

*Malé Declaration
on Control and Prevention of Air Pollution
and Its Likely Transboundary Effects for South Asia*



Report of the Task Force for Further Development of Male' Declaration

MD/IG12/3

The Twelfth Session of the Intergovernmental Meeting

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BACKGROUND

1. With increasing urbanisation and economic growth, and having a quarter of the world's population, air pollution is an increasing concern in South Asian countries. In 1998, UNEP together with the Stockholm Environment Institute (SEI) drew attention to the possibility of the impacts of transboundary air pollution in South Asia. This initiative led to the adoption of the Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia (Malé Declaration). The initiative was funded by the Swedish International Development Cooperation Agency (Sida) as part of the Regional Air Pollution in Developing Countries (RAPIDC) Programme. The Malé Declaration is the only inter-governmental agreement of its kind covering the eight countries involved including Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan and Sri Lanka. The South Asia Cooperative Environment Programme (SACEP) is also part of the network.
2. The Malé Declaration's objective is to aid the process of providing a clean environment through clean air. The Declaration calls for regional cooperation to address shared local air quality problems and the increasing threat of transboundary air pollution and its possible impacts. Through a process of mutual consultation, the Declaration also calls for the continuation of this process in phases, to formulate and implement national and regional action plans and protocols based on a fuller understanding of transboundary air pollution issues. The Malé Declaration has a yearly intergovernmental meeting to discuss the ongoing activities and future programmes to implement the Declaration. Its implementation has been in phases since its adoption in 1998. More details on the activities and achievements during the implementation phases is presented in MD/IG12/3/1.
3. A review of the implementation process of the Malé Declaration since 1998 during the Eighth Session of the Intergovernmental Meeting (IG8) of the Malé Declaration held on October 2004 at Tehran, Iran led to the formation of the Task Force for Future Development of Male Declaration (TFFD) during the Ninth Session of the Intergovernmental Meeting (IG9) held on 13th September 2006 in Maldives. The Terms of Reference (ToR) of the TFFD was adopted during the Tenth Session of the Intergovernmental Meeting (IG10) held on 21st August 2008 in Sri Lanka, with its primary tasks to a) establish a sustainable financing mechanism for Malé Declaration; b) conduct a feasibility study on the establishment of regional centres; and c) conduct a feasibility study on strengthening the regional framework on air pollution reduction in South Asia.
4. As the implementation of the Malé Declaration has progressed a lot, greater involvement of the participating countries is required. A regional framework on air pollution reduction in South Asia could be a logical step towards this end. There is also a need to establish a sustainable financing mechanism to continue the implementation process with the ownership of the member countries. Moreover, establishing centers at regional and national levels is necessary to sustain the capability building in the region and at the national level.

5. The First Meeting of the TFFD was held on 2-3 August 2010 at Pathumthani, Thailand. Results of this meeting include a) agreed draft on the financial mechanism; b) agreed framework and outline of the feasibility report on the establishment of regional centres; c) agreed major outline and procedures on conducting the feasibility on strengthening the regional framework on air pollution reduction for South Asia; and d) agreed draft resolution for consideration of the Ministerial level meeting (MD/IG12/3/2).
6. During the second meeting of the TFFD which was held on 29-30 November 2010 in Colombo, Sri Lanka, the report on the financial mechanism was finalised (see MD/IG12/3/3); the draft feasibility report on the regional centres was discussed and potential regional centres were identified (see MD/IG12/3/4); and the feasibility report on strengthening the regional framework on air pollution reduction in South Asia was discussed and the report was finalized by email communications (see MD/IG12/3/5).
7. This report presents to the participants of this meeting, the three reports which was mentioned above and is also reiterated here:
 - Report on the Sustainable Financing Mechanism of the Male Declaration (final report as document MD/IG12/3/3)
 - Report on the Feasibility Study on the Establishment of Regional Centres (final report as document MD/IG12/3/4)
 - Report on the Feasibility Study on Strengthening the Regional Framework on Air Pollution Reduction in South Asia (final report as Document MD/IG12/3/5)

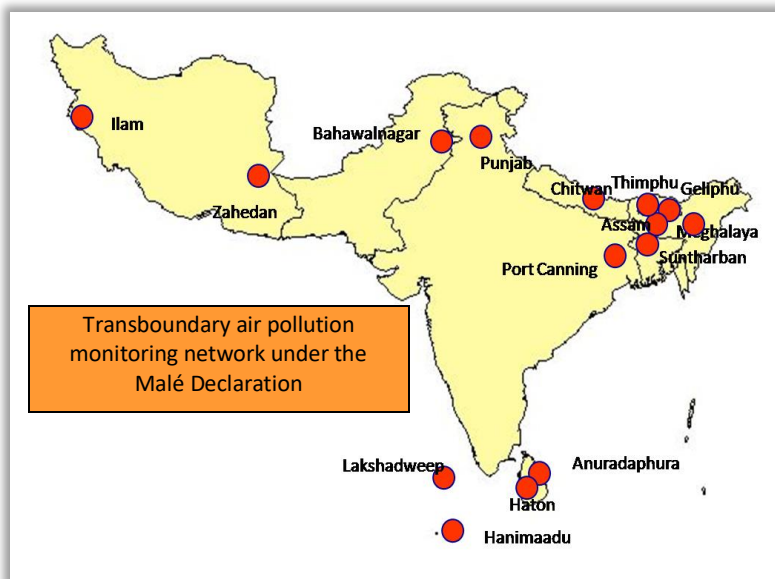
These reports are for review, consideration and adoption. The draft resolution supported by this report will be submitted to Ministerial level meeting.

SUPPORTING DOCUMENTS

THE MALÉ DECLARATION BRIEF

Background

With increasing urbanisation and economic growth, and having a quarter of the world's population, air pollution is an increasing concern in South Asian countries. In 1998, UNEP together with the Stockholm Environment Institute (SEI) drew attention to the possibility of the impacts of transboundary air pollution in South Asia. This initiative led to the adoption of the 'Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia (MD)'. The initiative was funded by the Swedish International Development Cooperation Agency



(Sida) as part of the Regional Air Pollution in Developing Countries (RAPIDC) programme. It is the only inter-governmental agreement of its kind covering the eight countries involved.

Participating countries are Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan and Sri Lanka. The South Asia Cooperative Environment programme (SACEP) is also part of the network. Country Governments nominated National Implementing Agencies (NIAs) for the implementation of the MD. UNEP RRC.AP hosts the Secretariat. The implementation is now in Phase IV.

Phase I: 1999-2001

An intergovernmental network was established which governs the MD activities. After Phase I, all the participating countries completed baseline studies and action plans. The baseline studies provided valuable information on air pollution management programmes in the participating countries and clearly identified the gaps in the existing monitoring systems to understand transboundary air pollution.

Phase II: 2001-2004

A capacity building programme was initiated in Phase II which included strengthening the monitoring network and training. National and regional level stakeholders' consultations were also held during this phase. With the completion of Phase II, all the participating countries had established one transboundary air pollution monitoring structure was developed and local capacities in monitoring local and transboundary air pollution had been increased. Common methodology to train technical staff, strengthen monitoring stations and establish scientific and stakeholder networks, was also developed.



One-week hands-on training program on monitoring transboundary air pollution

Phase III: 2005-2008

Phase III implementation continued the capacity building for monitoring initiated during the previous implementation Phase. Capacity building for impact assessment and prevention of air pollution was also initiated. The regional network development was strengthened in a number of ways. Four Intergovernmental Meetings and four Regional Stakeholders cum Regional Coordination meetings and national stakeholder meetings of the MD took place. Capacity on monitoring programme was strengthened through regular regional and national training programme and others activities. A passive sampler Inter-comparison programme and two inter laboratory comparison programmes were conducted for quality assurance and control. Monitoring of ozone O₃ was included as an additional parameter. The emission inventory manual and workbook were continuously improved during Phase III.

An epidemiological study looking into the impacts of particulate matter on asthmatic schoolchildren was successfully undertaken in Bangladesh. The studies and different training workshops on air pollution impact assessment on crops, health, corrosion and rapid urban assessment also presented opportunities for both technical people and policy makers from the ministries to meet hence strengthening the regional and intergovernmental cooperation. Three publications “Past, Present and Future of Malé Declaration; “Good Practices on Prevention and Control of Air Pollution: A Compendium” and “Youth for Clean Air Compendium” were published. An interactive “Youth for Clean Air” CD for youth which contains 4 modules on understanding atmospheric emissions, their sources, impacts and measures to reduce the atmospheric emissions was developed. Bangladesh NIA developed a DVD on “No to Air Pollution, it’s Time to Go Healthy” as a part of the public awareness campaign. In addition, the countries and their representatives were kept updated through the quarterly newsletters and the development of MD brochures.



Phase IV: 2010-2012

Phase IV will continue to assist the member countries enhance their regional cooperation, monitoring, impact assessment; strengthen the initiatives started in the first three phases and to initiate new ones. The implementation will follow the institutional arrangement of the MD, which was adopted in IG8 Meeting. A Task Force on Future Development (Task Force) of the MD is established to consider important aspects of the expanding network such as the development of regional centres; development of a regional framework agreement between countries regarding atmospheric emissions of air pollutants; and establishment of a Sustainable Financing Mechanism for the MD. The First Meeting of the Task Force held on 2-3 August 2010 in Thailand, agreed that 1)a mechanism for sustainable financing be developed; 2)a feasibility study on establishing regional centres be conducted; and 3) a feasibility report on strengthening the regional framework on air pollution reduction in South Asia be conducted. Progress on these was reviewed and discussed during the Second Meeting of the Task Force held in Colombo, Sri Lanka, on 29-30 November 2010. The Task Force also agreed to draft a resolution for consideration of the Ministerial Meeting.

A study of the health impact of air pollution on school children, which was carried out during the previous implementation phase will also be conducted in two more MD countries (Nepal and Pakistan). Crop Impact Assessments, to quantify yield losses in relation to prevailing O₃ levels and climate using experimental approaches developed in previous phases of the MD will be conducted in all MD countries. Resulting information will be used to develop risk assessment modelling methods unique for Asia and will be applied for both current day and future conditions to assess macro-scale economic losses for the MD region. A handbook on control and prevention of air pollution which was developed in Phase III will be disseminated to practitioners and policy makers in all the MD participating countries. The national level public awareness campaigns will also be conducted in the countries.

**DRAFT RESOLUTIONS FOR THE CONSIDERATION OF THE MINISTERIAL
LEVEL MEETING**

1. In recognition to the increasing risks of problems on air pollution and its likely transboundary effects in South Asian countries, the Malé Declaration on Control and Prevention of Air pollution and Its Likely Transboundary Effects for South Asia (Malé Declaration) was adopted by the Environment Ministers of the region in Maldives in 1998 during the meeting of the Governing Council of the South Asia Cooperative Environment Programme (SACEP). The Malé Declaration's objective is to aid the process of providing a clean environment through clean air. The Declaration calls for regional cooperation to address the increasing threat of transboundary air pollution and its possible impacts.
2. After 11 years of implementation, the Malé Declaration has achieved significant progress in the area of air pollution issues in South Asia. Capacity of member countries to address the atmospheric issues had been enhanced in terms of skilled manpower, infrastructure, and institutional setup. More importantly, the Malé Declaration has been providing the framework for the governments and stakeholders for cooperation at the regional as well as national level. The need for the Malé Declaration has been proven and agreed by all the stakeholders in South Asia.
3. There is a need to establish a sustainable financing mechanism to continue this process with the ownership of the member countries. There is also a need to establish centers at regional and national levels to sustain the capability building in the region and national level. The time is ripe to consider enhancing the regional cooperation under the Malé Declaration.
4. Recognizing the need to further implement the Malé Declaration, member countries will provide voluntary financial support for the Malé Declaration as decided by the Intergovernmental Meeting of the Malé Declaration. They will support the national and regional centers as proposed by the Intergovernmental Meeting of the Malé Declaration. The member countries also agreed on strengthening the regional policy framework to carry forward the Malé Declaration

TASK FORCE REPORT ON THE ESTABLISHMENT OF SUSTAINABLE FINANCING MECHANISM FOR MALÉ DECLARATION

I. Background and Objectives

1. Air pollution in South Asia has become a priority issue for all the countries of the region for various reasons. The pollutants released in the air have increased with the use of fossil fuels in the sectors of transport, energy production and industry. Indoor air pollution and biomass burning have also added to the problem. These pollutants cause adverse effects on human and animal health, crop and animal husbandry and also by corrosion of materials and objects of cultural heritage. These pollutants can also travel across national boundaries. Though the countries of the region are at the base of the economic growth ladder, there is need to act in time and with vigilance to promote preventive and control measures and also do scientific studies on transboundary movements of air pollutants. While each country will, in its own interests and within its own means, take measures to prevent and control air pollution, it is necessary to monitor transboundary effects, if any. In a recognition of all these factors, the Environment Ministers of the region adopted the Malé Declaration in Maldives in 1998 in a meeting convened by South Asia Cooperative Environment Programme (SACEP) and United Nations Environment Programme (UNEP).
2. The salient points of the Malé Declaration include:
 - a. Analysis (economic and technical) of the origins, causes and effects of local and regional air pollution using expertise in various institutions and building capacity in them;
 - b. Development of strategies to minimize air pollution;
 - c. Co-operation in monitoring arrangements and standardizing methodologies for monitoring, beginning with sulphur, nitrogen and volatile organic compounds;
 - d. Transfer of financial resources and technology for the programme and training securing incremental assistance from bilateral and multilateral sources; and
 - e. Encouragement of key stakeholders in the effort and activities.
3. Malé Declaration further stressed improvement of national reporting systems as well as scientific and academic effort. The process would continue in stages to draw up and implement national and regional action plans and protocols based on a fuller understanding of transboundary air pollution issues. In the process, appropriate national structures and networks will be evolved and the good offices of regional, international, bilateral and multilateral agencies in this process will be used, as appropriate.
4. It may be pointed out at this juncture that Malé Declaration visualised only incremental assistance and good offices of international, bilateral and multilateral agencies being taken. In other words, the major effort for funding and setting up structures, networking etc., would come from member countries themselves.

II. Progress on Malé Declaration Implementation

5. The implementation of Malé Declaration so far has been in phases with funding from Swedish International Development Agency (Sida) and secretarial support from UNEP RRC.AP. Member countries have so far contributed only in kind and that too marginally by helping in the organizing of meetings on their soil and providing land and appurtenant facilities for the monitoring stations. No cash contributions have come so far from member countries and it is their contribution which has been incremental and small while the ‘good offices’ of international agencies have also meant underwriting the financial component of Malé Declaration thus far.
6. Inline with the Phase I implementation plan adopted in February 1999 by the First Intergovernmental meeting (IG1), countries prepared the baseline studies on the national structures, modalities, regulations, institutions and capacities available to tackle air pollution. Each country nominated an NFP which are generally at the policy level and NIA which are generally authorities or agencies engaged in environmental regulation. The baseline studies led to the formulation of the National Action Plans by the NFPs and NIAs which indicated requirements for monitoring equipment and capacity building. The second intergovernmental meeting (IG2) reviewed and adopted these outputs and also agreed that national and sub-regional stakeholders meetings will be held.
7. An important decision of the second meeting was the creation of a Monitoring Committee (MoC) with experts on air pollution which was mandated to study the national needs in monitoring and capacity building. The three-member MoC prepared a strategy paper by June 2001 including criteria for location of monitoring sites near the borders of the countries. An outline of a technical manual was also prepared.
8. In Phase II, the third intergovernmental meeting (IG3) reviewed the strategy and adopted the monitoring manual for training and requested the MoC to prepare a full-fledged manual. The first regional training programme was conducted in UNEP RRC.AP in May 2002 benchmark criteria for setting up monitoring stations were prepared.
9. The fourth intergovernmental meeting (IG4) at Kathmandu in July 2002 discussed these developments. This was followed by activity in 2003 to set up monitoring stations in all the countries starting with Nepal and covering Bhutan, Sri Lanka, Maldives, Bangladesh, India, Iran and Pakistan. The second regional training workshop was held in India in August 2003 run by the Central Pollution Control Board.
10. The fifth intergovernmental meeting (IG5) held at Dhaka in October 2003 witnessed presentations by member countries on various activities under Malé Declaration and by Stockholm Environment Institute (SEI) on parallel activities on emission inventories compilation and air pollution modeling. An outline of Phase III activity was also discussed. The first regional stakeholders’ meeting was held after this meeting in Dhaka. In March 2004 a workshop on rapid urban assessment, health impacts and corrosion assessment was held in

New Delhi, India under the Regional Air Pollution in Developing Countries (RAPIDC) programme funded by Sida.

11. The sixth intergovernmental meeting (IG6) was held at Tehran, Iran wherein plan of implementation of Phase III was adopted. Apart from carrying forward activities like capacity building and coordinated interventions of stakeholders, it was decided to strengthen analytical and assessment capabilities through integration of data from monitoring stations, local pollution prevention and rapid impact assessment studies. Raising awareness through targeted information dissemination was also agreed upon.
12. In the seventh intergovernmental meeting (IG7) at New Delhi in October 2005 Phase III plans were firmed up for implementation up to August 2008. Data reports from air samplers were presented and it was felt more information flow from all countries was required to draw meaningful conclusions Capacity building for impact assessment and prevention of air pollution was also initiated.
13. The eighth intergovernmental meeting (IG8) at Bhutan in September 2006 decided to draw up plans for Phase IV. The proposal drafted in pursuance of this was adopted in the ninth intergovernmental meeting at Maldives in October 2007.
14. The tenth session of the intergovernmental meeting (IG10) was held in August 2008 at Colombo, Sri Lanka after the Fifth Regional Stakeholders cum Coordination meeting. The significance of these meetings was that a mention was made of the need for participating countries to take a greater ownership of the project especially in terms of the financial support for the implementation of Malé Declaration. A detailed report on data analysis was presented in the intergovernmental meeting and the results of the impact assessment studies made in Phase III were discussed along with future plans for Malé Declaration activities. One of the documents presented was a compendium of best practices in preventing and controlling air pollution in South Asia.
15. After 11 years of implementation the Malé Declaration has achieved significant progress in the area of air pollution management in South Asia. Capacity of member countries to address the atmospheric issues had been increased in terms of skilled manpower, infrastructure, and institutional setup. More importantly, the Malé Declaration has been providing the framework for the governments and stakeholders for cooperation at the regional as well as national level. The need for the Malé Declaration has been proven and agreed by all the stakeholders in South Asia. There is a need to establish a sustainable financing mechanism to continue this process with the ownership of the member countries.

