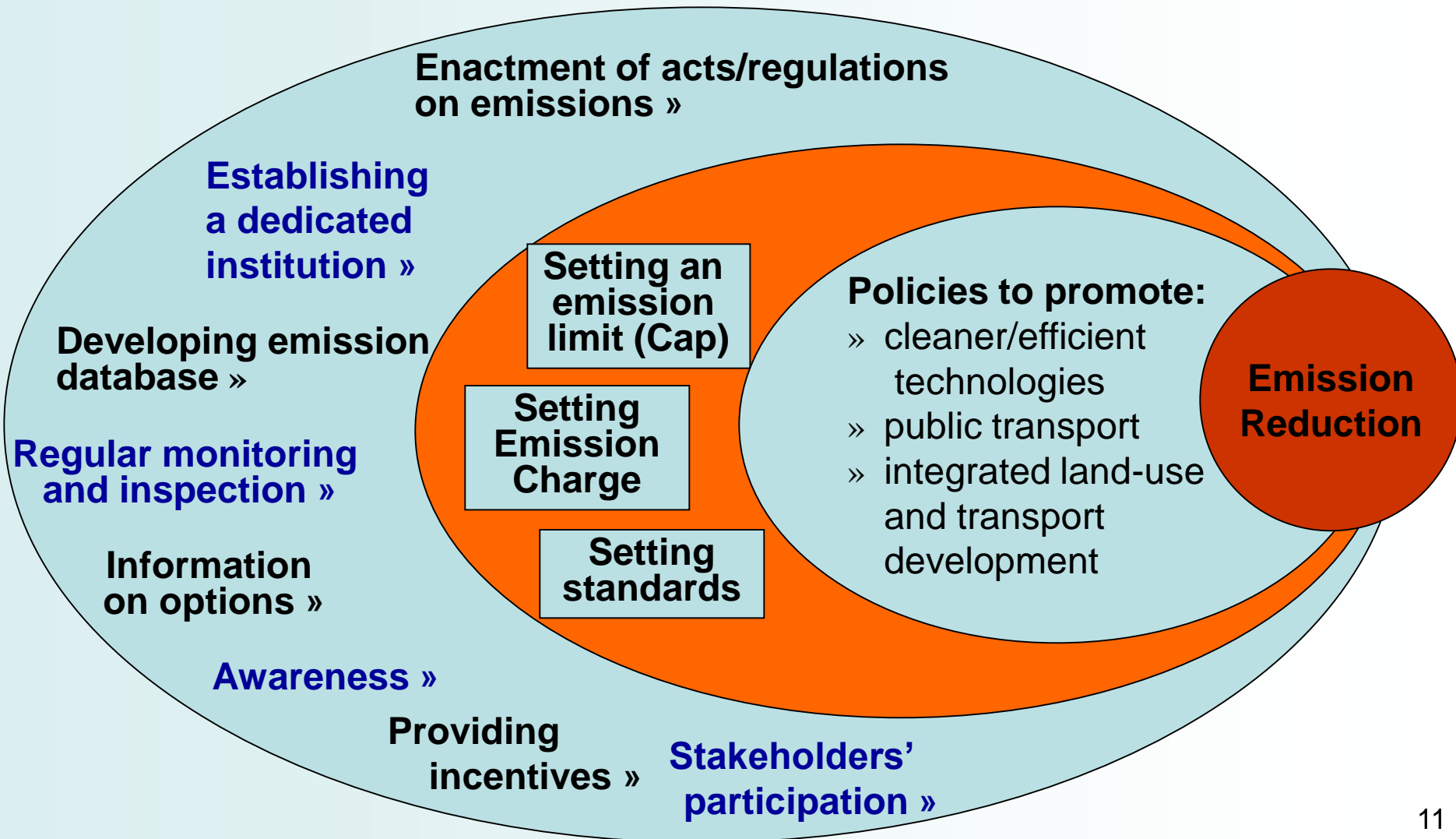
The following prerequisites are identified for the smooth scaling-up of good practices:



Broad categories of Good Practices In the Compendium

- » **Emission Reduction Credit Mechanism**
 - » SO₂ trading in the US Acid Rain Program
 - » NOx trading in the Netherlands
- » **Emission Tax**
 - » E.g., Emission taxes on VOCs from aircraft engines in Switzerland, Sweden, France and UK.
 - » Refund based tax system in Sweden
 - » NOx Tax in Norway
- » **Standards on Emission, Technology and Fuel Quality**
 - » Requirement to install flue gas desulfurization by coal fired utility (sulfur >1%) in Two Control Zone Program in China.
 - » Delhi government vehicles requirement -- either be fitted with a catalytic converter -- or be converted to CNG.
- » **Transport Demand Management**
 - » Singapore
- » **Cleaner and Energy Efficient Technology:
Transfer, Development and Deployment**
 - » VSBK, Electric Vehicles Program

