Proceedings of the training workshop – "Forest Reference Level for REDD+"

16-24 August 2017, Ban Vaban, Dhaka, Bangladesh

Food and Agriculture Organization of the United Nations

UN-REDD PROGRAMME

Bangladesh Forest Inventory Project Management Unit, Forest Department,
Ban Bhaban, Agargaon, Dhaka-1207

The UN-REDD Programme, implemented by FAO, UNDP and UNEP, has two components: (i) assisting in developing countries to prepare and implement national REDD strategies and mechanisms; (ii) supporting the development of normative solutions and standardized approaches based on sound science for a REDD instrument linked with the UNFCCC. The programme helps empower countries to manage their REDD processes and will facilitate access to financial and technical assistance tailored to the specific needs of the countries.

The application of UNDP, UNEP and FAO rights-based and participatory approaches will also help ensure the rights of indigenous and forest-dwelling people are protected and the active involvement of local communities and relevant stakeholders and institutions in the design and implementation of REDD plans.

The programme is implemented through the UN Joint Programmes modalities, enabling rapid initiation of programme implementation and channelling of funds for REDD efforts, building on the in-country presence of UN agencies as a crucial support structure for countries. The UN-REDD Programme encourage coordinated and collaborative UN support to countries, thus maximizing efficiencies and effectiveness of the organizations' collective input, consistent with the "One UN" approach advocated by UN members.

CONTACTS:

Rakibul Hasan Mukul
Project director
UN-REDD National Programme
Email:
pd-unredd@bforest.gov.bd

Matieu Henry
Chief Technical Advisor
UN-REDD National Programme
Food & Agriculture Organization of the United Nations
Email: matieu.henry@fao.org

Suggested Citation: Islam, K.M.N., Poultouchidou, A., Akhter, M., Lee, D., Sola, G. Henry, M. (2017). Proceedings of the training workshop "Forest Reference Level for REDD+", August, 2017, Bangladesh Forest Department and Food and Agricultural Organization of the United Nations, Dhaka, Bangladesh.

Disclaimer

This report is designed to reflect the activities and progress related to the FREL/FRL calculation capacity development under Bangladesh UN-REED programme. This report is not authoritative information sources-it does not reflect the official position of the supporting international agencies including Forest Department, UNDP and FAO should not be used for official purposes. Should readers find any errors in the document or would like to provide comments for improving the quality they are encouraged to contact one of above contacts.

EXECUTIVE SUMMARY

REDD+ refers to reducing emissions from deforestation and forest Degradation, conservation of forest carbon stocks, sustainable management of forests, and enhancement of forest carbon stocks, in accordance with the guidance set out in section III-C of Decision 1/CP.16. In view of this, Bangladesh is currently implementing the UN-REDD National Programme through Ministry of Environment and Forests (MoEF) in collaboration with the Forest Department (FD). One of the objectives of the national programme is to submit the FREL/FRL to the UNFCCC. As a part of the FREL/FRL calculation capacity development process, a training workshop was organized on 16-24 August, 2017, titled as "training workshop on Forest Reference Level for REDD+."

The objectives of the workshop were to calculate and review the emissions and removals based on the available activity data and emission factors; discuss on different forest related definition and necessary modification; discuss on the preliminary result and recommendation for modification; and prepare the initial draft of the FREL/FRL report.

Based on group discussion and group exercise participants were reached in consensus on several elements as well as draft of the FREL/FRL report, such as-

- Activities: Bangladesh can consider Deforestation, Degradation, Enhancement (Afforestation/Reforestation, Restoration and Enrichment), and calculation will be also performed considering Conservation and will be discussed during national consultation.
- Carbon pools: Based on data Above ground biomass, and Below Ground Biomass will be included for the FREL/FRL development in Bangladesh.
- Gases: Only CO_2 will be considered, and depending on data in future other non- CO_2 gases can be considered.