III. Principles of Sustainable Financing Mechanism

16. The principles of sustainable financing mechanism for the Malé Declaration include:

- a. Activities of the Malé Declaration is classified into three groups: (a) National level core activities such as implementation of monitoring activities at the national level, (b) Regional level core activities such as intergovernmental meeting, and (c) additional activities such as research activities.
- b. Member countries will take the lead in financing their respective national level core activities.
- c. Member countries will make effort to contribute to the regional level core activities based on the amounts indicated in section VI.
- d. Financial resources for the additional activities will be mobilised from external sources.
- e. Financial contribution of member countries will be on voluntary basis.
- f. Stepwise approach will be implemented for the contributions from the member countries. It is not necessary that all countries will start contributing at once.

17. This report is based on the above principles. It defines activities on the Malé Declaration implementation, provides an estimated budget for the national and regional level core activities as well as the stepwise approach for the countries to make the voluntary contributions.

IV. Defined Activities for Malé Declaration Implementation

18. This section contains the activities defined under the three groups including the national level core activities, regional level core activities and additional activities.

19. National level core activities are the main activities coordinated and done by partners in each of the participating countries. These activities aim to enhance capacity of in-country people conducting the monitoring and emission inventory and strengthen the monitoring network; strengthen the coordination among stakeholders at the national level; provide support/input to policy makers for the mitigation/reduction of air pollution and raise awareness of the country people on the issues of air pollution and involve them in the mitigation and control activities. The following are the list of activities covered in this group:

- a. National Advisory Committee (AC) Meetings
- b. Monitoring & Reporting
- c. Emission Inventories and integrated assessments
- d. National Stakeholders' Meeting
- e. National level awareness programmes (e.g. translation of Malé Declaration brochures into local language, etc.)

20. Regional level core activities are conducted with the participation of all the Malé Declaration countries which aims to strengthen regional cooperation; raise awareness and enhance the participation of stakeholders in the region; and strengthen the regional air pollution monitoring network. The following are the activities under this group.

- a. Intergovernmental (IG) Meetings
- b. Regional Stakeholders' Meeting
- c. Regional Refresher Training Workshop on Transboundary air pollution
- d. Regional Training Workshops on Impact Assessment
- e. TFFD of Malé Declaration Meetings

21. Additional activities are the necessary activities which aim to enhance the air pollution impact assessment capacities of the national institutions; and generate knowledge and awareness on the issues of air pollution, its likely transboundary effects and its impacts to various stakeholders to come up with the right mix of policies and programmes to tackle the problem in the region. The following are the activities under this group

- a. Impact Assessments
- b. Awareness Raising (e.g. Workshops on Youth for clean air)

V. Annual Budget Estimate

National Level Core Activities

22. The budget for the national level activities in each of the participating countries of Malé Declaration depends on the status in terms of the number and extent of the activities conducted. The common activities being done in most if not all of the participating countries as mentioned in section IV are a)national AC meetings; b)monitoring and reporting, c)emission inventories and integrated assessments; d)national stakeholders' meeting; and e)awareness programmes (translation of Malé Declaration brochure to the local language). In general, the estimated annual budget for the national level activities USD 15,300 (fifteen thousand and three hundred US dollars only).

Regional Level Core Activities

23. The following Table presents the annual budget of each of the core activities under the regional level.

Table 1. Budget for Regional Core Level Activities

| No. | Activities/Tasks | Estimated Budget (USD) |
|-----|---|------------------------|
| 1 | IG Meeting | 45,549 |
| 2 | Regional Stakeholders' Meeting | 28,000 |
| 3 | Regional Refresher Training Workshop on Transboundary air pollution | 36,234 |
| 4 | Regional Training Workshops on Impact Assessment | 32,468 |
| 5 | TFFD of Malé Declaration Meeting | 32,517 |
| 6 | Operational costs | 47,200 |
| | TOTAL BUDGET | 221,968 |

Additional Activities

24. The budget for other activities varies according to the project to be implemented in each of the participating countries.

VI. Stepwise Approach in Making Contributions

25. This section defines the steps by which the countries could contribute to the annual budget for the regional level activities as mentioned in the previous section.

a. The countries shall make voluntary contributions based on the UN assessment scale. The present UN scale percentages and the percentages derived approximately for voluntary contributions under Malé Declaration is shown in Table 2.

b. For these activities, the countries shall make contributions for a period of 2 years, after the governments agreed to make contributions. Contributions in kind by the country concerned could be considered instead of the financial outlay which may otherwise be incurred. This will be the transition period before fully contributing the corresponding amount indicated in Table 2.

c. Transitional measures can also be applied to some if not all countries to reduce immediate burden on making the contributions, such as 1) bearing their own traveling expenses to participate to Malé Declaration meetings/workshops; and 2) bearing all logistics expenses while hosting/organising event in their country.

d. The countries shall agree on procedures and guidelines for voluntary financial contributions to the Malé Declaration.

Table 2. Approximate Country Contributions for Regional Level Activities

| No. | Country | % in UN Assessment Scale | % in Malé Declaration (approximate) | Approximate Contribution (USD) |
|--------------|----------------|---------------------------------|--|---------------------------------------|
| 1 | Bangladesh | 0.01 | 1.13 | 2,506 |
| 2 | Bhutan | 0.001 | 0.11 | 251 |
| 3 | India | 0.534 | 60.27 | 133,782 |
| 4 | Iran | 0.233 | 26.30 | 58,373 |
| 5 | Maldives | 0.001 | 0.11 | 251 |
| 6 | Nepal | 0.006 | 0.68 | 1,503 |
| 7 | Pakistan | 0.082 | 9.26 | 20,543 |
| 8 | Sri Lanka | 0.019 | 2.14 | 4,759 |
| TOTAL | | | | 221,968 |

VII. Conclusions

26. After 11 years of implementation the Malé Declaration has achieved significant progress in the area of air pollution management in South Asia. The need for the Malé Declaration has been proven and agreed by all the stakeholders in South Asia. There is a need to establish a sustainable financing mechanism to continue this process with the ownership of the member countries.

27. The TFFD of Malé Declaration is established to develop the sustainable financing mechanism. The TFFD proposes draft resolutions (included in a separate document) for consideration of the IG of the Malé Declaration. The IG Meeting may wish to submit the draft resolutions for a Ministerial Level Meeting of the member countries for formal approval.

28. For the purpose of convincing the governments to make contributions, a report on phasewise activities and achievements of the Malé Declaration is presented in MD/IG12/3/1.

FEASIBILITY REPORT ON THE ESTABLISHMENT OF REGIONAL CENTRES

I. Initiation of Regional Centres

1. During the Intergovernmental Meeting 8 (IG8) held in Bhutan on 13th September 2007 the establishment of regional technical centres for implementing the Malé Declaration was proposed. The IG9 held in the Maldives on 13th September 2008 proposed the establishment of the TFFD for the Malé Declaration during the phase IV implementation. The ToR of the TFFD were adopted during the IG 10 held on 21st August 2009 in Sri Lanka, with one of the primary tasks being to conduct a feasibility study on the establishment of regional centre's during the Phase IV implementation of the Malé Declaration.

II. Objectives of the Regional Centre

2. The purpose of a regional centre is to advise on any technical problem faced by a country and provide guidance on the smooth operation of Malé Declaration activities and how to maintain high quality data provision. It will also offer training courses to update and enhance the knowledge and capacity in the field.
3. The basic function of a regional centre is to exchange knowledge and to support the research and development on air pollution issues in the region on the proposed theme namely: a) dry and wet deposition monitoring; b) soil monitoring c) vegetation monitoring; d) corrosion impact assessment; e) health impact assessment; e) emission inventory compilation f) atmospheric transport modeling; and g) pollution reduction policies/strategies.

III. Task Force Meeting

4. The First Meeting of the TFFD of Malé Declaration was held on 2-3 August, 2010 in Pathumthani, Thailand. The Meeting was attended by the Task Force members from the participating countries of the Malé Declaration (Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan, and Sri Lanka), as well as resource persons from the Asia Center for Air Pollution Research (ACAP), Asian Institute of Technology (AIT), SACEP, and Environment Representatives from UNEP and UNEP RRC.AP. During the meeting one of the agenda items was to discuss on the establishment of the regional centres. It was agreed that eight regional technical centres would be established as indicated in the organizational chart previously agreed by the IG. In order to minimize the operational costs, it was decided that the regional technical centres for monitoring wet and dry deposition will be combined into one centre. The same was agreed for the centre on soil and vegetation impact. It was also agreed to change the name of the Technical Center on Pollution reduction/strategies to "Technical Center on Pollution Control & Prevention". The outcome of the discussion agreed to name "Regional Centres" for the respective fields e.g. "Regional centre on dry and wet deposition monitoring" and NFPs and NIAs would identify the potential candidate regional centres in their respective countries.
5. The second Task Force meeting held on 29-30 November 2010 in Colombo, Sri Lanka, discussed on the draft document on the establishment of the regional centres. In the meeting

again it was suggested to separate the Regional Centers for Soil and Vegetation to “Regional Centre for Soil” and “Regional Centre for Crops and Vegetation”. Similarly, Regional Centre for Emission Inventory Compilation and Air Pollution Modeling will be two different components; one for Emission Inventory compilation and another for modeling. Though interconnected these two centres will be independent of each another.

6. In the meeting the potential regional centres in each country were identified by NFP’s and NIA’s. These centres were discussed in terms of the existing expertise. It was suggested that each country could have a maximum of two regional centres only. Accordingly the meeting agreed on the proposed location of regional centers as follows: same order for ToR
 - a. Regional Centre on Wet and Dry Deposition Monitoring - India
 - b. Regional Centre on Crops and Vegetation Monitoring - Pakistan
 - c. Regional Centre on Soil Monitoring - Bhutan
 - d. Regional Centre on Corrosion Impact Assessment - India
 - e. Regional Centre on Health Impact Assessment - Bangladesh
 - f. Regional Centre on Emission Inventories – Sri Lanka
 - g. Regional Centre on Modelling Atmospheric Transport of Air Pollution - Iran
 - h. Regional Centre on Pollution Reduction Policies/Strategies –Nepal / Maldives

IV. ToRs for Regional Centres

7. The TORs for the regional centres listed below are given in Attachment 4.
 - a. Regional Centre on Wet and Dry Deposition Monitoring
 - b. Regional Centre on Crops and Vegetation Monitoring
 - c. Regional Centre on Soil Monitoring
 - d. Regional Centre on Corrosion Impact Assessment
 - e. Regional Centre on Health Impact Assessment
 - f. Regional Centre on Emission Inventories
 - g. Regional Centre on Modelling Atmospheric Transport of Air Pollution
 - h. Regional Centre on Pollution Reduction Policies/Strategies
8. The key qualities that a regional centre should have include:
 - a. Scientific expertise in the given field;
 - b. Regionally recognized with a track record in the area of expertise and able to give input on the given issues;
 - c. Capacity, personnel and time available to undertake work required;
 - d. Instrumentation and consumables available for conducting the activities;
 - e. Support for role as technical centre at Governmental level;
 - f. Capacity to coordinate activities at the regional scale;
 - g. Global linkages with the institutions working in the same field would be preferred;
 - h. Committed or potential funds from national government to support the institute in its work under the Malé Declaration;

- i. Capable of conducting training in the given field and with capacity and logistic support to host training meetings as necessary.
9. Apart from these the programme is seeking to uniformly distribute the regional centres among the South Asian countries. In this context the proposed regional centre's existing capacity and the capacity building needs will be assessed. Regional and international experts will be involved in completing this task. Experts will develop an assessment paper for each of the centers through reviewing the centres by teleconference, using existing knowledge of prior visits, feedback forms and if necessary by visiting the centres. Upon these recommendations each proposed regional centre which is still not at the required standard will be strengthened incrementally over time.

V. Operating Guidelines for the Regional Centre

10. The selected centres will be recognized as the Regional Centre's of the specified area. The regional centre will work in close collaboration with the Malé Declaration secretariat at UNEP RRC.AP in Bangkok. The Regional centre's will coordinate with the national implementing agencies and national focal point of the country to provide technical support, compile data and information and store it and prepare policy briefs. The other member countries in similar modality have to contact these regional centre's through their respective national focal point or implementing agency for any query or assistance required on the subject. This will ensure that the NFP and NIAs in each country can monitor the use of the technical centres.
11. Regional Centres will support the development and evaluation of new monitoring technologies, and the development and application of quality assurance/quality control guidelines. Annually the regional centres will brief the Malé Declaration Intergovernmental meeting on progress. The viable technologies will be adopted during the IG meeting and disseminated to the member countries through the NFPs and NIAs.
12. The Regional Centres will be established one by one over time, if the current capacity needs to be enhanced, other institutions will be engaged to upgrade the capacity. The capacities and facilities of the proposed regional centres is given in MD/IG12/4b.

VI. Conclusions and Recommendations

13. The TFFD meeting has identified the potential regional centres. The chosen regional centres will be discussed in the IG12 meeting (scheduled for June 2011) and endorsed by the Governments.

MD/IG12/3/4a. TORs for Regional Centres

3a.1 THE REGIONAL CENTRE ON WET AND DRY DEPOSITION MONITORING

Criterion: The regional centre should have the required capacity (technical experts and experience) and the facilities to conduct dry and wet deposition monitoring.

Mission: To ensure and promote accurate procedures and data on dry and wet deposition monitoring for better control and prevention of air pollution and its likely transboundary effects in South Asia.

Mandate: Compile, evaluate and store data; implement and coordinate quality assurance/quality control (QA/QC) activities; and provide technical support on monitoring wet and dry deposition in South Asia.

Networking: The NIAs and NFPs shall nominate the national centre for dry and wet deposition monitoring. The regional centre shall coordinate among the national level technical centres identified for the implementation of the monitoring activities.

Governance: The regional centre will directly report to the IG and make strategic decisions in consultation with the Malé Declaration Monitoring Committee.

1. To further develop and elaborate the strategy for dry and wet deposition evaluation in the region.
2. To discuss on further direction of dry and wet deposition evaluation and provide guidance on relevant activities based on the strategy.
3. To develop the Technical Manual for dry and wet deposition monitoring in the sub-region.
4. To develop a work programme and report to the IG.

Responsibilities of the National Centre

1. To take charge of developing and/or maintaining the monitoring sites.
2. To collect data and liaise with the regional centre for storage and quality control of data.

MD/IG12/3/4a.2. THE REGIONAL CENTRE ON CROPS AND VEGETATION MONITORING

Criterion: The regional centre should have the required capacity (technical experts and experience) and the facilities to conduct crop and vegetation monitoring to assess the effects of air pollution.

Mission: To ensure and promote accurate procedures and data on crop and vegetation monitoring for better control and prevention of air pollution and its likely transboundary effects in South Asia.

Mandate: Compile, evaluate and store data; implement and coordinate (QA/QC) activities; and provide technical support on crops and vegetation monitoring in South Asia.

Networking: The NIAs and NFPs shall nominate the regional centre for crop and vegetation monitoring. The regional centre shall coordinate among the identified national level technical centres for the implementation of the monitoring activities.

Governance: The regional centre will directly report to the IG Meeting and make strategic decisions in consultation with the Malé Declaration Secretariat.

1. To develop manual of methodologies for crop and vegetation monitoring for Malé Declaration.
2. To revise the technical documents on crop and vegetation monitoring as necessary.
3. To develop a work programme for the implementation of activities on crop and vegetation monitoring and report to the IG.
4. To assess the impacts of relevant air pollutants on crop and vegetation based on available data and other information for the Malé Declaration periodic reports.

Responsibilities of the National Centre

1. To take charge of developing and/or maintaining the monitoring sites.
2. To collect data and liaise with the regional centre for storage and quality control of data.

MD/IG12/3/4a.3. THE REGIONAL CENTRE ON SOIL MONITORING

Criterion: The regional centre should have the required capacity (technical experts and experience) and the facilities to conduct soil monitoring.

Mission: To ensure and promote accurate procedures and data on soil monitoring for better control and prevention of air pollution and its likely transboundary effects in South Asia.

Mandate: Compile, evaluate and store data; implement and coordinate (QA/QC) activities; and provide technical support on soil monitoring in South Asia.

Networking: The NIAs and NFPs shall nominate the regional centre for soil monitoring. The regional centre shall coordinate among the identified national level technical centres for the implementation of the monitoring activities.

Governance: The regional centre will directly report to the IG Meeting and make strategic decisions in consultation with the Malé Declaration Secretariat.

1. To develop manual of methodologies for soil monitoring for Malé Declaration.
2. To map the sensitivity of soil in South Asia to acidic deposition.
3. To revise the technical documents on soil monitoring as necessary.
4. To develop a work programme for the implementation of activities on soil monitoring and report to the IG.
5. To assess the impacts of relevant air pollutants on soil based on available data and other information for the Malé Declaration periodic reports.

Responsibilities of the National Centre

1. To take charge of developing and/or maintaining the monitoring sites.
2. To collect data and liaise with the regional centre for storage and quality control of data.

MD/IG12/3/4a.4. THE REGIONAL CENTRE ON CORROSION IMPACT ASSESSMENT

Criterion: The regional centre should have the required capacity (technical experts and experience) and the facilities to conduct corrosion impact assessment.

Mission: To ensure and promote accurate procedures and data to assess the impact of air pollutants on materials and objects of cultural heritage for better control and prevention of air pollution and its likely transboundary effects in South Asia.

Mandate: Compile, evaluate and store data; implement and coordinate (QA/QC) activities; and provide technical support on conducting corrosion impact assessment in South Asia.

Networking: The NIAs and NFPs shall nominate the regional centre for corrosion impact assessment. The regional centre shall coordinate among the identified national level technical centres for the implementation of the monitoring activities.

Governance: The regional centre will directly report to the IG and make strategic decisions in consultation with the Malé Declaration Secretariat.

1. To develop a work programme on corrosion impact assessments and report to the IG.
2. To develop manual of methodologies for corrosion impact assessment for Malé Declaration.
3. To continue developing capacity of Malé Declaration countries in assessing the impacts of air pollutants on materials and objects of cultural heritage.
4. To continue assisting the countries on collecting environmental data at the required period of time.
5. To analyse collected data and transform it into information for policy makers and the community.
6. To develop data & assessment reports based on gathered data.
7. To facilitate the development of awareness materials in the countries based on updates.