Major Components of Strategies for Up-scaling of the Good Practices



Some Common Elements of Strategies for Up-scaling of the Good Practices

Activities of Implementing and Up-scaling Process:

- Raising awareness
- Identification of barriers
- Identification of policies/measures/targets
- Policy analysis
- Stakeholders' participation
- Enactment of acts/regulations on emissions
- Developing emission database
- Establishing a dedicated institution
- Technical support and information on technological options
- Regular monitoring and inspection (including related infrastructure development)
- Financing facilities/mechanisms
- Providing incentives

Policy Analysis of Environmental Policies/Strategies

- **Should a good practice in a country/region be necessarily effective and good elsewhere?**
- **Answer lies on the outcome of policy analysis (based on various criteria):**
 - » Cost of implementing a policy/strategy (economic efficiency, cost effectiveness)
 - » Financial affordability
 - » Scientific, technical and managerial capacity to design implement the policy
 - » Administrative complexity (enforcement capacity)
 - » Political will and sensitivity
 - » Social acceptability
 - » Environmental effectiveness

Raising Awareness

- **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 also show concern to the environment by buying the SO₂ allowances.
 - » They can access the information in real time by using internet.
 - » Also stakeholders can participate in emission trading using real time information network through the internet.

Stakeholders' Participation

- **Stakeholders' participation is crucial in designing and implementation.**
 - » In Pakistan, emission tax as a pollution levy on industrial effluents (emission charge) was revised after consulting with the industries. The industries agreed to an increase in the tax level in the following year.
- **The success of the good practices also lies in developing networks of stakeholders with well-defined roles and responsibilities**
 - » E.g., entrepreneurs' forum in VSBK program in Nepal.

Enactment of Acts/Regulations on Emissions

- **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/protocol.**
 - » E.g., 8 protocols issued under CLRTAP
 - » Clean Air Act Amendment 1990
 - » European Commission National Emission Ceilings Directive (2001/81/EC)

Developing an Emission Database

- **An emission database or emission inventory containing historical emission activities of the polluting sources need to be established**
 - 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 in the US Acid Rain Program**.
 - This database was utilized for estimating SO₂ allowance in the US Acid Rain Program.
- **Emission database helps:**
 - to identify the amount of emission reduction necessary to meet an emission reduction goal.
 - to identify the polluting sources and their potential of emission reductions.

Establishing a Dedicated Institution

- **A dedicated institution is necessary to oversee the implementation/up-scaling of good practices.**
- **The institution may be either an existing governmental environmental agency or a new institution dedicated for such purpose.**
- **Some of the functions e.g., measurement and monitoring of emissions as well their certifications could be delegated to other competent independent non-governmental organizations having good facilities in terms of equipments and human resources for such purpose**
 - » E.g., in the US Acid Rain Program, US Environmental Protection Agency (USEPA) has been overseeing the implementation of the program.
 - » In Slovakia, the Ministry of Environment.
 - » In the Netherlands, the Dutch Emission Authority as a separate entity
 - » In Norway, competent organizations certified by the Norwegian Maritime Directorate are also allowed to measure emission at polluting sources.
 - » specialized laboratories in the case of Norway

Information on Technological Options

- **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 good practices.**
- **While emission regulations/laws impose an obligation on the polluting sources to emission reduction, 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 NO_x emission reduction program in the US Acid Rain Program also has provided information on low NO_x emitting burners.
- **These information need to be reviewed and updated over time.**

Regular Monitoring and Inspection

- **Regular monitoring of the emissions from the sources is necessary in order to meet the overall objective of emission reduction.**
 - » In emission tax cases, the regular monitoring may provide feedback on the effect of the instrument in overall emission reduction.
- **Feedbacks from the monitoring help in reviewing/revising regulations/standards on emission.**
 - » a stricter standard can be introduced if the present standard is found inadequate to achieve the desired emission reduction.

Providing Incentives

- **Financial incentives may be necessary 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.
 - » 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.
- **Incentives could also be provided in the form of lower import tax on**
 - » imported cleaner/energy efficient equipments
 - » low emission technologies (e.g., low NO_x burners) and
 - » emission measurement and monitoring equipments.

Some Components Specific to Emission Limit, Emission Charge and Standards

- **For Emission Reduction Credit Mechanism:**
 - Setting annual emission limit (Cap)
 - Maximum allowances for annual emission need to be allocated to the participating polluting sources.
- **For Emission Tax Mechanism:**
 - Setting emission charge
 - An appropriate (i.e., efficient) level of emission charge should be designed along with a penalty rate for any non-compliance of the emission regulation.
- **For Standards:**
 - Setting a standard
 - based on the available scientific information on potential of emission reduction from polluting sources and their cost effectiveness.