Moreover, the existing forest definition was revised to include some mangrove species (*Goran-Ceriops decandra*), which may not include under the existing forest definition because of height threshold. So, the definition was revised as "*Land spanning more than 0.5 hectares with trees higher than 5 meters (exception for the Ceriops decandra with height of 2 meters) and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under rural settlement, agricultural or urban land use, therefore trees grow outside forest are considered as non-forest trees.*"

The workshop ended with a zero draft of the FREL/FRL report to the UNFCCC, a writing team consisting of officials from forest department, and a review team consisting of officials from forest department, MoEF, academician from three universities, and officials from SPARSO. Based on the agreed planning the tentative date of the national consultation on proposed FREL/FRL will be 5th November, 2017.

CONTENTS

CONTENTS

1. Introduction

United Nations Framework Convention on Climate Change (UNFCCC) decisions [1] encourage developing countries to contribute to climate change mitigation actions by voluntarily undertaking activities to reduce greenhouse gas (GHG) emissions, and enhance carbon sinks in the forest sector. Such contribution is known as REDD+[2], and covers (a) reducing emissions from deforestation; (b) reducing emissions from forest degradation; (c) conservation of forest carbon stocks; (d) sustainable management of forests; and (e) enhancement of forest carbon stocks.

A national Forest Reference Emission Levels or Forest Reference levels (FREL/FRLs) in terms of tonnes of CO_2 equivalent per year is determined for a nationally agreed reference period covering the five REDD+ activities. In short, FREL/FRLs are benchmarks to assess a country performance for implementing REDD+ activities[3], and against this benchmark, performance of country in terms of difference between reference levels and actual emissions will be compared for results based payment (RBP) during result period.

Therefore, FREL/FRLs depicts the level of emissions in the absence of implementation of REDD+ activities. Besides, according to UNFCCC decisions, eligibility for RBP require an assessed FREL/FRLs [4]. So, FREL/FRLs are required for countries that wish to access to RBP based on measured, reported, verified (MRV) emission reductions[5]. So, the construction and submission of FREL/FRLs to the UNFCCC is a process that requires transparent, complete, consistent, comparable, and accurate information.

2. Bangladesh contexts

Given the technical and procedural complexity involved in the implementation of REDD+ activities, Parties agreed that REDD+ should be done in three phases[6], such as readiness, implementation and result period. The choice of a starting phase, depends on the specific national circumstances, capacities and capabilities of each developing country Party and the level of support received[7]. Bangladesh is currently in the readiness phase, and hence the country is working to develop national REDD+ strategies or actions plans, policies and measures (PAMs), and built capacity to contribute to climate change mitigation through forest-based actions. The country is under the process of constructing FREL/FRLs for REDD+ with the aim to assess the effectiveness of REDD+ activities and potentially receive RBP.

The FREL/FRL should be consistent and coherent with national REDD+ strategy. To construct FREL/FRLs, Bangladesh must reflect and make methodological choices on key elements like scale, scope, forest definition, selection of historical data and analysis, stratification, selection of construction methodology, and reference period. As a part of the capacity development and data generation, FAO through the UN-REDD Bangladesh National Programme organized several programs as reflected in the Figure 1.

---

[1] All REDD+ related decisions can be accessed through this link: http://unfccc.int/6917