Responsibilities of the National Centre

1. To take charge of establishing and/or maintaining the corrosion monitoring sites.
2. To collect data and liaise with the regional centre for storage and quality control of data.

MD/IG12/3/4a.5 THE REGIONAL CENTRE ON HEALTH IMPACT ASSESSMENT

Criterion: The regional centre should have the required capacity (technical experts and experience) and the facilities to conduct health impact assessments.

Mission: To ensure and promote accurate procedures and data on health impact assessments. To develop capacity within NIAs of the Malé Declaration countries to assess the impacts of air pollutants such as particulate matter and ozone on human health.

Mandate: Compile, evaluate and store data; implement and coordinate (QA/QC) activities; and provide technical support on conducting health impact assessment in South Asia.

Networking: The NIAs and NFPs shall nominate the regional centre for health impact assessment. The regional centre shall coordinate among the identified national level technical centres for the implementation of the assessment activities.

Governance: The regional centre will directly report to the IG and make strategic decisions in consultation with the Malé Declaration Secretariat.

1. To develop a work programme and report to the IG.
2. To continue facilitating the development of networks in all Malé Declaration countries with medical or health institutions having expertise on this type of impact assessment.
3. To develop manual of methodologies for health impact assessment for Malé Declaration countries.
4. To continue developing capacity of Malé Declaration countries in assessing the impacts of air pollutants on human health.
5. To develop data and assessment reports based on gathered data.
6. To analyze collected data and transform it into information for policy makers and the community.
7. To facilitate the development of awareness materials in the countries based on updates.

Responsibilities of the National Centre

1. To take charge of developing and conducting the health impact assessment at the national level.
2. To collect data and liaise with the regional centre for storage and quality control of data.

MD/IG12/3/4a.6. THE REGIONAL CENTRE ON EMISSION INVENTORIES

Criterion: The regional centre should have the required capacity (technical experts and experience) and the facilities to conduct emission inventory.

Mission: To ensure and promote accurate procedures and data on emission inventory for better control & prevention of air pollution and its likely transboundary effects in South Asia.

Mandate: Compile, evaluate and store data; implement and coordinate (QA/QC) activities; and provide technical support to carry out emission inventory in South Asia.

Networking: The NIAs and NFPs shall nominate the regional centre for emission inventory. The regional centre shall coordinate among the identified national level technical centres for the implementation of the inventory activities.

Governance: The regional centre will directly report to the IG and make strategic decisions in consultation with the Malé Declaration Secretariat.

1. To develop a work programme and report to the IG.
2. To continue to improve methodologies mentioned in the Malé Declaration Manual for Emission Inventory Compilation.
3. To facilitate good partnerships with governments and academia in all the Malé Declaration countries on emission inventory activities.
4. To continue to assist the countries in conducting emission inventory compilation and develop emission factor suitable for South Asia
5. To conduct QA on the emission inventories submitted to the centre.
6. To develop accurate regional emission inventories
7. To facilitate the development of online real-time emission inventory.

Responsibilities of the National Centre

1. To take charge of developing and/or maintaining emission inventory activities.
2. To collect data and liaise with the regional centre for storage and quality control of data.

MD/IG12/3/4a.7. THE REGIONAL CENTRE ON MODELING ATMOSPHERIC TRANSPORT OF AIR POLLUTION

Criterion: The regional centre should have the required capacity (technical experts and experience) and the facilities to conduct atmospheric transport modeling.

Mission: To ensure and promote accurate procedures and data on atmospheric transport modeling for better control & prevention of air pollution and its likely transboundary effects in South Asia.

Mandate: Compile, evaluate and store data; implement and coordinate (QA/QC) activities; and provide technical support to run atmospheric transport modeling in South Asia.

Networking: The NIAs and NFPs shall nominate the regional centre for atmospheric transport modeling. The regional centre shall coordinate among the identified national level technical centres for the implementation of the modeling activities.

Governance: The regional centre will directly report to the IG and make strategic decisions in consultation with the Malé Declaration Secretariat.

1. To develop a work programme and report to the IG.
2. To continue to improve methodologies for the Malé Declaration atmospheric transport modeling activities.
3. To continue to assist the countries in conducting atmospheric transport modeling activities.
4. To develop accurate regional atmospheric transport models linked to the regional emission inventory compilation activity.
5. To facilitate good links with air pollution monitoring efforts in all the Malé Declaration countries to promote validation of the results of the atmospheric transport models being developed in the region.

Responsibilities of the National Centre

1. To take charge of developing and/or maintaining atmospheric transport modeling activities.
2. To collect data and liaise with the regional centre for storage and quality control of data.

MD/IG12/3/4a. 8. THE REGIONAL CENTRE ON POLLUTION REDUCTION POLICIES/STRATEGIES

Criterion: The regional centre should have the required capacity (expertise and experience) for developing and implementing pollution reduction policies/strategies.

Mission: To ensure and promote the best pollution reduction practices, policies and strategies for better control & prevention of air pollution and its likely transboundary effects in South Asia.

Mandate: Compile and update good practices on prevention and control of air pollution in South Asia; facilitate update and monitor progress in the implementation of air pollution reduction policies/strategies in South Asia and assist countries in developing and implementing such in their respective nations.

Networking: Work closely with the other regional technical centres, NIAs & NFPs and the Secretariat; assisted by the regional partners and the Regional Stakeholders' Forum.

Governance: The regional centre will directly report to the IG and make strategic decisions in consultation with the Malé Declaration Secretariat.

1. To develop a work programme and report to the IG.
2. To continue updating the compilation on good practices on prevention & control of air pollution for reference of the Malé Declaration countries.
3. To compile pollution reduction/ strategies developed or implemented by the countries.
4. To assist countries in developing and implementing air pollution reduction strategies.

Responsibility of the National Centre

1. Implement and monitor updates on activities on prevention and control of air pollution at the national level.
2. Liaise with the regional centre for information on good practices.

MD/IG12/3/4b Information Sheets on Regional Centre

MD/IG12/3/4b.1. Information sheet

Bangladesh: Regional Centre for Health Impact Assessment

| S. NO | Item | Description |
|-------|--|---|
| 1 | Name of the Country | Bangladesh |
| 2 | Name of the Institution | National Institute of Preventive and Social Medicine(NIPSOM) |
| 3 | Address for Correspondence | Dr. A. Wazed Head, Department of Occupational and Environmental Health, NIPSOM |
| 4 | Type of Institution(Autonomous,Government, Private,any other) | Government |
| 5 | Year of Establishment | Established in the year 1974, Course start in the year 1978 |
| 6 | Brief note on the Institution | Attached in 4.2.1.1 |
| 7 | Funding Source(Government, Self supported,any other) | Government |
| 8 | Regional Centre for (Area of Specialization) | Health Impact Study |
| 9 | Head of the Institution with name and designation | Prof(Dr.) Saroj Kumar Mazumder Director, NIPSOM |
| 10 | Name of the contact person, designation & contact details | Dr. A. Wazed Head, Department of Occupational and Environmental Health, NIPSOM Mobile No; 01712-125552 E-mail dra.wazed@ yahoo.com |
| 11 | Head of Division/ Laboratory(with name, designation & contact details) | Dr. A. Wazed Head, Department of Occupational and Environmental Health, NIPSOM Mobile No; 01712-125552 E-mail dra.wazed@ yahoo.com |
| 12 | Recognition of activities International National | Assessment of the Impact of Air Pollution Among School Children In Selected Schools of Dhaka City- International |
| 13 | Mandate of the Laboratory | |

| | | |
|----|--|---|
| 14 | <p>Infrastructure Area Services Instrumentation</p> <p>Training Facilities</p> | <p>Area-3.5 Acre</p> <p>Services-Academic, Research, Training</p> <p>Laboratory facilities for diagnosis of Arsenic in water, Temperature+ humidity in air by Hygrometer, Audiometry for hearing impairment, sound level meter for sound pollution, lux meter for light measurement, Peak expiratory flow meter-Peak Expiratory Volume, Biochemical test, diagnosis of parasite, culture and serological test, diagnosis of different vector</p> <p>Training facilities- Lap-top, Multimedia, Public address system and well-decorated room for training is available at NIPSOM</p> |
| 15 | <p>Human Resources & Expertise Area Expertise</p> | MD/IG12/3/4b.1 |
| 16 | <p>Current Projects/Activities In-House National International Any Other</p> | WHO Biennium activities-National, International Research about Arsenicosis-by Dr. A. Wazed,Head, Dept of OEH,NIPSOM-National |
| 17 | Regional and International Collaborations | <p>Collaborative activities with</p> <p>University of Cambridge, United Kingdom</p> <p>Department for International Development (DFID)</p> <p>World Health Organization</p> <p>United Nations Population Fund</p> <p>European Union</p> <p>Columbia University</p> <p>Mahidol University</p> |
| 18 | <p>Annual Expenditure Current Year Proceeding Year</p> | <p>45 million thirty thousand;2009-2010 financial year</p> <p>48 million;2010-11 financial year</p> |
| 19 | Willingness to assist Male Declaration through National funding | |
| 20 | Additional Information(if any) | NIPSOM is a centre of Excellence |

MD/IG12/3/4b.1.1

NIPSOM Established in the year 1978 & is only national level postgraduate public health institute in Bangladesh. It includes 12 departments consists of a very competent teaching faculty of 42 experienced members supported by 94 non-teaching staff, conducts 8 MPH courses in different fields of public health of one-year duration and one M.Phil course in Preventive and Social Medicine of two years duration. NIPSOM produced more than 2000 public health specialists, publishes Journal of Preventive and Social Medicine (JOPSOM), twice in a year .

The Mission of NIPSOM: Academic, Research, Training, to support public health activities and to improve the quality of healthcare of our nation.

The Institutional Objectives:

- ◆ To conduct academic courses leading to postgraduate degrees;
- ◆ To organize in-service and continuing education/training programme;
- ◆ To promote and undertake Health Systems Research;
- ◆ To provide technical advisory/consultancy services;

The Physical Facilities of NIPSOM:

- ◆ One academic building having
- ◆ one auditorium,
- ◆ two conference rooms,
- ◆ one computer lab,
- ◆ Laboratories (microbiology, nutrition and biochemistry, occupational and environmental health)
- ◆ Separate class room for every department
- ◆ Audio-visual facilities
- ◆ National & international students' accommodation
- ◆ Field training center for field practice
- ◆ Library facilities

12 Departments of NIPSOM:

1. Biostatistics
2. Community Medicine
3. Entomology
4. Epidemiology
5. Health Education and Health Promotion
6. Maternal and Child Health
7. Microbiology
8. Nutrition & Biochemistry
9. Occupational and Environmental Health

10. Parasitology
11. Population Dynamics
12. Public Health and Hospital Administration

Courses of NIPSOM:

1. Master of Philosophy in Preventive and Social Medicine
2. Master of Public Health in Community Medicine
3. Master of Public Health in Epidemiology
4. Master of Public Health in Health Promotion & Health Education
5. Master of Public Health in Hospital Management
6. Master of Public Health in Nutrition
7. Master of Public Health in Occupational and Environmental Health
8. Master of Public Health in Public Health Administration
9. Master of Public Health in Reproductive and Child Health

Short Courses of NIPSOM

- ◆ Arsenic Prevention
- ◆ Reproductive and Child Health
- ◆ Gender based Violence
- ◆ Epidemiology
- ◆ Biostatistics
- ◆ Research Methodology
- ◆ Data Handling and Analysis using SPSS
- ◆ Occupational Safety and Health
- ◆ STD&AIDS prevention
- ◆ Tobacco Prevention
- ◆ Health Manpower management

Research interests of NIPSOM

- ◆ Environmental Health issues including Aresinosis-More than 30 publications
- ◆ Reproductive Health
- ◆ Communicable and Non-communicable disease and its risk factors
- ◆ Vector Borne Diseases
- ◆ Human resource Management

Collaborative activities of NIPSOM

- ◆ University of Cambridge, United Kingdom
- ◆ Department for International Development (DFID)
- ◆ World Health Organization

- ◆ United Nations Population Fund
- ◆ European Union
- ◆ Columbia University

Important achievement of NIPSOM

- ◆ More than 30 publications on Arsenicosis including development of diagnostic Kit and Manual
- ◆ More than 10 research works on Tobacco related Issues;
- ◆ 20 publications on vector borne diseases and its public health implication
- ◆ More than 25 publications on reproductive health issues including adolescent health
- ◆ 20 publications on public health issues related to non-communicable diseases

Involvement of NIPSOM:

- ◆ National Commission for Polio Eradication
- ◆ National AIDS Committee
- ◆ ICDDR,B- Center for Health and Population Research
- ◆ Armed Forces Medical Institute
- ◆ National Expert Committee on Arsenic
- ◆ Asia Arsenic Network
- ◆ International Union for Health Promotion & Health Education
- ◆ International Association of Hospital & Health Service
- ◆ Regional Centres in South East Asia- Health Impact Study

MD/IG12/3/4b.2. Information Sheet
Bhutan: Regional Centre for Soil Impact Assessment

| S.No. | Items | Description |
|-------|---|---|
| 1. | Name of the Country | Bhutan |
| 2. | Name of the Institution | National Soil Service Centre, Ministry of Agriculture |
| 3. | Address for correspondence | National Environment Commission |
| 4. | Type of Institution (Autonomous, Government, Private, any other) | Government |
| 5. | Year of establishment | Initially soil and plant lab in 1993 |
| 6. | Brief note on the Institution | National soil service centre in 1996 |
| 7. | Funding Source (Government, self supported, any other) | Government at the moment |
| 8. | Regional Centre for (Area of specialization) | Soil investigation |
| 9. | Head of the Institution with name and designation | Karma Dema Dorji, Programme Director |
| 10. | Name of the contact person, designation & contact details | Karma Dema Dorji, Programme Director |
| 11. | Head of Division / Laboratory (with name, designation & contact details) | Mr. Jamyang, Chief Chemist, National Soil service Centre |
| 12. | Recognition of activities <ul style="list-style-type: none"> ◆ International ◆ National | National |
| 13. | Mandate of the Laboratory | <ul style="list-style-type: none"> ✓ Analyze soil and plant samples and fertilizer samples. ✓ Analyze water samples for irrigation purposes too. |
| 14. | Infrastructure <ul style="list-style-type: none"> ◆ Area ◆ Services ◆ Instrumentation ◆ Training Facilities | <ul style="list-style-type: none"> • Total area around 6 acre • Analytical services, soil fertility, soil survey for crop plantation. • Instrumentation in the laboratory basically. |
| 15. | Human Resources & Expertise <ul style="list-style-type: none"> ◆ Area ◆ Expertise | Analytical services |
| 16. | Current Projects/Activities <ul style="list-style-type: none"> ◆ In-House ◆ National ◆ International ◆ Any other | <ul style="list-style-type: none"> • Sustainable Land management (supported by world bank) |
| 17. | Regional and International Collaborations | Wageningen Agriculture University, Netherlands |
| 18. | Annual Expenditure <ul style="list-style-type: none"> ◆ Current Year ◆ Proceeding Year | <ul style="list-style-type: none"> • Year 2010, 90million including the budget from the projects. |

| | | |
|---|---|--|
| | | <ul style="list-style-type: none"> • Not sure for the proceeding year |
| 19. | Willingness to assist Malé Declaration through National funding | |
| 20. | Additional Information(if any) | |
| *Attach separate sheet as Annexure wherever necessary | | |

MD/IG12/3/4b.3. Information Sheet
India: Regional Centre for Wet and Dry Deposition

| S. No | Item | Description |
|-------|---|---|
| 1. | Name of the Country | INDIA |
| 2. | Name of the Institution | Central Pollution Control Board, Delhi |
| 3. | Address for correspondence | <p>“Parivesh Bhawan” East Arjun Nagar, Shahdara, Delhi -110 032 Website: www.cpcb@nic.in</p> |
| 4. | Type of Institution (Autonomous, Government, Private, any other) | An autonomous statutory Institution under the Ministry of Environment & Forests (MoEF), Government of India. |
| 5. | Year of establishment | <p>1974, constituted under the provisions of Water (Prevention & Control of Pollution) Act, 1974. However, Air Laboratory was established in 1981 under Air (Prevention and Control of Pollution) Act, 1981.</p> |
| 6. | Brief note on the Institution | <p>The Central Pollution Control Board (CPCB) is a statutory body under the Ministry of Environment & Forests, Government of India. CPCB was constituted under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, and later the responsibilities under the Air (Prevention & Control of Pollution) Act, 1981, were also entrusted to CPCB. With the promulgation of the Environment Protection Act, 1986 various additional duties have been assigned to CPCB. The Major scientific and technical functions of the CPCB are as follows:-</p> <p>Carry out investigations and research relating to problems of prevention, control or abatement of water and air pollution.</p> <p>Provide technical assistance and guidance to the State Pollution Control Boards.</p> <p>Advise the Central Government on scientific and technical matters related to the prevention and control or abatement of water and air pollution.</p> <p>Lay down / modify pollution prevention & control standards (source specific & ambient).</p> <p>Establish laboratory to perform its functions.</p> <p>Collect, compile and publish technical and statistical data relating to water and air pollution.</p> <p>Plan and organize the training programmes for pollution control boards, PCCs, industries, NGOs and other related organizations.</p> <p>Organize through mass media, a comprehensive programme regarding the prevention, control or abatement of water and air pollution.</p> |

| | | |
|-----|--|---|
| | | Carry out technical investigations for reporting to Supreme Court and High Courts etc. |
| 7. | Funding Source (Government, self supported, any other) | 100% Grant-in-Aid Institution of the Government of India. |
| 8. | Regional Centre for (Area of specialization) | Monitoring & Measurement of Air Pollution, Dry & Wet Deposition, Instrumentation, Calibration, Human Resource Development |
| 9. | Head of the Institution with name and designation | Prof. S. P. Gautam, Chairman |
| 10. | Name of the contact person, designation & contact details | Mr. J. S. Kamyotra, Member Secretary, “Parivesh Bhawan” East Arjun Nagar, Shahdara, Delhi -110 032 Email: jskamyotra.cpcb@nic.in Te.: +91 11 2230 7078 Cell: +91 9891300237 |
| 11. | Head of Division / Laboratory (with name, designation & contact details) | Dr. D. Saha, Senior Scientist Head, Air Laboratory “Parivesh Bhawan” East Arjun Nagar, Shahdara, Delhi -110 032 Email: dsaha.cpcb@nic.in mailcpcb@gmail.com Tel.: +91 2230 1071 Cell: +91 97171 66653 |
| 12. | Recognition of activities International National | International: The Laboratory is accredited as per ISO/IEC 17025. National: The laboratory is recognized under the Environment (Protection) Act, 1986 |
| 13. | Mandate of the Laboratory | The CPCB laboratories are involved in many applied and experimental research activities besides routine monitoring, sampling and analysis activities. The main purpose of the laboratories are :- Carrying out monitoring of air. Supporting services for various projects with regard to sampling, analysis and reporting. Carrying out research and developmental project studies. Standardization of new methodology for analysis of specific pollutants. Carrying out bilateral collaborative project studies with other countries. Providing scientific laboratory related services to the State Pollution Control Boards and other organizations. |