Some Components Specific to Transport Demand Management

- **Development of public transport facilities as an alternative mode of transport**
- **Promoting innovative schemes like area license, congestion charge, vehicle quota etc.**
- **Establish correlation between commuters' behavior and transport demand pattern**
- **Promoting integrated land-use and transport policies**
- **Promote tax incentive to cleaner and efficient vehicles**

Singapore Example: Can it be Replicable?

- **The prerequisites:**
 - Provision of a good alternative public transport system
 - Strong commitment of government on better air quality
 - Effective enforcement mechanism
 - Effective communication system
 - Better manageability of vehicle growth being a city state

Some Components Specific to Cleaner and Energy Efficient Technologies

- **Shifting subsidy from polluting fuels to cleaner and energy efficient technologies**
 - » e.g. retrofitting catalytic converters in vehicles
 - » Conversion of passenger vehicles to CNG
 - » Promotion of vertical shaft brick kiln technologies
- **Policy to develop local technical capacity**
 - » e.g. promoting domestic manufacturing capacity in promoting solar water heaters.
- **Financing mechanism for cleaner and efficient technologies**
 - » e.g., Clean Development Mechanism, clean energy bank.

Final Remarks

Constraints in South Asian Countries

- **Lack of capacity to monitor and enforce the regulations/policies**
 - » Environmental Acts alone not enough (e.g., Nepal)
- **Inadequate scientific/technical capacity to analyze emissions, assess impacts, and formulate appropriate policies/strategies**
 - » Large share of small firms (more difficult to monitor and enforce)
 - » Inadequate resource allocation for environmental protection activities

Final Remarks

- 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.

Final Remarks

- 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.

Thank You!

Measure of Success in Good Practices

- 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.

Types of Up-Scaling Process

- **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.

Types of Up-Scaling Process

- **Functional up-scaling:**

- » 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.

- **Organizational up-scaling:**

- » 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.
- » 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.

Types of Up-Scaling Process

- **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.

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 for the smooth 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

Prerequisites of up-scaling process

- **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.
- » 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.

Prerequisites of up-scaling process

- **Institutional framework :**

- » It gives a momentum to the treaties and protocols to be implemented under stipulated rules and regulations.
- » In some cases, special institutions need to be established with adequate human resources and technical handling capacity.
- » 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, 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.

Prerequisites of up-scaling process

- **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.
 - » The availability of financial resources is another important factor in a scaling-up process.
 - » Project planning, institutional strengthening, stakeholders' participation and networking, dissemination of information, capacity building, monitoring and evaluation imply a cost that needs to be met.

Prerequisites of up-scaling process

- **Awareness among the stakeholders:**
 - » Scaling-up requires that the concepts and principles of scaling-up are fully understood among the stakeholders.
 - » Stakeholders at all levels require a clear understanding of 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.
 - » Failure to fully understand the implications of the concept for institutional strategies and activities will limit the potential for scaling-up.
 - » Awareness can be created using different media like radio, newspaper and television etc.

Prerequisites of up-scaling process

- **Stakeholders' participation:**

- » From the early stage of implementation, all stakeholders at different levels need to be involved in the up-scaling process.
- » Sharing of information among the stakeholders.
- » The success of the good practices also lies in developing networks of stakeholders with well-defined roles and responsibilities and legally binding agreements.
 - » E.g., 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.

Emission Reduction Credit Mechanism

Activities of Up-scaling Process of the ERC:

- Enactment of acts/regulations on emissions
- **Developing emission database**
- Setting a permanent annual emission limit (Cap)
- **Establishing a dedicated institution**
- Dissemination of information on technological options for emission reduction
- **Raising awareness**

Emission Reduction Credit Mechanism

- **Enactment of acts/regulations on emissions**
 - a legal act or regulation on emissions
 - E.g., the Clean Air Act 1990 Amendment
 - 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/protocol.
 - Clear definition of the target polluting sources
 - 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.

Emission Reduction Credit Mechanism

- **Enactment of acts/regulations on emissions**
 - 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 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.

Emission Reduction Credit Mechanism

- **Developing emission database**

- An emission database or emission inventory containing historical emission activities of the polluting sources need to be established
 - E.g., 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 in the US Acid Rain Program.
 - This database was utilized for estimating SO₂ 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 SO₂ during or after a specified year. For each ton of SO₂ emitted in a given year, one unit of allowance would be retired so that it can no longer be used.