[2] UNFCCC, Decision 1/CP.16, par. 70

[3] UNFCCC, Decision 12/CP.17, par. 7

[4] UNFCCC, Decision 9/CP.19, par. 3 and Decision 13/CP.19, par. 2

[5] UNFCCC, Decisions 11/CP.19/par. 3

[6] Decision 1/CP.16, paragraph 73

[7] Decision 1/CP.16, paragraph 74

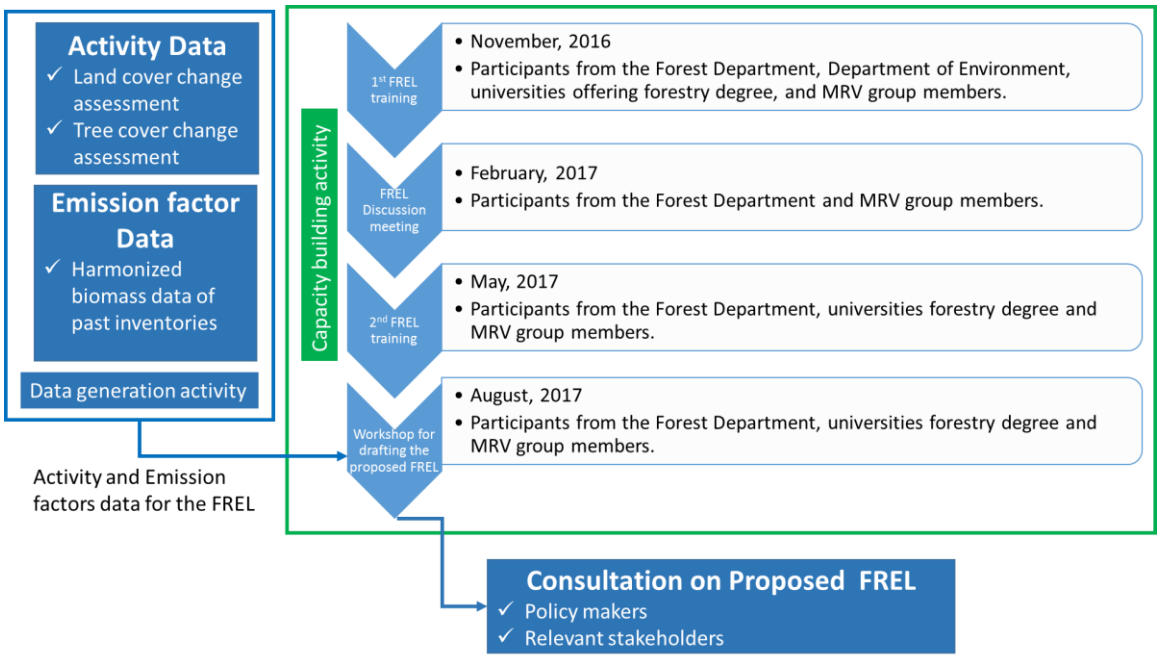

Figure 1: FREL/FRL development Bangladesh contexts.

UN-REDD Bangladesh National Programme is supporting Bangladesh Forest Department to develop FREL for submission to the UNFCCC in January 2018. The FREL workshop organized in August 16-24, 2017 was focused on identifying data for development of FREL with the guidance from experienced resource persons.

3. Objectives: training workshop

The objectives of the workshop were to:

- Calculate and review the emissions and removals based on the available activity data and emission factors;
- Discuss on different forest related definition and necessary modification;
- Discuss on the preliminary result and recommendation for modification; and
- Prepare the initial draft of the FREL/FRL report.

4. Summary of the presentation and exercise

The workshop started on 16th August with the welcome speech and informing the participant about the workshop objective by Mr. Rakibul Hasan Mukul, Project Director, UN-REDD National Programme Bangladesh. The whole workshop was organized by presentation on FREL/FRL basic particularly during morning session, followed by discussion to modify or to have consensus on FREL/FRL building blocks related to Bangladesh, and then calculation procedure for developing the FREL/FRL of Bangladesh during morning and afternoon session.

4.1 FREL/FRL basics

Following the welcome speech, the workshop on 16th August started with the presentation "Basic concepts of FREL and summary of previous workshops" by Mr. K M Nazmul Islam, National Consultant: GHG inventory and FREL/FRL. An overview of the presentation are as follows:

FREL/FRL is one of the four elements required by the UNFCCC for countries participating in REDD+. It is a benchmark for assessing REDD+ performance of country expressed in tons of carbon dioxide equivalent per year (tCO_{2e}/yr). The FREL/FRL modalities by UNFCCC are:

- FREL/FRL submissions to the UNFCCC should contain information and rationale on the development of FREL/FRLs, taking into account historical data. Countries may also adjust their FREL/FRLs for national circumstances.
- FREL/FRLs should maintain consistency with anthropogenic forest-related GHG emissions and removals as contained in national communication on GHG, and use IPCC guidelines for both national GHG inventories and FREL/FRLs.
- Information in FREL/FRL submissions should be transparent, complete, consistent and accurate and include: data sets, approaches, methods, models and assumptions used, description of relevant policies, forest definition, carbon pools, GHGs, REDD+ activities.
- FREL/FRLs may take a stepwise approach. Countries should update their FREL/FRLs periodically to incorporate better data, improve methodologies, and expand the scope or scale.
- Subnational FREL/FRLs may be developed as an interim measure. Countries are expected to transition over time to a national FREL/FRL.

FREL/FRL can be constructed based on historical average or linear projection or adjustment depending on national circumstances as reflected in the Figure 2.

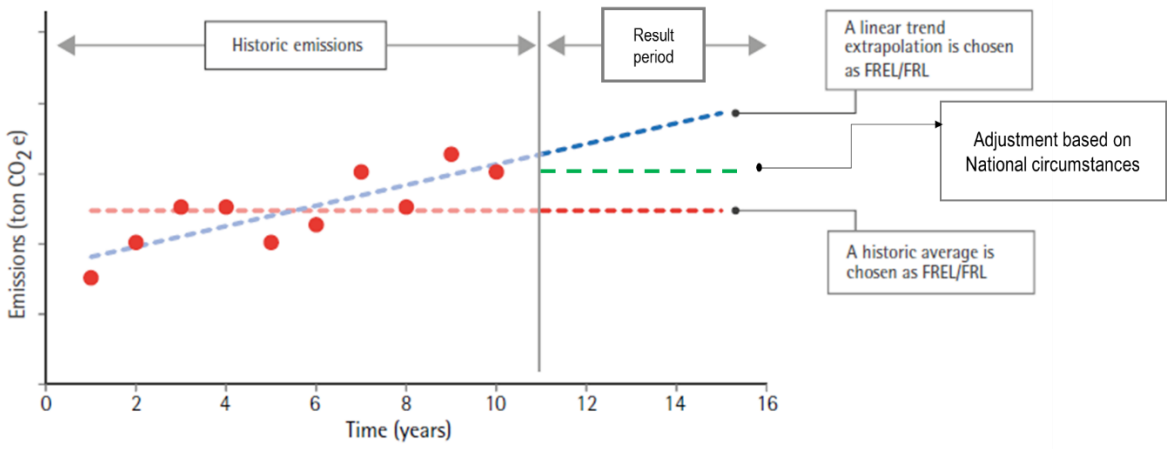

Figure 2: Eamples of FRE:/FRL construction approach.

As part of the capacity development process in Bangladesh two FREL/FRL technical workshop were organized during November 2016 and May 2017. Both the workshop recommended to have a consensus on definition of forest for the FREL/FRL submission. The recommendation of the previous workshop highlighted to decide on a forest definition to determine which lands will be included, and state the difference between the forest land and forest in Bangladesh, as well as inclusion or exclusion of tree outside the forests in the definition of forests of Bangladesh.

The next presentation on 16th August was about the forest related definition in Bangladesh by Dr. Mariam Akter, MRV consultant. The presentation highlighted the definition of forest land, forest, zones distinguished for the Bangladesh forest inventory, five REDD+ activity. An overview of the presentation are as follows:

Forest Land: According to the Forest Act, 1927 any land with the gazetted notification of Forests is known as forest land. In relation to the forest land, there is also some other relevant definition such as:

- Reserved Forest (RF): RFs fall under the management of the FD and are governed/protected under the Forest Act.
- Protected Forest (PF): PFs are also fall under the management of the FD and are governed/protected under the Forest Act.
- Vested Forests (VF): The Private Forests Ordinance, 1959 allows the Government to take over management of improperly managed private forest lands, any private lands that can be afforested, and any land lying fallow for more than three years. These government managed lands under this Ordinance are called "vested forests".
- Acquired Forests (AF): The private forest lands acquired by the government under the State Acquisition and Tenancy Act (SAT), 1950 are called "acquired forests".
- Un-classed State Forest Land (USF): The USF are located in the Chittagong Hill Tracts (CHT). The USF were until recently under the control of the Deputy Commissioner and now have been placed under the control of CHT District Councils where they are used as jhum (slash and burn agriculture) by indigenous communities.