| | | |
|-----|---|--|
| | | Conducting Inter Laboratory Analytical Quality Control (AQC) exercises for the benefit of the laboratories of SPCB and other for air related parameters. |
| 14. | Infrastructure Area Services Instrumentation | Laboratory is the service sector for the entire organization. Main focused services are: Ambient air Quality monitoring, Source emission monitoring, Fugitive Emission monitoring, Vehicular emission monitoring, Noise Monitoring, Monitoring, of Meteorological parameters Monitoring of special parameters viz. Dioxin- Furan, pesticides etc. Automatic ambient air quality monitoring system Research & Development etc. Instrumentations: Please see Annexure-II |
| 15. | Human Resources & Expertise Area Expertise | Please See Annexure-II |
| 16. | Current Projects/Activities In-House National International Any other | In-house: Demonstration of laboratory procedures with respect to monitoring & measurement of air pollutants. The on-going activities of air laboratory activities are Annexure III. National: Implementation of laboratory procedures with respect to monitoring & measurement of air pollutants including organization of workshops, seminars for dissemination of information. International: Association and participation in various international programs including organization of capacity building programs under Malé Declaration. Any other: The laboratory imparts training to various students / faculties (Schools, Technical & Scientific Institutes, Universities) including short term courses throughout the year. |
| 17. | Regional and International Collaborations | Regional: (1) MoU for capacity building of National Environment Commission, The Royal Government of Bhutan, (2) Organization of capacity building program & hands on training under Malé Declaration on Trans-boundary movement of air pollution in South Asia. International: Institutional capacity building programs with Environment-Canada, Sweden |
| 18. | Annual Expenditure | Expenditure on Laboratory Operations (excluding salary |

| | | |
|---|---|---|
| | Current Year Proceeding Year | components): Current Year :Rs.1,39,00,000/- Proceeding Year :Rs. 1,02,36,000/- |
| 19. | Willingness to assist Malé Declaration through National funding | Yes, willing to assist in capacity building (training & human resource development) activities. |
| 20. | Additional Information (if any) | The laboratory is proposed to undergo renovation in January 2011 and a modern state of art laboratory is expected to be in place with modern infra-structure and instrumentation by March 2011. |
| *Attach separate sheet as Annexure wherever necessary | | |

MAIN EQUIPMENT / INSTRUMENTS IN AIR LABORATORY

- ◆ Analyser (SO₂, NO_x, O₃, CO, BTEX, PM₁₀/PM_{2.5} (THC))
- ◆ Analytical Balance
- ◆ Auto Exhaust Analyser
- ◆ Centrifuge
- ◆ Combustion Analyser
- ◆ Conductivity Meter
- ◆ Digital Flow Calibrator
- ◆ Gas Analyzer for stack
- ◆ Gas Chromatograph –ATD
- ◆ Gas Chromatograph –Mass Spectrophotometer
- ◆ Gas Chromatograph –SPT
- ◆ Handy sampler
- ◆ High volume sampler
- ◆ Hot air oven
- ◆ Ion chromatograph
- ◆ Mass Flow Meter
- ◆ Meteorological Sensors
- ◆ Micro Analytical Balance
- ◆ Microwave Digestion System
- ◆ Multi calibration system
- ◆ Noise level meter
- ◆ Organic Carbon(OC)/ Elemental Carbon(EC) Analyzer
- ◆ Ozone Generator cum Permeation Oven
- ◆ pH Meter
- ◆ PM_{2.5} Sampler
- ◆ Read out/Control module for mass flow meters
- ◆ Respirable Dust Sampler
- ◆ Ring Test System for Analytical Quality control

- ◆ Rotary Evaporator
- ◆ Sodar system
- ◆ Spectrophotometer (portable)
- ◆ Spectrophotometer (UV-visible)
- ◆ Spectrophotometer (visible)
- ◆ Smoke Density Meter
- ◆ Soap Bubble Meter
- ◆ Stack Monitoring Kit
- ◆ Static Dilution System
- ◆ Ultrasonic Bath
- ◆ Water purification system
- ◆ Zero Air System



Conditioning Room



Rotary Evaporator



Gas Chromatograph –Mass Spectrophotometer



Gas Chromatograph –SPT



Gas Chromatograph –ATD



Ion chromatograph



Ring Test System for Analytical Quality control



Static Dilution System



Organic Carbon(OC)/ Elemental Carbon(EC) Analyser

Human Resources & Expertise

| S. No. | Area | Expertise |
|--------|---|-----------|
| 1. | Human Resource Management | 05 |
| 2. | Laboratory Management / operations | 08 |
| 3. | Research & Development | 12 |
| 4. | Ambient air Quality | 15 |
| 5. | Source emission monitoring, | 09 |
| 6. | Fugitive Emission monitoring, | 06 |
| 7. | Vehicular emission monitoring, | 04 |
| 8. | Noise Monitoring, | 07 |
| 9. | Monitoring, of Meteorological parameters | 04 |
| 10. | Monitoring of special parameters, | 05 |
| 11. | Automatic ambient air quality monitoring system | 08 |

MD/IG12/3/4b.4. Information sheet
India: Regional Centre for Corrosion Impact Assessment

National Metallurgical Laboratory located at Jamshedpur, India is a constituent laboratory of Council of scientific and Industrial Research (CSIR) of India. This laboratory was founded in 1950. Research and developments at National Metallurgical Laboratory focuses on Minerals, Metals and Materials. Through an arsenal of state of the art facilities and infrastructure, and on the strength of its expertise, NML has evolved into a premier Indian organization in the stated areas. It has to its credit numerous technologies in area of corrosion and coatings, mineral beneficiation protocols, number of strategic and substitute alloy developments, several industrial solutions especially in remaining life assessment, material selection and property enhancement.

NML has the largest creep testing facility in India and one of the largest in Asia. Its materials evaluation and characterization facilities compare with the best in the world. In advanced materials development, NML has strong presence in Corrosion assessment of metals and materials including atmospheric corrosion, Magnetic materials, Rapidly solidified alloys, Surface Coatings, Metallic Foams, and many others. Advanced materials processing and post-processing carried out include Mechanochemical activation, Semi-solid processing, Biomimicry, Thermo-mechanical treatments, High Temperature Synthesis, Advanced Joining, Grain boundary engineering, High strain rate forming, and several other techniques.

Surface Engineering activities at NML targets wear & oxidation resistance, corrosion resistance, high temperature resistance through Plasma processing by different PVD processes such as sputtering, electron beam evaporation, arc evaporation, plasma ion immersion, Laser cladding and surface medication, Self propagating High Temperature Synthesis (SHS) and thermal spray techniques. Additionally through shot peening and SMAT processing the fatigue, wear and fracture resistance of functional tools like automotive appliances are enhanced and optimized. Development of specialty powders and coatings from such powders for surface property enhancement is being carried out at NML.

Contact Address:

Dr. DDN Singh,

Head, Surface Engineering,

National Metallurgical Laboratory, Jamshedpur-831 007, INDIA

Email id ddns@nmlindia.org

Ph. No. 0657 2345266

Fax No. 0657 2345213

Current Research Projects:

In House:

1. Role of self – assembled mono layer of 1,2,3 benzotriazole in protecting copper artifacts covered with sulphide film,
2. Corrosion evaluation of painted steel panels by electrochemical measurement,
3. Performance and mechanism of action of self – priming organic coating on oxide covered steel surface,
4. Performance of different organic coatings on steel substrate by accelerated and in atmospheric exposure tests,
5. Role of climatic conditions on corrosion characteristics of structural steels”

National:

1. Impact of air pollution on corrosion of metallic and non-metallic materials sponsored by CPCB, New Delhi,
2. Degradation of coatings in polluted environments of India, Sponsored by Tata Steel, Jamshedpur
3. Predicting the life of galvanized wires in polluted environments of different locations of India, Sponsored by Tata Wire, Mumbai
4. Developing suitable coatings for steels for application in different climatic conditions of India, Sponsored by INSDAG, Kolkata
5. Assessing the performance of coatings and steels in different climatic conditions of India, Sponsored by INSDAG, Kolkata
6. Ascertaining the causes and suggesting remedial measures for failed boiler tubes, Sponsored by Jindal Power and Steel Ltd, Jajapur, Orisa
7. Investigation of quality defects in exported galvanized coils, Sponsored by Tata Steel, Jamshedpur
8. Plasma deposition of Zinc-Nickel coating to control corrosion due to foul fuels, Sponsored by tata Steel, Jamshedpur
9. Plasma deposition of Tungston Carbide-Cobalt coating on steel substrate, Sponsored by Tata Steel, Jamshedpur

International:

1. Providing consultancy on nano scale characterization of passive film on steel reinforcement bars, Sponsored by King Saud University, Riyadh, Saudi Arabia
2. Consultancy services for establishment of a metallurgical laboratory for failure analysis and corrosion assessment at caribbean Industrial Research Institute, Sponsored by CARIRI, Trinidad and Tobago
3. Providing consultancy to improve zinc utilization factors during galvanizing, Sponsored by MSI, Birat Nagar, Nepal

Research Projects completed in the past:

1. Studies on corrosion of steel rebars and determine their suitability for use in construction work of SSNNL , Gandhi Nagar SSNNLtd May 2001-Dec.2007
2. Relation between accel. Value & Actual performance Of CRS bars, Tata Steel Apr 1999-Mar 2006
3. Optimizing the properties of GC sheets, Tata Steel, Mar. 2000-June2004
4. Improving the quality of Metasave & Galvasave for use in CRM of Tata Steel Metoil Corp., Jamshedpur Oct 2000-Dec 2005
5. Optimization of corrosion inhibitors, Navdeep Chemicals Oct 2000-Apr 2002

6. Performance evaluation of epoxy coated vis-à-vis TMT CRS bars embedded in concrete Tata Steel, Jamshedpur Apr 2001-Mar 2003
7. Developing the criteria for CRS bars, SSNNLtd. May 2001-Nov 2002
8. Fluoride Induced Corrosion, SSNNLtd. July 2000-Jul.2002
9. Exhaustive review on the performance of epoxy coated rebars, Tata Steel May 2001- Jan 2003
10. Galvanized coatings on steels for use in concrete environments, EMR-CSIR, Jan2002 - Dec.2005
11. Paints & coatings on HSLA steels, INDO-US Apr 1999-July 2002
12. Optimizing the parameters of use of Galvaflux in the users plan, Adityapur Dies Apr.2002-March 2004
13. Ascertaining the quality of TMT steel bars produced by M/S Parmeswar steels, ahmadabad Parmeswar Steel June2002 – June 2003
14. Corrosion resistance mechanical properties and chemistry of CRS bars, Aug 2002 to Aug 2004
15. Paint System for extended Maintainance free life of steel structure, INSDAG Oct 2002 to May 2005
16. Technology transfer for HCl inhibitor KH -0059, Navdeep chemicals, Mumbai June 2002 Aug 2003
17. Advisory consultancy to ascertain the economical use and production of corrosion inhibitors, Navdeep chemicals, Mumbai June 2002 to Jul 2005
18. Imparting training to plant & R & D personnel on Hot Dip Galvanizing, Manawati Steels,Biratnagar, Nepal Dec.2005-Dec. 2007
19. Know-how for the production of NML-HODGAFLUX KH-61, Ambika Chemicals, Kolkata 2003-2005
20. Reduction of bu product generation during galvanizing, Tata Steel Jan.2006-Dec-2007
21. Development of long lasting rebars for use in building construction Planning Commission through CSIR, Oct. 2002-Dec.2007
22. Studies,characterisation and improvement of cold galvanized reinforcement bars, SRMB Udyog Ltd, Kolkata Jul.2006-Jun.2008
23. Quality improvement of synthetic red iron oxide pigments, Tata Pigments, Jamshedpur Oct.2004 to Sept.2006
24. Eco-friendly surface treatment of galvanized rebars embedded in concrete to prevent hydrogen evolution and corrosion. D.S.T. New Delhi Jul.2005- June-2008
25. Suggesting proper steel and coatings for rebars to be used in construction work of Me.S.E.B. Hydro project. M.E.S.E.B., Shillong Oct. 2004 to Oct.2006
26. Protection of CR coils using low oil rust preventives, Tata Steel Apr.2004-Mar.2005
27. White rust prevention on galvanized coils using chromate free Passivators, Tata Steel Apr.2004-Mar.2005
28. Suggesting proper materials and coatings for various components of hydro project of Me.S.E.B. M.E.S.E.B., Shillong Oct. 2004 to Mar. 2005
29. failure analysis of drain lines of Various KODs at GAIL plant, Lakwa GAIL, Lakwa, Assam Dec.2004 to march 2005
30. Corrosion studies of collapsed Daman-Ganga bridge structure at Daman, Admn. of Daman Oct. 2004-Sept.2005
31. Evaluation of rebars for their corrosion resistance RSIL,Jaipur Jan 1997-Feb 1997
32. Evaluation of Galvanized Coatings, Tata Steel Nov 1997-Feb 1998
33. Failure analysis of rear wall tubes, Usha Alloys Mar 1998-Dec1998

34. Evaluation of corrosion of steel rebars, Tata steel Sep 1998-Feb 1999
35. Evaluation of corrosion behaviour of steel bars, SSNNL, Gandhinagar Oct 1998-Apr 1999
36. Evaluation of rebars S.B.C., Dharangdhra Feb.1999-May 1999
37. Narmada project-evaluation of rebars SSNNL,Gandhinagar May 1998-april 2001
38. Evaluation & recomm. of rebars Gujarat Police May 1999-June 1999
39. Corrosion characteristics of steel Rebars use in NSE of Mumbai, Tata Steel May 1998-april 2001
- 40.Evaluation of rebars, SSNNLtd. May 1998-april 2001
- 41.Evaluation of rebars, Tata Steel, Jan 1997-Dec 1998
- 42.Narmada Project - Evaluation of rebars, SSNNLtd. May 1998-Apr 2001
43. Improving corrosion resistance of Tempcor rebar, Vizag Oct 1998-Dec 1999
44. Inhibitor for room temp. cleaning of Boilers components – NTPC NTPC Nov 1997-Aug 2000
45. Evaluation of rebars, Tata Steel Oct 1998-Apr 1999
- 46.Dev. Of value added product out of ETP effluent/solid waste Mehta Alloys Oct 1999-Apr 2000
- 47.Consultancy on Galvaflux, Adityapur Dies July 1997-Dec 1998
- 48.Quick identification of CRS &SRPC, SSNNLtd. July 1998-Apr 1999
- 49.Consultancy for opt. Of Galvaflux, Adityapur Dies 1995-1997
- 50.To improve surface finish of copper, Alcobex Mar 1999-Feb 2000
- 51.Improving the quality of CRS bars,RSIL, Jaipur June 1999-Dec 1999
52. Reduction in acid consumption & Pollution, Tisco Apex June 1997-Dec 1998
- 53.State of Art-Report, Tata Steel Feb1998-Jan2001
- 54.Dev. Of volatile corrosion inhibitors, AMU, Aligarh Feb1999-Jan2001
55. Corrosion characteristics of advanced Ferrous alloys, NRL Washington, June 1995-Dec 2000
- 56.Know-how on Galvaflux KH33/94/95, Adityapur Dies 1995-1996
- 57.Know-how on Galvasave KH Metoil Corp., Jamshedpur 1994-1995
- 58.Development of formulation for transportation of wet sour crude/condensate & gas. ONGC 1985-1990
- 59.NML-METASAVE : A pickling inhibitor, Tata Steel & TCIL, Jamshedpur,1985-1990
- 60.Failure investigation of off shore failed pipe lines. ONGC 1990-1991
- 61.Corrosion fatigue of structural steels. EMR, New Delhi 1991-1996
- 62.Development of passivator for galvanized surfaces. Rourkela Steel Plant 1989-1990
- 63.GALVASAVE : A passivator for galvanized surfaces.Tata Tubes & Metoil Corp. (Apex) 1994 - 1995
- 64.GALVA FLUX : A galvanizing flux. Tata Steel (Apex) 1995-1997
- 65.Studies on corrosion resistance, mechanical properties and chemistry of CRS bars to assess their suitability of use in different applications in SSNNL. SSNNLtd Aug. 2002-Aug. 2007
- 66.Developing paint systems for durable steel structures, INSDAG,Kolkata, April 2007 March 2010
- 67.Corrosion characteristics of coatings under simulated climatic conditions, Feb 2007-July 2007
- 68.Corrosion characteristics of glass reinforced coating in acidic mine water, May 2007 –Dec 2007