Emission Reduction Credit Mechanism

- **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 US Acid Rain Program, the penalty was set at US \$ 2000 per unit of excess emission of SO₂.
- **Establishing a dedicated institution**
 - 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 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 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.

Emission Reduction Credit Mechanism

- **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 NO_x emission reduction program in the US Acid Rain Program also has provided information on low NO_x emitting burners.
 - These information need to be reviewed and updated over time.

Emission Reduction Credit Mechanism

- **Raising awareness**

- 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 SO₂ 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.

Emission tax (Emission/Environmental Taxes and Fuel Taxes)

Activities of Up-scaling Process:

- Enactment of an act/regulation on emission tax/charge
- **Setting emission charge or fuel tax**
- Providing incentives for reduction of emission
- **Ensuring stakeholders' participation**
- Establishment of competent institutions
- **Raising awareness**

Emission tax (Emission/Environmental Taxes and Fuel Taxes)

- **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 an act or regulation to such effect provides.
 - 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 to determine the permissible level of emission from each source.

Emission tax (Emission/Environmental Taxes and Fuel Taxes)

- **Setting emission charge or fuel tax**
 - An appropriate (i.e., efficient) level of emission charge should be designed along with a penalty rate for any non-compliance of the emission regulation.
 - 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.
 - E.g., 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.
 - 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.

Emission tax (Emission/Environmental Taxes and Fuel Taxes)

- **Providing incentives for reduction of emission**
 - 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. 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.
 - 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.

Emission tax (Emission/Environmental Taxes and Fuel Taxes)

- **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.
- Establishment of competent institutions
 - a dedicated institution is necessary to oversee the implementation of such mechanism

Standards on Emission, Technology and Fuel Quality

Activities of Up-scaling Process:

- **Enactment of an act/regulation on emission reduction**
- **Setting a standard**
- **Establishing an institutional framework**
- **Availability of technologies and development of necessary infrastructures**
- **Ensuring regular monitoring and inspection**

Standards on Emission, Technology and Fuel Quality

- **Enactment of an act/regulation for emission reduction**
 - an act or regulation is an important component of the strategy to implement emission control standards.
 - E.g., 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.
- **Setting a standard**
 - 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.

Standards on Emission, Technology and Fuel Quality

- **Establishing an institutional framework**

- 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.

- **Dissemination of relevant information**

- technology and emission standards
 - Information on technological parameters and costs on desired technologies.
- fuel quality standard
 - information on desired fuels.

Standards on Emission, Technology and Fuel Quality

- **Availability of technologies and development of necessary infrastructures**
 - technology and emission standards,
 - prescribed technological options are available in the market to the polluting sources.
 - fuel standard,
 - the prescribed fuels have to be available.
 - E.g., 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.
- **Ensuring regular monitoring and inspection**
 - Any change in regulations/standards needs to be based on the feedbacks from the monitoring.
 - E.g, a stricter standard can be introduced if the present standard is found inadequate to achieve the desired emission reduction.

Transport Demand Management

Activities of Up-scaling Process:

- **Development of public transport facilities as an alternative**
- **Promoting innovative schemes**
- **Establish correlation between commuters' behavior and transport demand pattern**
- **Promoting integrated land-use and transport policies**
- **Promote tax incentive to cleaner and efficient vehicles**

Transport Demand Management

- **Development of public transport facilities as an alternative**
 - 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.
- **Promoting innovative schemes**
 - Area license schemes, congestion charges, vehicle quota systems, off peak car scheme, weekend car scheme (E.g. Singapore) for limiting 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.

Transport Demand Management

- **Establishing 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.
- **Promoting integrated land-use and transport policies**
 - Integrated approach for land use and development of transport infrastructures
 - Development of public transport facilities -- effectively reduces the need for private vehicles in high travel density areas
 - Effective policies to promote integrated land use and transport infrastructure development.

Transport Demand Management

- **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 for cleaner and efficient vehicles and lower annual registration fees on such vehicles.
 - e.g., lower import tax
 - Policies that discourage the usage of inefficient vehicles
 - e.g., phasing out of old/inefficient cars, increasing the annual registration fees on inefficient vehicles.

Cleaner and energy efficient technologies: Transfer, development and deployment

Activities of Up-scaling Process:

- Promoting policy of shifting subsidy from polluting fuels to cleaner and energy efficient technologies
- **Policy to develop local technical capacity**
- Financing of cleaner and efficient technologies

Cleaner and energy efficient technologies: Transfer, development and deployment

- **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.
 - 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.

Cleaner and energy efficient technologies: Transfer, development and deployment

- **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

- **Financing of cleaner and efficient technologies**

- high initial costs of cleaner and efficient technologies pose as a major barrier in the adoption of such technologies.
- Innovative schemes of financing needed.
 - 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.