Forest: The definition of forest used in the NFA 2005-2007 is similar with the FAO provided definition, which is "*Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use*".

During the discussion most of the participant from forest department expressed their concern regarding the height threshold, and inform that the height threshold (5 meter tree height) is not consistent some of the mangrove species of Sundarbans. So, the issue was discussed more rigorously during the definition exercise session.

Some other common terminologies were discussed during the presentation such as:

- Tree cover (also named crown cover or canopy cover): It is the area covered by crown of live trees. Its value is assigned as a percentage or range of percentage. Unit is percentage %.
- Forest cover: Land covering an area more than .5 ha in extent and having tree canopy density of 10 percent and above. This definition is based on the resolution of digital satellite data (pixel size 6m x 6m), and the technique employed for image processing (for example). Unit is ha or km^2.
- Tree density: Tree density is the number of stems per unit area. If there are 6 stems in 2 ha of land, then the tree density is 6/2 = 3 stems per ha. Unit is stem per ha.

The five zones distinguished for the Bangladesh forest inventory are defined as:

- Hill: includes the forests in hilly areas of CHT, Chittagong, Cox'sbazar and greater Sylhet districts.

- Sal: includes the sal forest of Dhaka, Gazipur, Mymensingh, Tangail and other districts.
- Coastal: Include the coastal plantations.
- Sundarban: Includes Sundarban.
- Village: Includes the rest area trees outside forest.

The five REDD+ activities were defined as:

- Deforestation: clearance or clearing or removal of a forest or stand of trees where the land is thereafter converted to a non-forest use. Deforestation include conversion of forestland to settlement, agriculture use.
- Forest Degradation: is changes within the forest which negatively affect the structure or function of the stand or site, and thereby lower the capacity to supply products and/or services.
- Sustainable Forest Management: means the environmentally appropriate, socially beneficial, and economically viable management of forests for present and future generations.
- Reforestation/Afforestation: refers to the replanting of trees on land that has previously had trees, but where these were cut down.
- Enhancement: actions to re-instate ecological processes, which accelerate recovery of forest structure, ecological functioning and biodiversity levels towards those typical of climax forest.

The next presentation on 16th August was about Activity data and emission factors by Ms. Anatoli, Consultant, FAO Bangladesh. The presentation highlighted about the IPPC approaches to activity data and Emission factors. An overview of the presentation are as follows:

IPCC guidelines refer to two basic inputs with which to calculate greenhouse gas inventories, such as activity data and emissions factors. Activity data refer to data related with land use change for example 1000 ha of forest is deforested in 2005, and emission factor refer to carbon stock under particular land use type for example 400 t CO_{2e}/ha under the forest land use.

IPCC suggested 3 Approaches to derive Activity data, such as:

- Approach 1 identifies the total area for each land category—typically from non-spatial country statistics—but does not provide information on the nature and area of conversions between land uses, i.e., it provides only “net” area changes and thus is not suitable for REDD+.
- Approach 2 involves tracking of land conversions between categories, resulting in a non-spatially explicit land-use conversion matrix.
- Approach 3 extends Approach 2 by using spatially explicit land conversion information, derived from sampling or wall-to-wall mapping techniques.

All countries for their FREL/FRL construction assessed deforestation using remote sensing (mostly Landsat) and creating wall-to-wall forest area change maps based on Approach 3. Most countries do not have spatially explicit data for degradation, hence many country used timber extraction data (e.g.-Guyana, Congo, Malaysia) for degradation. Countries like Indonesia, Vietnam used remote sensing for degradation, afforestation and reforestation.