MD/IG12/3/4b.5. Information sheet

Iran: Regional Centre for Modeling

| S.No. | Items | Description |
|--------------|--|--|
| 1. | Name of the Country | Iran |
| 2. | Name of the Institution | Institute for environment and Its conversion to the university is approved . |
| 3. | Address for correspondence | Standard square,sheikh abad road , Institute for environment box No 31746-118 |
| 4. | Type of Institution (Autonomous, Government, Private, any other) | Government |
| 5. | Year of establishment | More than 30 years |
| 6. | Brief note on the Institution | Institute have a long experiment in the field of educational and research and have good potential regarding human resources for scientific affairs Communicate with other organizations is desirable.infrastructure as such as others university is acceptable . |
| 7. | Funding Source (Government, self supported, any other) | Part of the funding prepared by government and part of its by self supported |
| 8. | Regional Centre for (Area of specialization) | At least two specialist with a Ph.D. are activities in this institute that have many experienced t in this field |
| 9. | Head of the Institution with name and designation | Dr Asghar mohammady Fazel |
| 10. | Name of the contact person, designation & contact details | Dr Javad bodagh jamali |
| 11. | Head of Division / Laboratory (with name, designation & contact details) | Dr Ravanbakhsh shirdam is responsible of laboratory |
| 12. | Recognition of activities International National | Most activities are associated with environmental issues such as training in the field of water ,Air pollution, soil, EIA, laboratory, research, and projects of modeling |
| 13. | Mandate of the Laboratory | Work in the laboratory is one of the requirements of students in this institute .In addition laboratory is also used for research and ongoing project one air pollution station is located in this institute also and is under management of institute . |
| 14. | Infrastructure Area Services Instrumentation Training Facilities | All requirements that needed for research such as human resources laboratory, internal funds, communication and cooperation with other organization is provided. |
| 15. | Human Resources & Expertise Area | <input checked="" type="checkbox"/> All teachers of this institute are Ph.D. degree and has |

| | | |
|---|---|---|
| | Expertise | excellent expertise in the field of environment and have a lot of experiment in the field of research . |
| 16. | Current Projects/Activities In-House National International Any other | Ongoing all of projects is internal but there is the high potential for doing international affairs, also institute has had very good project with the World Bank in the past. |
| 17. | Regional and International Collaborations | Since the activity of the institute is under the DOE association with other organization is very good . |
| 18. | Annual Expenditure Current Year Proceeding Year | Totally About 1500 million dollar annual |
| 19. | Willingness to assist Malé Declaration through National funding | Institute officials much interest to have cooperation with male declaration but the process of providing of funding is very difficult . |
| 20. | Additional Information(if any) | |
| *Attach separate sheet as Annexure wherever necessary | | |

List of Faculty Members:

| S No | Department | Name of Post | Name of Faculty | Degree/s obtained | Comments |
|------|---|---------------------|--------------------------------|-------------------------------------|--|
| 1. | Director | Director | Prof (Dr.)Saroj kumar Mazumder | MBBS, DCM, M.Phil | Director |
| 2. | Community Medicine | Professor | Dr. Shaila Hossain | MBBS, DCM, MPH | Head of the Department |
| | | Associate Professor | Dr. Mussarat Haque | MBBS, MPH, MPhil | |
| | | Associate Professor | Dr. Md. Ziaul Islam | MBBS, MPH, MSc, PGD | |
| | | Assistant Professor | Dr. Md. Mahmudul Haque | MBBS, MPH | |
| | | Assistant Professor | Dr. Hasina Rabeya Bashir | MBBS, MPH | |
| | | Assistant Professor | Dr. Suraiya Rawshan Ara Begum | MBBS, MPH | |
| | | Assistant Professor | Dr. Bipul Krishna Chanda | MBBS, MPH | |
| 3. | Epidemiology | Professor | Dr. Md. Anisur Rahman | MBBS, DPH | Head of the Department |
| | | Associate Professor | Dr. Meerjady Sabrina Flora | MBBS, MPH, PhD | |
| | | Associate Professor | Dr. Md. Shafiqul Islam | MBBS, D-Epid, MSc epid, PhD | |
| | | Assistant Professor | Dr. Md. Abdur Rahim | MBBS, DPH, Dip(H-Econ), M.Phil, PhD | |
| | | Assistant Professor | Dr. Monira Akhtar Moni | MBBS, MPH | |
| | | Assistant Professor | Dr. Kazi Shafiqul Halim | MBBS, MPH | |
| | | Assistant Professor | Dr. Md. Iqbal Kabir | MBBS, MPH | |
| | | Medical Officer | Dr. Anindita Shabnam Quraishi | MBBS, MPH | |
| 4. | Occupational & Environmental Health | Assistant Professor | Dr. A. Wazed | MBBS, MPH, DPS, DMU | Head of the Department |
| | | Assistant Professor | Dr. Manzurul Haque Khan | MBBS, DPH, PhD | Guest: Prof. Sk. Akhtar Ahmad, Prof. Dr.Abdul Wadud Khan |
| | | Medical Officer | Dr. Nasrin Khan | MBBS, MPH | |
| 5. | Public Health and Hospital Administration | Associate Professor | Dr. Md . Amirul Hasan | MBBS, MPH, MPH, PhD | Head of the Department |
| | | Associate Professor | Dr. Zahidur Rahman | MBBS, DPH, MPH | |
| | | Assistant Professor | Dr. Khorshed Ali Miah | MBBS, MPH | |
| | | Assistant Professor | Dr. Asit Baran Biswas | MBBS, MPH | |
| | | Assistant Professor | Dr. Abul Masud Md. Nurul Karim | MBBS, MPH | |
| 6. | Maternal and Child Health | Associate Professor | Dr. Afroza Begum | MBBS, MPH | |
| | | Associate Professor | Dr. Md. Nazrul Islam | MBBS, MPH | Head of the Department |

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|-----|----------------------------|---------------------|---------------------------|----------------------------|------------------------|
| | | Assistant Professor | Dr. Shahida Hamid | MBBS, MPH | |
| | | Medical Officer | Dr. Sathi Dastidar | MBBS, MPH | |
| | | Medical Officer | Dr. Md. Ashrafal Alam | MBBS, MPH | |
| 7. | Health Education | Assistant Professor | Dr. Jahan Ara Begum | MBBS, MPH | |
| | | Assistant Professor | Dr. Kazi Jahangir Hossain | MBBS, M.Phil, PhD | |
| | | Medical Officer | Dr. Md. Shamsul Alam | MBBS, M.Phil | |
| 8. | Population Dynamincs | Assistant Professor | Dr. Md. Rezaul Karim | MBBS, MPH, PhD | |
| 9. | Biostatistics | Medical Officer | Dr. Md. Rizwanul Karim | MBBS, MPH | |
| 10. | Nutrition and Biochemistry | Professor | Dr. Md. Emdadul Haque | MBBS, M.Phil | Head of the Department |
| | | Assistant Professor | Dr. Ferdousi Yasmin | MBBS,DCM, M.Phil | |
| | | Assistant Professor | Dr. Md. Mustafa Kamal | MBBS, MPH, PhD | |
| | | Assistant Professor | Dr. Rawshan Ara | MBBS,DMCH&FP, MS | |
| | | Assistant Professor | Dr. Hafiza Sultana | MBBS,MPH | |
| 11. | Parasitology | Professor | Dr.Akhtarunnahar | MBBS, M.Phil | Head of the Department |
| 12. | Microbiology | Professor | Dr.Naima Moazzem | MBBS, M.Phil | Head of the Department |
| 13. | Entomology | Professor | Dr. Shirin Akhtar | MBBS, DTM&H, MPH, MSc, PhD | Head of the Department |

MD/IG12/3/4b.6 Information Sheet

Nepal: Regional Centre for Pollution Reduction Policies/ Strategies

| S.No. | Items | Description |
|--------------|--|---|
| 1. | Name of the Country | Nepal |
| 2. | Name of the Institution | Ministry of Environment |
| 3. | Address for correspondence | |
| 4. | Type of Institution (Autonomous, Government, Private, any other) | Government |
| 5. | Year of establishment | |
| 6. | Brief note on the Institution | |
| 7. | Funding Source (Government, self supported, any other) | Government |
| 8. | Regional Centre for (Area of specialization) | Regional Centre for Pollution Reduction Policies/ Strategies |
| 9. | Head of the Institution with name and designation | Minister |
| 10. | Name of the contact person, designation & contact details | Mr. Purushottam Ghimire Joint Secretary Chief of Environment Division , Ministry of Environment Science and Technology Kathmandu, Nepal Tel 00-977-1-4211586 Off, 6637353 Residence Mobile: 00-977-9841278600 |
| 11. | Head of Division / Laboratory (with name, designation & contact details) | |
| 12. | Recognition of activities International National | |
| 13. | Mandate of the Laboratory | |
| 14. | Infrastructure Area Services Instrumentation Training Facilities | |
| 15. | Human Resources & Expertise Area Expertise | |
| 16. | Current Projects/Activities | |

| | | |
|---|--|--|
| | In-House National International Any other | |
| 17. | Regional and International Collaborations | |
| 18. | Annual Expenditure Current Year Proceeding Year | |
| 19. | Willingness to assist Malé Declaration through National funding | |
| 20. | Additional Information(if any) | |
| *Attach separate sheet as Annexure wherever necessary | | |

MD/IG12/3/4b.7. Information Sheet
Regional Centre for Crop and Vegetation Impact Assessment

| S.No. | Items | Description |
|--------------|---|--------------------|
| 1. | Name of the Country | |
| 2. | Name of the Institution | |
| 3. | Address for correspondence | |
| 4. | Type of Institution (Autonomous, Government, Private, any other) | |
| 5. | Year of establishment | |
| 6. | Brief note on the Institution | |
| 7. | Funding Source (Government, self supported, any other) | |
| 8. | Regional Centre for (Area of specialization) | |
| 9. | Head of the Institution with name and designation | |
| 10. | Name of the contact person, designation & contact details | |
| 11. | Head of Division / Laboratory (with name, designation & contact details) | |
| 12. | Recognition of activities International National | |
| 13. | Mandate of the Laboratory | |
| 14. | Infrastructure Area Services Instrumentation Training Facilities | |
| 15. | Human Resources & Expertise Area Expertise | |
| 16. | Current Projects/Activities In-House National International Any other | |

| | | |
|---|---|--|
| 17. | Regional and International Collaborations | |
| 18. | Annual Expenditure Current Year Proceeding Year | |
| 19. | Willingness to assist Malé Declaration through National funding | |
| 20. | Additional Information(if any) | |
| *Attach separate sheet as Annexure wherever necessary | | |

(information will be included upon appropriate centre is identified)

MD/IG12/3/4b.8. Information sheet
Sri Lanka Regional Central for Emission Inventory

| S.No. | Items | Description |
|-------|--|---|
| 1. | Name of the Country | Sri Lanka |
| 2. | Name of the Institution | Central Environmental Authority |
| 3. | Address for correspondence | 104, Denzil Kobbekaduwa Mawatha Battaramulla |
| 4. | Type of Institution (Autonomous, Government, Private, any other) | Semi-Government |
| 5. | Year of establishment | 1981 |
| 6. | Brief note on the Institution | The CENTRAL ENVIRONMENTAL AUTHORITY was established in August 1981 under the National Environment Act.(See Annexure I) |
| 7. | Funding Source (Government, self supported, any other) | Government |
| 8. | Regional Centre for (Area of specialization) | Preparation of Emission Inventory. |
| 9. | Head of the Institution with name and designation | Director General |
| 10. | Name of the contact person, designation & contact details | R.M.Kulasena, Deputy Director Air Quality Tel: +94 718188652 e mail kulelab@cea.lk |
| 11. | Head of Division / Laboratory (with name, designation & contact details) | Mr K.H.Muthukudaarachchi Deputy Director General (EPC) (*Laboratory is under the division of Environmental Pollution Control (EPC) Tel: +94112873453 e-mail muthukudaa@cea.lk |
| 12. | Recognition of activities International National | |
| 13. | Mandate of the Laboratory | Preservation of the Environment |
| 14. | Infrastructure Area Services Instrumentation Training Facilities | 800 Sqfeet Air Quality monitoring, water quality monitoring, Noise and vibration monitoring Equipments for water quality analysis, Air quality Monitoring, and Noise and vibration monitoring |
| 15. | Human Resources & Expertise | |

| | | |
|---|---|--|
| | Area Expertise | Air water analysis and noise and vibration monitoring. Air quality monitoring, Water quality monitoring and Noise and vibration monitoring. |
| 16. | Current Projects/Activities In-House National International Any other | Inland surface water monitoring Ambient air quality monitoring Malé declaration, IAEA/RCA Subproject on Improved Urban Air quality Management through Isotope and related Techniques |
| 17. | Regional and International Collaborations | UNEP, KOICA, JICA, IAEA |
| 18. | Annual Expenditure Current Year Proceeding Year | Rs 360 million |
| 19. | Willingness to assist Malé Declaration through National funding | CEA is willing. But it should be confirmed through the focal point (Ministry of Environment) |
| 20. | Additional Information(if any) | |
| *Attach separate sheet as Annexure wherever necessary | | |

Description of CEA

Vision of the CEA

A Clean and Green Environment through Service Excellence

Mission of the CEA

Flagship of the Nation, in Protecting and Managing the Quality of Environment by Promoting Public Participation, Enforcement, and Advanced Technological Intervention and Environmental Education

Powers, Functions and Duties of the Authority

- ◆ to administer the provisions of Sri Lankan National Environmental Act and the regulations made there under;
- ◆ Set up and Implement Specific Standards, Norms and Criteria to protect and maintain the quality of the Environment
- ◆ Coordinate and implement all regulatory activities related to the discharge of waste and pollutants into the Environment
- ◆ Regulate, Maintain and Control the volumes, types and effect of waste discharge, emission, disposal or other sources of pollutions, which are of danger or potential danger to the quality of the Environment
- ◆ Environmental Education and Awareness
- ◆ Undertake investigation and inspections to ensure compliance and investigate complaints relating to none compliance
- ◆ to conduct, promote and co-ordinate research in relation to any aspect of the environmental degradation or the prevention thereof, and to develop criteria for the protection and improvement of the environment;
- ◆ Environmental Management and Assessments on New Projects

FEASIBILITY REPORT ON STRENGTHENING THE REGIONAL FRAMEWORK ON AIR POLLUTION REDUCTION IN SOUTH ASIA

I. Background

1. The implementation of the Malé Declaration has been in phases in the last 12 years and has succeeded in building up regional cooperation. As its implementation continuous, greater involvement of the participating countries is required. A regional framework on air pollution reduction in South Asia could be a logical step forward towards this end. To take a step towards this, the implementation of the Malé Declaration was reviewed during the Sixth Session of the Intergovernmental Meeting (IG6) on October 2004 in Iran, which lead to the decision of forming a TFFD of the Malé Declaration during the Ninth Session of the Intergovernmental Meeting (IG9) held on 13th September 2006 in Maldives. The ToR of the TFFD was adopted during the Tenth Session of the Intergovernmental Meeting (IG10) held on 21st August 2008 in Sri Lanka with one of its primary task recognising the impacts of air pollution on human health and the environment, is to conduct a feasibility study on strengthening a regional framework on air pollution reduction in South Asia during the Phase IV implementation of Malé Declaration. The aim of the regional framework would be for better cooperation, and better understanding among the countries on issues related to air pollution in order to successfully implement air pollution reduction measures across the participating countries.
2. The TFFD, during the first meeting which was held on 2-3 August 2010 at Pathumthani, Thailand, discussed further steps on conducting the feasibility study. The TFFD agreed on the major outline for the feasibility study which include a)Review of the socio-economic situation of South Asia; b)The existing framework on air pollution reduction in South Asia; c)Possible options for consideration of the government; and d)Other Concerns/Other Issues.
3. The Second Meeting of the TFFD which was held on 29-30 November 2010 in Colombo, Sri Lanka, discussed and adopted the draft feasibility study and the analysis of gaps and weaknesses of the Malé Declaration. Based on the discussions, the draft feasibility study and the analysis of gaps and weaknesses of the Malé Declaration, was revised. The TFFD agreed to finalise the document through email communications. The final document was further presented to the Intergovernmental Meeting (IG12) which was held on June 2011.

II. Recommendations to further develop the Malé Declaration towards strengthening the framework for air pollution reduction at national and regional levels

4. The analysis of gaps and weaknesses of Malé Declaration attached to this report (see attachment 5.1), should lead to identifying the policy actions at the regional and national level while this should be continuing process. Current experience shows we may have some policy instruments which will complement the on-going national efforts. We could have minimum standards, e.g. automobile, brick kiln, fuels, etc. referring to both terrestrial and non-terrestrial forms. This would be strengthened by technical assistance of experts on standards

and thus enable protocols to be drawn up. This will be left to each country to adopt or amend the protocol to make it more stringent based on national requirements.

MD/IG12/3/5a. Analysis of Gaps and Weaknesses of the Malé Declaration

I. Introduction

1. This feasibility study has been conducted on the “Malé Declaration on Control and Prevention of Air Pollution and its likely Transboundary Effects for South Asia” to assess the socioeconomic situation of South Asia, the existing situation of air pollution in the countries and region, and the responses of countries to air pollution. It makes recommendations for strengthening the framework for air pollution reduction at regional and national levels in South Asia.
2. The Malé Declaration stated the need for countries to carry forward, or initiate, studies and programmes on air pollution in the member states Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan and Sri Lanka.
3. Since its inception over twelve years ago in 1998, the Malé Declaration and its member countries have carried out a number of projects/ activities for the creation of a meaningful framework to limit air pollution. Details of the four implementation phases and some of the key activities are described in Annex 1.
4. A greater participation of Malé Declaration member states is required as its implementation progresses. A regional framework is needed for better understanding and cooperation among the Malé Declaration member states, on issues related to air pollution and to effectively implement with shared responsibilities, air pollution reduction measures across the member countries for the protection of environment and safeguarding public health, especially of future generations.

II. Socio-Economic Status of Malé Declaration Member States

5. In order to understand the importance of Malé Declaration for reducing air pollution and its likely trans-boundary effects, it is important to first review the socioeconomic situation of the Malé Declaration member states. This section of the report describes the existing socioeconomic situation of the region and provides a review of the same.
6. South Asian countries with a combined population of roughly 1.6 billion people, have adopted the Malé Declaration. As a low-income region, South Asia is home to half of the world’s poor. Traditionally, the South Asian economies are centered on agriculture, however recently manufacturing and services have become major contributing sectors as well. The

strong recovery in India and the growth in the economies of Bangladesh and Sri Lanka are the primary reasons for this economic rebound (World Bank, 2010a). India, as an emerging economy of the world is the dominant political power in the region.

7. The state of education and health in the region leave much to be desired. With the worst score on the Global Hunger Index (GHI)¹, South Asia along with Sub-Saharan Africa suffers from the highest level of hunger (International Food Policy Research Institute, 2010).

III. Environment Degradation and Air Pollution in Malé Declaration Member States

8. Environmental degradation remains a challenge in Malé Declaration member countries. With the projected increase in industrial activity, exponential growth in number of vehicles and population, the contribution of each Malé Declaration member country to regional air pollution will increase over time. India is the biggest energy user, followed by Iran and Pakistan (World Bank, 2010). With increasing urbanization and industrialization, air pollution is an increasing concern in South Asia. Sulfur dioxides, nitrogen oxides and particulate matter (PM) emissions have been rising steadily over past few decades. Owing to economic growth and increasing demand, greenhouse gas emissions have risen in South Asia by about 3.3% annually since 1990. Coal is the main source of energy in the region, followed by natural gas (World Bank, 2010c).
9. Bangladesh: Air pollution is one of the major sources of environmental degradation in Bangladesh. There are 3 main causes of air pollution in Bangladesh; these are (1) Vehicular emissions (2) Industrial emission (3) Brick kilns (Ministry of Finance - Bangladesh, 2009). In addition, due to the high density of vehicular traffic and industries in the urban areas of Bangladesh, air pollution is a growing concern for the inhabitants of urban areas. The geographic location coupled with low income and over reliance on climate sensitive sectors makes Bangladesh particularly vulnerable to natural disasters.
10. **Bhutan** is one of the few countries in the world where the environment is still protected. Two main reasons behind Bhutan's enviable record of environmental protection are (1) Recent start of the development process and (2) Constitutional protection given to environmental sustainability. The constitution of Bhutan specifically states that at least 60% of Bhutan landmass must be under forest cover at all times. Over the years the government has rigorously followed its policy of environmental sustainability and currently almost 51% of Bhutan's land mass falls into the category of protected areas and forests. Forest fires are the biggest sources of air pollution in Bhutan. Constitutional protections and government efforts have allowed Bhutan to limit air pollution to fairly low levels despite steady economic growth over the last few years.

¹ Global Hunger Index (GHI) is a multidimensional statistical tool used to describe the state of hunger in countries. The GHI captures three dimensions of hunger: insufficient availability of calories, shortfalls in the nutritional status of children, and child mortality (IFPRI, 2010).

11. **India:** Rapid growth and industrialization over the last few years has led to some major changes in India's environment. More and more cities are experiencing unhealthy levels of air pollution as a direct consequence of unplanned urbanization and growth in population. A number of reasons have contributed to the sharp rise in air pollution and environmental degradation in India. Some of these include (1) Coal, (2) Oil, (3) Process emissions and (4) Traditional sources of energy. Coal is India's most abundant source of energy and currently almost 60% of its commercial energy needs are fulfilled by it. Besides having a very high ash content that is responsible for particulate matter emission, coal is also a large source of sulfur dioxide emission in India because of its high sulfur content. Oil is another major source of pollution emissions in India. Lastly, widespread use of traditional sources of energy such as fuel wood and animal dung has also been contributing to air pollution. Estimates indicate that nearly 3 in 4 rural households depend on traditional sources of energy for cooking, heating etc. (Ministry of Environment - India, 2010).
12. **Iran:** Environmental and natural resources have been substantially degraded in Iran over the past few decades due to unsustainable development, inadequate enforcement of environment laws, and overpopulation. Urban areas in particular have had to endure exceedingly unhealthy levels of pollution. This is evident by the fact that schools in Tehran are closed occasionally due to dangerously high levels of air pollution (World Bank, 2010).
13. **Maldives:** is at the forefront of efforts to limit climate change impacts. Located in the Indian Ocean, most of the islands that comprise Maldives are between 1 and 1.5 meters above the sea level. Consequently, if global warming continues at its current pace, most of Maldives will be underwater before 2050 (MDEP, 2008B).
14. **Nepal:** Years of unabated population growth and lack of a stringent pollution regulation and management systems has left a deep imprint on the environment in Nepal. Air quality in both urban and rural areas is deteriorating in the country with Kathmandu in particular being at very high levels of risk. The bowl like topography of the Kathmandu valley restricts air movement, thereby accumulating high levels of dangerous pollutants (UNEP2008 D).
15. **Pakistan:** Air pollution is one of the most pressing concerns for environmental protection agencies in Pakistan. Despite having very low energy consumption in comparison to international standards, air pollution in Pakistani cities is soaring (Khwaja & Khan, 2005). Not able to afford gas or electric stoves and heaters, poor people across the country use firewood to cook food and provide heat during the coldest months of winter. Biomass burning is problematic because of the high level of particulate matter produced as well as carbon monoxide and other harmful gases. The level of particulate matter (PM) in major Pakistani cities is almost 2-3.6 times higher than WHO standards (Shigeta, 2000). Environmental challenges facing Pakistan today are the result of a rapidly growing economy, and also unplanned increases in industrialization and urbanization. Increasing economic growth over the years has resulted in overexploitation of natural resources. In addition, unplanned increases in industrialization are leading to air, water and land pollution all across the country (Ministry of Finance - Pakistan, 2009)

16. **Sri Lanka:** Rapid growth over the last few decades has had a massive impact on the environment in Sri Lanka. Years of development with little regard for the environment has resulted in the forest cover decreasing from 70% in 1900 to less than 20% currently (FAO, 1991). Similarly an increase in the GDP per capita over time has resulted in a rapid increase in the number of motor vehicles in Sri Lanka. This in turn has increased the levels of air pollution, especially in the urban areas. Some of the key sources of air pollution aside from motor vehicles include (1) Open burning of domestic and industrial refuse, (2) Combustion of commercial energy and (3) Indoor cooking using fire wood (York University, 2003).
17. Air pollutants can be transported across state and national boundaries covering a distance from about 100s to a few 1000s of kilometers, therefore pollutants produced by one country can have adverse impacts on the environment of neighboring countries as well. Down-wind areas of the countries are likely to be affected more than the up-wind areas. Especially for landlocked cities, trans-boundary air pollution is an issue that demands critical attention. In this context, the Malé Declaration adopted in 1998 provides the basis for a regional framework for air pollution reduction. Some key air pollutant of priority concerns to Malé member states are described below.

IV. Key Air Pollutants of Priority Concerns to Malé Declaration Member States

Particulate Matter:

18. The suspended particulate matter (SPM) is of great concern in Malé Declaration member states. In most of the Malé Deceleration member countries, the levels of SPM exceed the set national standards and cause severe health impacts and environmental damage. WHO guideline levels of particulate matter (SPM) are exceeded in the air of most megacities in South Asia (Asian Development Bank, 2001).
19. The aggravated condition of SPM in Bangladesh, Bhutan, India, Iran and Maldives is no more a myth. In Bangladesh, the commercial sources include the combustion of fuels for power generation in industrial processes and powering motor vehicles. Another important source is different construction and development works (UNEP, 2008 B). 3 wheeler 2 stroke and 2-wheeler 2 stroke are important emission factors, each emitting 0.75 g/km of PM. The main natural sources of particulate matter in Bangladesh are winds blowing over dry soil, and pollen from trees and flowers. In Bhutan, the SPM are usually emitted during the combustion of biomass fuels and responsible for both indoor and outdoor air pollution. In India, the combustion of fuels in the domestic, industrial and transport sector are the major sources of SPM. Due to dry conditions, natural dust is one of the major sources of SPM both for indoor and outdoor air pollution. In industrial sector, cement sector is a major source of SPM besides the small scale industries like foundry, textile etc. The main source of SPM in Iran is incomplete fuel combustion, almost 79.5% of SPM emissions are due to traffic sector. Another important source is chemical reaction during chemical and industrial processes such as sulfuric acid and crude oil. SPM are also dispersed in the air through grinding and crushing

of the materials used in construction and agricultural activities (Zandi, 2008). In Maldives, the particulate matters are usually found in the form of soot and coral dust. The main sources of their emission include the land and sea transport, power generation and construction activities (MDEP, 2008 B).

20. The situation is no more different in Nepal and Pakistan regarding SPM but slightly better in Sri Lanka. In Nepal, the major source of SPM is vehicles, especially in Katmandu valley. The average values for PM₁₀ fall in the range of 23 to 295 µg/m³ in the core areas with the seasonal variation: higher in dry and lower in the rainy season (ADB and ICIMOD, 2006). Other main sources of SPM in urban areas include the industrial emissions. Very high levels of SPM are emitted from cement, brick, tile and textile factories (National Planning Commission Nepal and IUCN, 1992). In Pakistan, the main sources of SPM are vehicles. Dust due to mobile sources is mainly responsible for air pollution in Sri Lanka. Annual average ambient PM₁₀ level in Colombo over the years have remained relatively within the 72 to 82 µg/m³ range, peaking only in 2001. These values, however, consistently exceeded WHO latest annual guidelines value of 20 µg/m³ for PM₁₀, suggesting very unhealthy situation in relation to the PM pollution in Colombo (MDEP, 2008 A).

Sulfur oxides:

21. The sources of sulfur oxides vary from country to country, for instance in case of Bangladesh, Bhutan, India, Iran, Maldives, Nepal and Pakistan these considerably differ from each other. In Bangladesh, the major sources of emissions of sulfur Dioxide are vehicles, brick kilns, paper and pulp industries, oil refineries and sulfuric acid production plants. The high emission factors of trucks (1.13 g sulfur dioxide/km), followed by minibuses, diesel powered, indicate that substantial sulfur dioxide emissions come from these sources. The estimated emission levels of SO₂ in Bhutan have indicated that major source is households. The petroleum refineries, textiles, pulp & paper and industrial chemicals produce about 87% of sulfur emission in India. The main emission factors for sulfur dioxide are coal, oil and industrial process of paper and pulp, copper, zinc and lead smelting, thermal power plants, oil refineries and sulfuric acid. In Iran, sulfur dioxide is mainly emitted from oil refineries during processing. In Maldives, land transport vehicles largely contribute to the air pollution of the country including sulfur dioxide along with carbon dioxide, carbon monoxide, oxides of nitrogen, lead, particulate matters and volatile organic compounds (MDEP, 2008 B). In Nepal, incomplete combustion of fossil fuels, including petrol, diesel, kerosene and coal produce large amounts of carbon monoxide, sulfur dioxide, oxides of nitrogen and hydrocarbons (National Planning Commission, Nepal and IUCN, 1992). Coal consumption in Pakistan is very low as compared to neighboring countries, so the predominant source of Sulfur Dioxide is vehicular emission. (UNDP, 2006). Other sources of SO₂ are vehicles, refuse burning, open dump burning, vehicular automobiles and aircrafts (Pak EPA and UNEP, 2004). In Sri Lanka, SO₂ emissions are mainly from industrial activities, especially thermal power plants. Unlike ambient PM₁₀, which was fairly stable within a small range of values, SO₂ levels in the Colombo air have shown an increasing trend from 1997 to 2000 and then a general decreasing trend from 2003 (MDEP, 2008 A).

Nitrogen oxides:

22. The sources of nitrogen oxides are also different for MD member countries. In Bangladesh, Nitrogen Oxide is mainly emitted during energy consumption including energy transformation industries, transport and biomass burning. Nitrogen Oxide is also emitted during processing of iron and steel industries. Another major source of nitrogen oxide emission is burning of agricultural residues. In Bhutan, the sector wise emissions estimates of nitrogen oxide indicate that domestic sources are responsible for NO emission. In India, sources of nitrogen oxides emissions are vehicles. In India, the road transport is the main source of nitrogen oxide emissions (7.63 Million Tones/Year) as compared to industry and power sector. The number of vehicles, registered in India was 21 millions in 1990-91 which has grown to around 37 millions by 1996-97 (UNEP, 2008 C). Another important source of nitrogen oxide emission is industrial process, especially the production of nitric acid, used in fertilizer manufacturing. In Iran, the major source of nitrogen oxide is transport, followed by power plants and industries. In Maldives, the domestic combustions are responsible for nitrogen oxide air pollution. In Nepal, the major nitrogen oxide sources are associated with the combustion of fossil fuels and from fuel combustion in industries, especially cement industry.
23. In any preventive pollution control strategy, “Reduction at Source” is considered to be the very first option. The same needs to be considered for air pollution reduction in Malé member states, to minimize the resulting economical, environmental and health impacts in the region.

V. Health and Economic Impacts of Air Pollution on Malé Declaration Member States

24. The level and nature of air pollution in any country has implications for the economy of that country as well as neighboring countries, owing to the transboundary nature of air pollution. The importance of a regional level framework such as Malé Declaration for combating air pollution and its harmful effects can only be assessed after reviewing the socioeconomic situation in South Asia and establishing the impact of air pollution on the various socioeconomic parameters. Once governments and society realize the potential damages caused by air pollution, sufficient support can be garnered at the national and regional levels to combat this environmental hazard.
25. High levels of air pollution have serious impact on the environmental quality that imposes economic costs associated with reduced quality of life, lost productivity, due to acidification and ozone impacts and health care costs. According to the World Health Organization (WHO), approximately 3 million people die each year due to air pollution in the world (World Bank, 2003b). It is also responsible for increase in outpatient’s visits owing to respiratory and cardiovascular diseases.
26. The persistent Atmospheric Brown Haze over Bay of Bengal has been traced to emissions from South Asian and South East Asian countries. As part of the Indian Ocean Experiment

(INDOEX), scientists discovered the Atmospheric Brown Haze (also referred as Atmospheric Brown Cloud) that pervades most of South Asia. This haze consists of sulfates, nitrates, organics, black carbon, fly ash and other pollutants. Biomass burning, rapid industrialization, urbanization and lack of alternative environment-friendly energy sources are primarily responsible for this haze over South Asia. Other sources include industrial air pollution, indoor air pollution (biomass burning), increasing traffic trends, thermal power plants and incineration of solid waste (UNEP 2008 B)

27. Bangladesh: about 132,000 premature deaths are caused annually due to air pollution (70 percent from indoor air pollution). According to the World Bank, up to 10% of respiratory infections and disease in Bangladesh may be attributable to urban air pollution. Dhaka is the most vulnerable city, owing to the high level of mobile sources of emissions and the high population density. Particulate matter is the most significant pollutant. According to the same study, while the total burden of disease in Bangladesh is comparable to other South-East Asian countries with high mortality rates, the share attributable to respiratory infections and disease is about one third higher than the average for these countries. In the case of Bangladesh, environmental impacts result in economic losses of more than 4% of GDP (World Bank 2006). These costs fall disproportionately heavy on the poor. Respiratory diseases become more pronounced during the dry season. Acute Respiratory Infection (ARI) cases reported in Dhaka Shishu Hospital (DSH) have increased over the years. Most of these patients are severely exposed to PM air pollution (UNEP, 2005). Respiratory infections and disease are one the top five causes of disease and death in Bangladesh. The share of Disability Adjusted Life Years (DALYs) lost due to respiratory disease and infections are 17%. Of this, indoor air pollution has a share of 30-50% while urban air pollution has a share of 6-10% . These health savings translate to about 0.7% to 3.0% of the gross national product if air pollution is reduced in just four major cities of Bangladesh. In a 2006 report by the World Bank, reducing exposure to indoor air pollution and urban air pollution can result in savings worth US \$114-458 million and US \$ 169-492 million, respectively, to the country (World Bank, 2006).
28. Bhutan: Diseases like respiratory tract infection and diarrhea are still on the top ten health problems affecting the majority of the population. Due to increasing air pollution, especially in the urban areas of Bhutan, there has been an increase in the incidence of acute respiratory tract diseases, cough and colds, bronchitis and asthma. Morbidity due to respiratory diseases has shown increase from 1990 to 1998. Acute respiratory tract diseases have increased from 10.08% in 1990 to 14.02% in 1998, whereas other respiratory disease has increased from 2.45% in 1990 to 6.82% in 1998. Cough and colds, bronchitis and asthma have also gone up from 16% to 22.4% and 1.95% to 2.95% during the same period (UNEP, 2001). According to a press release, According to press releases and reported statistics of Ministry of Health, Bhutan has seen an increase in respiratory diseases between 2003 and 2006. The respiratory diseases were 44% of the total health referral cases and for about 20% of the deaths caused by all diseases (Bhutan Today, 2010).

29. India: The primary health impacts of air pollution are impaired pulmonary functions, use of medication, reduced physical performance, frequent medical consultations and hospital admissions with complicated morbidity and even death in the exposed population. In the rural areas of Andhra Pradesh India, environmental factors account for 22-23 percent of the total burden of disease. Since urban areas have better infrastructure, access to clean drinking water and use of cleaner fuels for household cooking, the average burden of disease for urban population is much lower – 18-19% of the urban burden of disease. Mortality of children under 5 comprises almost two-thirds of the total rural burden of disease and women are the second most vulnerable group (World Bank, 2001). Various studies estimate the number of premature deaths (mainly among young children) caused by indoor air pollution at 400,000–2 million per year, while 40,000–300,000 adult deaths per year are attributed to urban air pollution (NFHS Bulletin, 1997; Smith and Mehta, 2000). In a study to estimate the economy-wide costs of environmental degradation in India, Brandon et al. estimated the total health costs due to polluted air to be \$517-2102 million and the physical impacts were in terms of 40,000 premature deaths avoided (Brandon et al, 2005) According to 1990 data, Indoor air pollution contributes 6% of total burden of disease and urban air pollution contributes 2% of total burden disease in India (World Bank, 1995).
30. Iran: Air pollution is a major urban environmental concern. The damage caused by air pollution to health and overall environment in Tehran, the capital city of Iran, is such that schools are occasionally closed because of dangerously high levels of air pollution (World Bank, 2003). According to the Huffington Post, for the second time in December 2010, heavy air pollution in Tehran has forced authorities to declare a two-day public holiday and closed down schools and government offices (Huffington Post, Dec 1, 2010). Critics say each holiday incurs about \$130 million in financial losses. Air in Tehran is very polluted, leading to serious health problems for the people. In Tehran, respiratory ailments and allergies related to air pollution affect about 20 percent of the population, children in particular. The rate of chronic and acute diseases such as asthma, cardiovascular diseases in Tehran is increasing. Recent studies have shown that high levels of PM10 could be responsible for an average of 52 cases of cancer and 62 deaths per 100,000 inhabitants every year (World Bank, 2003). Damages incurred in Iran as a result of air pollution exceeded 1.7 billion dollars in 2001 to eight billion dollars in 2006 (Tehran Times, 2008). This figure is projected to rise to 16 billion dollars in the next 10 years. Annually, it is estimated that the losses from mortality due to urban air pollution are 640 million dollars that is equivalent to 0.57 percent of GDP of Iran. Besides, diseases caused by urban air pollution create 520 million dollar cost (0.023 percent of GDP) for the economy of Iran ((Tehran Times, 2003).
31. Maldives: In general, the air quality is considered to be good. Transboundary air pollution became apparent first in the Maldives in 1997, when the country was affected by a haze caused by Indonesian forest fires. The livelihoods of the Maldivians were adversely affected due to this haze from October to December 1997 (ADB, 2007). Although the relationship between respiratory diseases and ambient air quality in Malé has not been studied in detail, there has been an increase in the reported cases of respiratory diseases in the past years. Available data shows that in 2003, over 52,000 cases of respiratory diseases have been

recorded. A study conducted by the Institute of Health Sciences (IHS) 1996, shows that Acute Respiratory Infections (ARI) are one of the five leading diseases in Malé. Moreover, as much as 60% of out patient children are diagnosed with ARI. Asthma is a common health problem amongst both children and adults (ADB, 2007).

32. Nepal: Medical records from hospitals in Kathmandu Valley revealed that urban residents have more respiratory diseases than rural residents. Urban air pollution from construction and vehicles and indoor air pollution from using wood, for domestic purposes have increased the incidence of acute respiratory infection (ARI). ARI is one of the top five diseases in the country and reason for 12% of outpatient visits (Ministry of Health, 1999). ARI continues to be the leading cause of death among young children, accounting for more than 30% of deaths in children under five years of age (Niraula, 1998). The records of three major hospitals in Kathmandu reveal that the number of Chronic Obstructive Pulmonary Disease (COPD) patients has increased significantly in the last ten years. Khanal and Shrestha (2005) have estimated that out of total 16,966 deaths, 1,337 cases of deaths can be attributed to air pollution, taking threshold limit as $10 \mu\text{g}/\text{m}^3$ for PM10 for the year 2004. The atmospheric data obtained from the Kathmandu airport show that visibility has suffered in the valley since 1980. The number of days with good visibility ($> 8,000\text{m}$) around noon in the winter months fell from more than 25 days/ month in 1970 to 5 days/month in 1992 (UNEP, 2001).
33. Pakistan: Urban air pollution in term of particulate matter is estimated to cause around 22,000 premature deaths among adults and 700 deaths among young children annually. Indoor air pollution causes the deaths of more than 30,000 children per year (World Bank, 2006). In terms of total DALYs lost due to urban air pollution, mortality accounts for an estimated 60 %. Of this, premature adult mortality has the largest portion. A medical study conducted in 2002 on the health of 1000 traffic policemen, showed that about 80% of traffic policemen had chronic ear-nose-throat (ENT) problems and about 40% showed lung problems. Another phenomenon is winter fog- caused by air pollutants. The health impact of this winter fog is estimated at 40% of total urban population in Pakistan and about Rs. 25.7 billion each year (EPA,2005). A study in Pakistan demonstrated that a 40 per cent reduction in rice crop yields was due to presence of air pollutants (Hameed et al, 2009;EPA,2009). In case of Pakistan, the World Bank has estimated that the mean annual damage to the environment is 6% of GDP, or Rs. 365 billion per annum. Damages from indoor pollution have been estimated at Rs. 67 billion while damage from urban air pollution has been estimated at Rs. 65 billion or about 1% of GDP (World Bank, 2006).
34. Sri Lanka: Since 1995, diseases of the respiratory system, excluding diseases of upper respiratory tract, pneumonia and influenza ranked as the second leading cause of hospitalization. Moreover, respiratory diseases ranked the first five leading causes of death in all age groups, except 15 – 24 and 25 – 49 years. Hospital data from 1995 – 2001 showed that asthma and acute bronchiolitis have become major reasons for hospitalization (Senarath, 2003). According to latest available statistics, 2,399 cases per 100,000 persons have been reported for suffering from respiratory diseases in 2007. In the same year, diseases of the upper respiratory tract were the 12th leading cause of hospitalization in Sri Lanka, resulting

in 0.18 millions asthma cases and 721 deaths due to asthma (Government of Sri Lanka, 2007). In Sri Lanka, the total environmental damage is estimated at Rs. 10,201 million or 2.4% of GNP, of which Rs. 64.5 millions are due to air pollution (UNEP, 2001).

35. To minimize the economical and health impacts, resulting from air pollution, Malé Members states have developed environmental legal and regulatory frameworks in their respective countries. However, the implementation of national environmental action plan has been limited due to lack of financial resources and technical know-how.

VI. Environmental Legal and Regulatory Frameworks in Malé Declaration Member States

36. Environmental policies only exist in Bangladesh, India, Nepal and Pakistan. The policies mainly focus on assessment of existing policies, multi-sector frame-works, policy guidelines and suggesting action plans. The environmental policy of Pakistan is ahead of other member states in addressing the enactment of National Clean Air Act.

37. Environmental Acts exist for all the member states. While India takes distinction in having an Air Act. The environmental acts are defined for ecosystems, hazardous substances, forest and mineral resources; air, water, soil, human and plant resources. The environmental act of Bhutan addresses the principles to reduce, reuse and recycle and the polluter pay principle, while India and Nepal address the protection of property and heritage. These are the exceptional privileges taken up by Bhutan, India and Nepal, with respect to Environmental Acts.

38. Sustainable Development Strategies are established at the national levels by Bangladesh, India, Maldives, Nepal and Sri Lanka. The major areas of emphasis under every strategy are livelihood, environment, social justice, poverty alleviation, public participation, and good governance. All the sustainable development strategies focus over the promotion of clean and healthy environment but none of them addresses the problems related to air pollution.

39. Conservation strategies have been adopted by Bangladesh, India, Nepal, Pakistan and Sri Lanka. The focus of all the strategies is mainly upon the conservation of ecosystems, cultural heritage, conservation of natural resources, improving energy efficiency and promotion of clean technologies. The National Conservation Strategy of India exceptionally emphasizes the use of control system for air and noise pollution.

40. Environment action plans exist for six out of eight Malé Members states. Bhutan and Iran lag behind in the formulation or adoption of the action plans. The fundamental approach of every action plan is based over sustainable development. The objectives of all plans are to investigate, demonstrate, implement, monitor and evaluate the sustainable approaches. The key areas of consideration under the action plans in general are health, environment, and economic sectors. Although the plans fully emphasize over the protection of environment there is no emphasis on air pollution related issues in particular.

41. The air quality standards exist for all the member states except for the Maldives. Generally the Ambient Air Quality Standards are defined in all the member states for sulfur dioxide, carbon monoxide, nitrogen oxide, black smoke, hydrocarbons, nitrogen oxides, suspended particulate matter, lead and ammonia. The criteria for categorization of the pollutants are also more or less the same for all the member states industrial, commercial, residential and sensitive areas. Bhutan, Iran, Maldives and Sri Lanka have established specific emission standards for vehicular emissions. Nepal and Pakistan have defined specific standards for extreme winter seasons, atmospheric washout, natural cleansing, poverty level, and institutional capacities.
42. A number of international Conventions and Treaties have been signed by all the member states. Every member state has its own designated organizational authority for the implementation of conventions and treaties. However the major hurdles in the implementation of these treaties and conventions are common to all states, which include lack of financial and technical support, lack of coordination, inefficient legal and regulatory framework, no access to relevant databases and lack of awareness among the local populations.
43. The environmental legislation in Bangladesh seems to be quite weak, especially with reference to air (SAARC, 2009). Iran seems to have a bit fragile legislative structure to encounter the environmental problems being faced by the country. Although the need for environmental conservation has been emphasized in the constitution, yet the implementation status of the legislative framework seems to be feeble (Iran Pollution Report, 2002). The implementation of frameworks and policies in Nepal are still under the initiation process. In general, there seems to be a lack of institutional/technical support along with a considerable resource limitation and financial support (SAARC, 2009)
44. Apparently it could be seen that Bhutan has a good structure of polices and legislation from the institutional standpoint. However, Bhutan has got resource constraints, both for the implementation and monitoring of its frameworks and policies, related to environment. The Indian environmental legislative framework seems to be well acquainted in terms of acts, plans and policies. Integrated approaches at local, national, regional and global scales are needed, duly supported by international agencies and donors as well as through national means (RAPIDC, 2002). The environmental litigation setup of Maldives has got two important elements, including environmental protection and sustainable development. But, the legal framework seems to be weak and lacks the cohesiveness to bring together the disparate sectoral environmental policies and regulations under one “roof”. Pakistan has got a well-structured legislative framework. Yet, much attention is still to be paid over a few sensitive issues. A multi-sectoral approach for the management, protection and conservation of the environment should be emphasized. Sri Lanka’s legislative framework for environment seems to be relatively mature in general, however, it lacks some of the major structural blocks in particular. Sri Lanka also enjoys a coordination mechanism between the sectors, for environmental concerns through Committee. Technological/Financial aspects should also be addressed in country’s litigation.

Strengthening of Malé Declaration

45. As discussed for each Malé Declaration member country, air pollution has a serious impact on the socioeconomic status of any country. Air pollution has pushed respiratory disease up in the ranks as the leading cause of hospitalization. Asthma, chronic bronchitis, heart disease and cancer are pervasive in areas with high pollution. While urbanization and industrialization have led to an increase in urban outdoor pollution, the level of indoor air pollution owing to poor ventilation and use of biomass or ‘dirty’ fuels in domestic use cannot be ignored. Women, children and senior citizens are most vulnerable to indoor air pollution. Air pollutants such as sulfur dioxide, nitrogen oxides, and ammonia are known to affect plants. Absorption of pollutants by soil can lead to poor germination of seeds. Exposure to polluted air can harm the growth of plants, reduce crop yield, and make them harmful for consumption by human or livestock consumption. Considering that most of the economies of Malé Declaration member countries are agrarian in nature and employ a large percentage of the workforce (around 25%), air pollution has serious implications for the potential for crop loss in these countries. Crop loss would result in food insecurity, health problems and malnutrition. Moreover, crop loss would reduce the agricultural exports of the Malé Declaration member countries, upsetting the balance of trade and creating numerous economic and financial challenges. Needless to say the above local impacts would be further aggravated by the transboundary effects.
46. Through the channels of health, agriculture and other factors mentioned above, air pollution has serious implications for the socioeconomic status of Malé Declaration member states and developing countries in general. The environmental burden of ill health, disease or mortality is borne in both rural and urban areas, although the sources may be different. However, the environmental burden of disease and mortality is borne disproportionately by the poor, especially the urban poor. Air pollution exposes the poor to high medical and health related costs. Moreover, ill health, impairment or disability owing to air pollution can lead to loss of job or other socioeconomic opportunities for the poor. People living close to sources of air pollution (industrial sites, houses with unclean fuel and poor ventilation) are more vulnerable to its harmful effects. Rising health costs push these people into deeper poverty. An important impact associated with air pollution is that women and children under the age of 5 are most vulnerable. Women who are already marginalized in developing countries suffer increasingly from maternal health issues.
47. Despite the fact that most countries are moving towards industrialization, agriculture still forms the backbone of economies of most Malé Declaration member states. Degradation of soil and reduced crop yield has serious implications for food security, exports and economic viability of these countries. Quantification helps reveal that the impacts of air pollution can constitute even 4 percent of GDP for Malé Declaration member states.
48. Air pollution can increase poverty, widen the classes and gender-divide and harm the agriculture sector in Malé Declaration member states. Local impacts due to air pollution, as

emphasized above, would be only further aggravated by the transboundary air pollution. Therefore, it is imperative to identify a regional level framework not only for reducing the transboundary impacts of air pollution in South Asia but also to support enforcement for adopting control measures at country level towards improvement of ambient air quality in general.

VII. Re-examining the Roles of Institutions in Malé Member States

49. Undoubtedly, any effort to control air pollution levels in South Asia will be daunting, in light of the continued policy push for unabated economic growth by the region's governments. The role of the social and environmentally focused institutions of the state, serving at the least as a forum for monitoring, should be expanded towards knowledge sharing between industry, non-government organizations and state authorities in sub regional contexts. Any efforts to control transboundary air pollution will require a policy and administrative framework of cross cutting national/provincial and environmental/social development policy objectives similar to that being called for in transboundary forest and water resource management. To this end, stakeholder collaboration between adjacent provinces in their monitoring and outreach efforts to engage point sources of pollution will be critical.
50. On the household front the persistent increases in population, will continue to place increased pressure on the environment through increased commuter traffic (motorbike, automobile, bus, etc.) in particular. It must therefore be assumed from the outset that any progress towards defined goals will likely be suppressed or at least marginalized to some extent by continued urbanization. In light of this reality, including only the ministries of environment and forestry departments in stakeholder consultations limits the scope of the declarations sponsorship. More inter governmental support needs to be committed to in order to exploit opportunities for sector niches and technology facilitate solutions to point source pollution control. Knowledge sharing on technology aspects is one aspect but also knowledge sharing in terms of advocacy, education and outreach. As the state will likely be unable to achieve much on its own, more partnerships with recognized organizations focused on education and outreach will be essential. Furthermore, sufficient intra state capacity (accompanied by the concerted push from regional partners) will hold states accountable for reporting on trans-boundary air pollution and providing top down support for policy solutions. Regional cooperation has often been called for across the region in economic terms, but the call has yet to be answered institutionally in terms of social and environmental concerns.
51. In terms of industry, more technology sharing for low emissions industrial development must take place. The task is daunting, in a market based context where competitive forces and national interests often trump environmental concerns and collaboration. However, the appropriate sector based mix of private firms, state regulatory agencies and civil society experts may allow for the removal of constraints to sector based progress. For example, pollution prevention for vehicle emissions and brick kiln industries in both Pakistan and Indian Punjab should speak to the same initiatives and means of reducing emissions. Progress

that has been made in technology solutions as applied to the transportation sector (elimination and phasing out of two stroke auto rickshaws) now needs to be rolled out to other industries such as brick kiln (based on regional experiences such as the Vertical Shaft Brick Kiln in Bangladesh) and larger vehicles.

52. In the absence of sufficient national and regional political support, multi-lateral sponsorship and cooperation is valuable in moving the discussion forward. As will be discussed, a mass of regional knowledge and reporting in the baseline reporting component of the Malé Declaration has revealed opportunities for development of controls. Donors such as UNEP, can facilitate the discussion and assist in taking the Declaration's spirit forward, by filtering through and developing the knowledge sharing of technology based solutions. Sector specific aspects can be contributed to by other multi lateral and private sector actors, as a means of encouraging technology transfer and influencing policies on point source pollution control, as has been recommended in East Asia. Some conventions, protocols and agreements have been successful, as will be discussed in this section. Air pollution – climate change, economic development and green economy initiatives are all contemporary policy alternatives that need to be taken into consideration. Only a regional institutional capacity and forum for engagement will be able to facilitate knowledge dissemination in a way that it is non-competitive and effective.

VIII. Analyses of the Malé Declaration

53. While the Malé Declaration was adopted in 1998, and baseline data continue to be collected, a number of limitations are noticeable in the Declaration's framework. These gaps and omissions, no doubt a result of a daunting negotiating process, rather than intentional, have likely contributed to the limitations of the Declaration in achieving substantive results in the control of regional air pollution. It goes without saying, that continued increases in population growth, urban concentration and a push towards industrialization have also taken their toll on progress, thereby deflating progress with the pressures of increased fuel consumption, industrial emissions and net vehicle operation. This section outlines the main characteristics of the Declaration and highlights the gaps and weaknesses in terms of the Declaration's ability to serve as a policy framework for implementing institutions:
54. The first few paragraphs of the declaration are focused on highlighting the recognition, reiteration and realization goals of advocacy regarding the spirit of the document. Given that the stakeholders are largely the ministries of environment and forestry (with some participation from technology in the smaller SAARC members), these efforts are perhaps to form an inter-governmental coalition around the issue of air pollution and transboundary effects in South Asia. However, as the focus on study, realizing potentials and the acceptance of economic exploitation as key to development are also spoken to, the initial context setting perhaps undermines the ensuing initiatives to measure the impact of transboundary air pollution. For example, the following specific points can be accused of undermining the urgency for action in the declaration.

- a. An institutional omission is the lack of assignment of responsibility of national measures and institutions that are engaged in the task of controlling and abating such pollution. This should already be understood as far as the ministries of environment are concerned. While the state ministries may not be able to point to their adjacent ministries and agencies, non-government stakeholders should be aware of and point to the responsible bodies that should be empowered and engaged to take the pollution abatement forward either through regulatory control or market based instruments and incentives.
 - b. In terms of Agenda 21, we need to include elements of technology sharing and best practices as a means of moving the policy agenda for transboundary pollution control forward. There is a need to focus on technology sharing and solution development, along with regulatory control.
 - c. Knowledge sharing and best practice mechanisms and institutional arrangements from the LRTAP and ASEAN need to be defined and outlined in more detail for administrative bodies at the national levels to follow.
55. In terms of programs to carry forward, there is ample space dedicated to assessing, studying, strategizing, allocating resources, economic mobilization and network development but limited discussion on specifics.
- a. Assessing institutions and identified partners is a good start but an implementing and responsible agency in the state needs to be assigned and empowered with the responsibility
 - b. Developing initiatives and working in cooperation to monitor specific emissions and concentration is good but accountable bodies need to be identified.
 - c. Standardized methodologies emerge from this but a defined and accountable hierarchy of institutional agencies and capacities is required
 - d. Training programs and securing incremental assistance can only happen if joint capacities are assigned and defined early on.
56. The mentioning and commitment to national reporting systems, consultation, protocols and institutional structures are all spoken to, but at such a point, it should be realized as to which agencies are best positioned to carry out and manage the commitments spoken to.
57. The declaration text and content speaks to a good advocacy and awareness campaign protocol, but not one that takes the necessary monitoring and evaluation steps to move the agenda forward. In the inter governmental forum summary pages, the focal points are outlined for each meeting as involving multilateral institutions as well as international non governmental agencies and national authorities. However, in the contact pages, the focal points for the national level are merely ministry of environment and forests contacts, with natural resources, energy and water and science and technology components included in the smaller countries of Nepal and Maldives. The influence of the Ministries of Environment is

limited compared to other ministries, such as those linked to Finance. It is therefore important for the Malé Declaration to link more effectively with all the relevant ministries. There is a need to draw upon inter-governmental partnerships between ministries of economic development, industries and commerce to ensure that all of the necessary growth concerned cells are in partnership with one other. At the least, the ministries of environment should have initially or eventually included the interests of the ministries of health as well as other intergovernmental colleagues included.

58. Again, this study does not attempt to delve into the complexities of negotiations between Malé member states. Credit must be given to UNEP, SACEP and other partner organizations for establishing the initiative, maintaining the declaration documentation along with progress report information that tracks baseline data and information. No doubt, a number of issues have been avoided and/or excluded in the declaration in order to ensure that the declaration could be signed by all stakeholders. In any event, the limitations of progress by stakeholders towards meeting the aims of the negotiations are of interest to this study. An assessment of the policies and actions that should be taken, should involve a review of the existing baseline data that has been accumulated from the various partners. Naturally, the common initiatives should be reviewed and aligned between partners with information sharing on technical points elevated in profile. Where initiatives are more heterogeneous, knowledge sharing and transfer should lead to the inception or at least agenda setting of sector specific policies. In the next section, recommendations to move the agenda of the negotiations forward are made.

IX. Recommended Policy Actions at the Regional Levels

59. A number of recommendations are already outlined within the Malé Documentation and are emphasized in this section. However, while progress has been made in areas such as fuel emissions reductions and technology introduction, a number of areas require improvement.
60. The consistent flow of meetings and activities under Malé Declaration should be built upon and maintained as part of the membership's efforts to disseminate and share knowledge. The intergovernmental forum, successful in its regularity serves as a useful discussion of baseline studies but a more robust roadmap in moving forward is required to elevate the profile of the networks efforts. The stakeholder participation forums are also regular but involve knowledge sharing among state and non state stakeholders. Training has also been regular but how institutional capacity and capability to retain learning has progressed is questionable, with staff turnover and attrition. Monitoring stations are located in rural areas to avoid the focused and concentrated impacts of urban pollution. Nevertheless, the urgency of dealing with point source pollution emitters by sector needs to be factored into the discussion and agreements in moving forward.

61. The following section outlines actions that could be taken at the regional and national levels, given the progress that has been made by Malé Declaration member states. Finally, the section concludes with specific policy instruments that should also be considered.

62. Given the progress that has been made at the national levels in terms of institutional building and development, a number of initiatives are recommended which should initially create forums for more regular technology sharing and dialogue. In terms of actions, the following broad initiatives have been undertaken by the following member countries and should be noted:
 - a. Bangladesh is focusing on awareness building activities/outreach, data dissemination, regulatory measures, technical options (vehicle inspection and maintenance; transportation planning; fuel reformulation/pricing/tax; industry standards and stack heights; standard setting; institutional frameworks and regulatory compliance; dissemination of data and sub regional cooperation).
 - b. India is taking action in the various policies (air pollution control act, environmental protection act, national policy on pollution abatement, environmental action program, motor vehicle act and central motor vehicle rules). Various abatement measures, specific to industries that emit a lot are prescribed, along with gas lead phase out programs, diesel sulfur phase out programs, traffic flow, monitoring, industrial pollution and community sources.
 - c. Iran is taking action in efficiency improvements in production, substitutions with materials for energy which are less emissions of pollutants, abatement of pollutants emission through changes in production processes, managerial and behavioral changes to reduce emissions.
 - d. Sri Lanka is taking action on penalizing vehicles that are high emissions loading, linking duties and taxes on low emission vehicles, vehicle inspection and maintenance, fuel reformulation, pricing and fleet mix; standard setting, institutional framework establishment and transportation planning.

Hence, at the regional level, the following recommendations are in order for consideration:

- a. Establish consensus sharing between national and provincial bodies on common issues of concern related to transboundary pollution. Policy sharing and alignment is already in process and should be discussed at subsequent technical work shops in the areas such as motor vehicle emissions, inspection and maintenance (including Fuel quality improvement, Use of alternatives, Design and standards improvement for new vehicles – hybrids/low emissions, Enforce tail pipe emissions norms, Identify high polluting vehicles); Traffic Management measures (Traffic management, Staggered office hours, Pedestrian flow, Mass transit such as bus rapid transit that will reduce automobile traffic and congestion); Monitoring; Industrial pollution; Community sources related to air pollution (Refuse burning, wood & other fuels burning, dust suspension).

- b. In a related vein, ensure that dissemination of work to other regional bodies takes place on a regular basis. Pilot projects should be set up and their progress monitored regularly, reported on and disseminated to other groups and interested agencies region wide. Web based reporting should also be implemented to ensure transparent dissemination of all data and information – either static through regularly updated documents or dynamic through the creation of a clearinghouse. The solution’s sophistication should reflect data being collected and ideally, should evolve to encompass GIS based and mapping technologies. A work plan of such data mapping should follow soon and be used to gauge progress on regional reporting.
- c. Look at ways of defining the precautionary principle for usage that encourages solutions and alternative development while not constraining economic growth and development imperatives.
- d. Establish working groups on specific sectors which involve public and private sector stakeholders and actors in priority areas such as and automobile emissions and standards; Industrial emissions and standards
- e. Stakeholder groups that look at impacts should continue to be examined as have been in the past and they should also be linked with the preceding sectors (Health; Crops; Corrosion; Rapid Urban; Soil Acidification)
- f. Regional expert committee/working groups may be constituted to recommend, in the light of national emission inventories and metrological data (wind speed, direction etc):
 - Pollution reduction option/s (specified such as 25% reduction or maintenance of the existing) over an agreed period of time, 20 or 30 years (with specified base year, time scale and target year).
 - Minimum standards vehicles road worthiness, fuel quality and emissions from brick-kilns.
 - Emission limit values (ELVs), for SO_x and NO_x emission control areas (ECAs)
 - Minimum critical load (Kg/ha/yr, for SO_x and NO_x
- g. In order to ensure that emission levels are in compliance with international health and environmental standards, it is imperative that industrial sector of Malé Declaration member countries need to be educated and sensitized. These standards should also be imposed with legal implications to ensure that control equipment/filters are installed at factories or industries to control the type and amount of pollutants that are released into the atmospheric environment. Regular inspections should be made mandatory such that external auditors or inspectors visit the industrial sites and ensure that minimum standards are being observed when releasing emissions into the environment. Similarly, standards should be formalized regarding vehicular emissions. Annual vehicle inspection in which the emissions and smoke emitted from each private or commercial vehicle is monitored and filters are checked should be made mandatory.
- h. National emission reduction targets to comply with agreed regional targets.

- i. Consideration of replication of “Self-monitoring and Reporting/SMART program for industrial sector in Pakistan for other member states (Pak-EPA/MoE, 2000; Khwaja, 2001)
- j. Technical Assistance Protocols should be set in place for countries to assist each other in matters regarding air pollution and its likely trans-boundary effects. Such protocols would allow the Malé Declaration member countries to benefit from each other’s experiences viz-a-viz air pollution control. This technical assistance could encompass (1) emission standards (2) implementation and legal matters regarding emission standards (3) health and socio economic impacts of air pollution. Through technical assistance protocols, countries would be able to learn from each other, thereby making the goal of minimizing air pollution and its trans-boundary effects possible.

X. Role of South Asian Association for Regional Cooperation (SAARC) in Air Pollution Reduction in South Asia

- 63. South Asian Association for Regional Cooperation (SAARC) could be a possible forum for looking into ways & means in generating possible support for strengthening Malé Declaration for air pollution reduction in the region.
- 64. Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka together form the South Asia Association for Regional Cooperation (SAARC), an organization developed to promote regional economic cooperation. Established in 1985, the organization has the following core objectives: To (i) promote and strengthen collective self-reliance among the countries of South Asia; (ii) develop mutual trust, understanding and appreciation of one another’s problem; (iii) promote active collaboration and mutual assistance in the economic, social, cultural, technical and scientific fields; (iv) strengthen cooperation with other developing countries; (v) strengthen cooperation among themselves in international forums on matters of common interest; and, (vi) cooperate with international and regional organizations with similar aims and purposes. SAARC support to MD would be in line with its objectives 3 & 5.
- 65. SAARC has organized different summits since 1987 focusing on climate change and natural disasters. The SAARC Environment Action Plan was adopted by the Third Meeting of the SAARC Environment Ministers (Malé, 15-16 October 1997). This action plan identified some of the key concerns of Member States and set out the parameters and modalities for regional cooperation. The action plan was based over the fundamental principles of causes and consequences of natural disasters, protection and preservation of environment and greenhouse effect and its impact on the region. A number of measures outlined in the SAARC Environment Action Plan have been reportedly implemented. SAARC Coastal Zone Management Center (SCZMC) and SAARC Forestry Center (SFC) were established in 2004 and 2007, respectively. These SAARC centers could also house some of the future activities of Malé Declaration.

66. Member States finalized South Asia Environment Outlook (SAEO) 2009 in collaboration with the United Nations Environment Programme (UNEP) and it was launched during the Eighth Meeting of the SAARC Environment Ministers (New Delhi, 20-21 October 2009).
67. The SAEO 2009 addresses the air pollution and attracts the attention of the governments, civil societies, and industries in South Asia States towards the deteriorating air quality due to environmental damages, migration from rural to urban areas, and exacerbating vehicular emissions. SAARC Convention on Cooperation on Environment as stipulated under Item 17 (Legal Framework) of the Action Plan was signed during the Sixteenth SAARC Summit (Thimphu, 28-29 April 2010), (SAARC, 2009). The convention promotes the exchange of best practices and knowledge, capacity building and transfer of eco-friendly technology in a wide range of areas related to the environment. However, the convention does not address the air pollution in particular (SAARC, 2009) and Malé Declaration member states may consider proposing to SAARC for its inclusion.
68. Unresolved conflict or post-conflict issues are the major reasons for poor integration of South Asia. However, SAARC has made landmark achievements and it would be worthwhile for Malé Declaration member states to seek SAARC support to enable meeting the objectives of Malé Declaration.

XI. Recommendations

69. While SAARC has been in function for about 25 years now, the impact of this framework, especially with regard to air pollution is yet to be seen. SAARC needs to be strengthened with a monitoring and evaluation mechanism to observe whether the member countries are making progress on reducing air pollution and its associated impacts in the South Asia region. Moreover, there needs to be a mechanism of binding commitments such that member countries take the promises of reducing air pollution seriously and if it could be mandatory for them to make some progress in this regard. Also, SAARC summits should be more frequent so that the momentum of the agenda of air pollution is not lost.

Support to Malé Declaration - Legally Binding Instrument (LBI) for Strengthening the Framework of Air Pollution Reduction in South Asia

70. The Acid Deposition Monitoring Network in East Asia (EANET) and the Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia are current reflections of regional efforts to assess air pollution issues at a regional level. ASEAN has also established the ASEAN Agreement on Transboundary Haze Pollution to prevent and monitor such pollution. The UNECE Convention on Long Range Transboundary Air Pollution (LRTAP) is another regional agreement for air pollution reduction. Besides possible support from SAARC forum, another option for consideration by Malé Declaration

member states is preparing and in-acting a legally binding instrument, specifically for air pollution reduction in member states.

71. Political momentum in adjacent regions has been created through the signing of the ASEAN Haze Agreement, from which several lessons can be extracted. The recognition of disasters must be addressed, such as from forest fires. Hence, the potential for cooperation exists, for Malé Declaration member states. It is a matter of substituting the intention of reactive responsiveness to emergencies (forest fires) with the proactive objective of addressing point source pollution (industries). In the introduction, ASEAN agreement recognizes the problem of forest fires, along with the economic loss and the map for member countries signing on. In the objective section, prevention, operational mechanisms and enforcement activity strengthening are included in the agreement. The latter part, of enforcement is particularly noteworthy as it is lacking the Malé Declaration. In terms of preventative measures, national policies, national plans, curbing sources of forest fires (enforcement, legislation, monitoring, task forces and information technology) are all included. Regional monitoring is also spoken to as an outcome of information technology and multi lateral support from the ADB is sought for as a means of facilitating technical expertise.
72. Malé Declaration LBI may also have as basis, the recognition of the problem of increasing air pollution and its resulting environmental, economical and health impacts on population of Malé Declaration member state. Further elements of LBI may be further built accordingly.
73. The Convention on Long Range Transboundary Air Pollution (LRTAP) aims to reduce the air pollution through the exchanges of information, consultation, research and monitoring. This treaty offers a viable example of a science-based, legally-binding convention from 1979 and eight associated protocols (1984-1999) of increasing ambition level and sophistication which have been successfully implemented over the years, resulting in major emission reductions of agreed air pollutants in Europe and North America and established a stable mechanism for regional cooperation on science, monitoring, policy and assessments.
74. It holds that each Contracting party undertakes to develop the best policies and strategies including air quality management systems. LRTAP emphasizes the control measures compatible with balanced development, in particular, by using the economically feasible best available technology and low- or non-waste technology; should be adopted. Various improvements in research sector are advised such as research over existing and proposed technologies for reducing emissions of sulfur compounds.
75. Among others, LRTAP strongly recommends the introduction of improved models for a better understanding of the transmission of long-range trans-boundary air pollutants; establishment of scientific basis for dose/effect relationships designed to protect the environment. The economic, social and environmental assessment of alternative measures for attaining environmental objectives including the reduction of long-range trans-boundary air

pollution; education and training program related to the environmental aspects of pollution by sulfur compounds and other major air pollutants. These are some of the pertinent guidelines derived from the convention. LRTAP also emphasizes flexibility for change of information pertaining to trans-boundary air pollution. The exchange of information is essential and may include emissions at periods of time to be agreed upon, agreed air pollutants, (starting with sulfur dioxide) coming from grid-units of agreed size; or on the fluxes of agreed air pollutants across national borders, at distances and at periods of time to be agreed upon and their potential impacts which would be likely to cause significant changes in long-range trans-boundary air pollution. For the implementation and further development of the cooperative program for monitoring and evaluation of the long-range transmission of air pollutants, a comparable or standardized procedures for monitoring is recommended whenever possible which should be based on the framework of both national and international programs.

76. Several useful proposals can be developed from this convention, as elements of LBI to strengthen the framework for Malé Declaration

Proposed Elements of a Legally Binding Instrument for Strengthening the Framework of Air Pollution Reduction in South Asia

77. The Malé Declaration encourages intergovernmental cooperation to address the increasing level of trans-boundary air pollution and its negative impacts. The declaration exists for countries to assess and develop strategies for mitigating air pollution, set up monitoring arrangements, collect and analyze air quality data and their impacts. However, much more collaboration and practical efforts are needed to strengthen the framework. It is also important to expedite the process of improvement, since the Malé Declaration has been in existence for over 12 years already.
78. Pollution levels continue to rise, due to unabated economic growth (vehicle emissions) and unsustainable industrial practices (stack emissions) that mitigate efforts on controlling pollution. The costs are not only social (human health), but also economic (crop losses, lost productivity) and environmental (forest degradation).
79. Air pollution leads to atmospheric transport of pollutants, affecting countries of the region in more than one way, thus making pollution a regional issue.
80. Being a regional problem, no one country, specially in a poor and diversified region like South Asia, can tackle it at its own. National actions in this regard seem to be insufficient. Lack of financial support, skilled and trained manpower, technology and technical know-how, further limit one single country capability to handle it.
81. As air pollution impacts the region, to combat it, a regional focus and approach is essential in which all member countries of the region have a role to play, with equal and diversified

responsibilities. Malé Declaration member states need to develop and in-act an agreement to manage air pollution in a similar way to the ASEAN and LRTAP regional agreements.

82. A legally binding instrument may be constituted to ensure that the Malé Declaration member countries follow through with progress on monitoring stations, collection and analysis of data, sharing of air quality and health data and information across member countries and steps to reduce air pollution. A legally binding instrument would ensure that each country meets its specific targets in reducing transboundary air pollution.
83. A main feature of the envisaged instrument would be the recognition that obligations regarding control and reduction of emissions of agreed pollutants should allow for flexible and differentiated national programs to be implemented by individual Parties to the instruments with a view to achieving the most cost-effective and environmentally benign improvements of air quality in the whole region
84. Importantly, this instrument would encourage governments to pass legislation in their respective countries, set up minimum emission standards for vehicular and brick kiln emission and fuel quality, banning the use of unclean or 'dirty' fuels for domestic or industrial consumption.
85. It would also encourage the governments to pass laws requiring the use of filters to 'clean' emissions from factories before they are released into the environment.
86. The instrument would also encourage steps to ensure sufficient and quick investment in (a) building technical expertise viz-a-viz air pollution control and (b) financial resources allocated from country budgets for combating air pollution.
87. The objective of such an instrument should be to protect human health and ecosystem by setting up time framed air pollution (starting with SO_x and NO_x) reduction targets.
88. The instrument specific elements may be further built up on the above proposed objective to address/accommodate "Policy Actions at the Regional Level " recommended in section 8 in the preceding pages.
89. For effective implementation of LBI on air pollution reduction by Malé Declaration member states, Mechanisms would need to be established capacity building and intra-state available technology transfer, knowledge and information exchange (about emissions, exposures, monitoring data, socio-economic impacts), reporting and evaluation of LBI effectiveness.

90. Sustainable financial mechanism for Malé Declaration (TFFD2/2/1), presently under consideration and revision by TFFD, when finalized and approved may be made part of or implemented under the LBI
91. The LBI should acknowledge and ensure an active role of civil society in the development and implementation of the LBI and development and implementation of national and regional implementation plans.
92. Finally, among others, the LBI should establish effective and enforceable treaty compliance provisions.
93. A LBI on air pollution reduction prepared and adopted by the Malé Declaration member states would not only enhance better understanding and cooperation among the member states but would also effectively implement air pollution reduction measures across the region. The expected likely outcomes of this would be halting effects on acidification, corrosion, eutrophication and deterioration of visibility; higher agric productivity; better quality of food and shelf-life; fewer hospital admissions; lower death rate; less absence from work place; and, improved health.
94. The instrument should contain provisions for independent compliance monitoring, analysis and assistance in case of non-compliance”. Legal framework should include the harmonization of air pollution policies (ambient and emission standards) addressing the pollutants that have high potential of regional transport (fine PM, SO_x, NO_x, ozone precursors, etc.). Both air quality and climate policies at both national and regional levels should be integrated.
95. In view of the above, this study strongly recommends the following resolutions for consideration of the Malé Declaration member states Ministerial meeting:
 - a. Re-affirm their government’s commitments towards air pollution reduction in the region to minimize the resulting economical, environment and health impacts.
 - b. Advise Malé Declaration Secretariat to contact and initiate interactions with SAARC secretariat to explore possible support for strengthening the Malé Declaration
 - c. As the regional nature of air pollution problem and member state actions by themselves are not sufficient, agree to initiate a negotiation process among Malé Declaration member states to develop and adopt a legally binding instrument for further strengthening of the Malé Declaration.
 - d. Agree to assign to TFFD or to a Negotiating Committee of representatives of Malé Declaration member states, to negotiate and develop, within a specified time, an agreed draft text (with due consideration to regional policy actions as recommended in this study) of the LBI for consideration and approval by the Ministers

- e. Support funds through sustainable financial mechanism for Malé Declaration (TFFD2/2/1) as to be agreed/approved or by setting up of a dedicated fund for LBI negotiations as its financial mechanism with contributions (as may be agreed upon) by the Malé Declaration member states, UN agencies, including UNEP and other possible regional/international donors.

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