IPCC suggested 3 tiers for emission factors, such as:

- Tier 1: Default factors (e.g. from IPCC emission factor database).
- Tier 2: Country-specific EFs (e.g. from country specific literature review or scientific work)
- Tier 3: Higher order methods used (e.g. from National Forest Inventory measurements over time)

Emission factors can be also developed using stratification by homogenous carbon contents based on forest type or forest structure, for example emission factors for Bangladesh can be developed by five BFI zones.

The next presentation on 16th August was about presentation on calculation methodology on FREL/FRL by Mr. Gael Sola, Consultant, FAO. The presentation highlighted about the calculation methodology. An overview of the presentation are as follows:

CO_2 emissions and removals by the forest are not stocks they are changes. CO_2 emissions and removals can be measured by the fluxes of gas going in and out of the system as presented in the Figure 3.

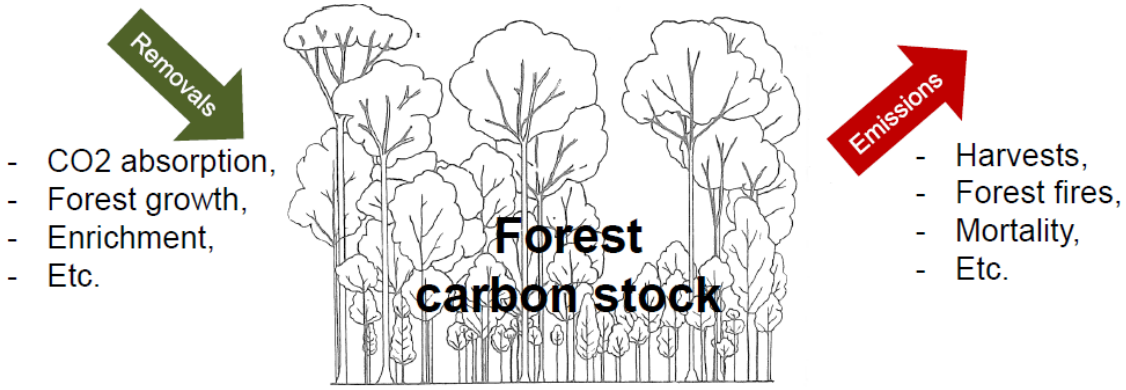

Figure 3: CO_2 emissions and removals by the forest.

CO_2 emissions and removals can be measured by the stock difference between two time points. If the forest carbon stock is reduced between two time points then depending on the threshold value used in the forest definition, it can be considered as emission from deforestation or emission from degradation. On the other hand, if the forest carbon stock is enhanced between two time points, then it can be considered as enhancement of carbon stock from afforestation/reforestation/restoration.

Following the basic of emerging approaches of FREL/FRL construction on 16th August the afternoon session was focused on discussion of different definition, and the participant reached a consensus on the following definition:

- Forest: “Land spanning more than 0.5 hectares with trees higher than 5 meters (except for *Ceriops decandra* with height of 2 meters) and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under rural settlement, agricultural or urban land use therefore trees growing outside forest are considered as non-forest trees.”
- Forest cover: Area covered by the forest in hectares (ha).
- Forest land: Area declared as forest land in hectares (ha) by the government.
- Tree cover/crown cover/canopy cover: The area covered by the crown or canopy of living trees. Its value is assigned as a percentage or range of percentage.

- Tree Density: Number of stems per unit area for example per ha or km^2.
- Forest type: A particular area of forest based on species composition and their association, which is developed overtime due to the interaction of physical and biological factors.
- Zone: A particular area identified based on the ecology, forest land, soil salinity, soil type and water bodies for the assessment of forests and trees.

The next day was about the calculation exercise of FREL/FRL development of Bangladesh, which is discussed in the section 4.3.

The workshop resumed on 20 August, 2017 after two days weekend. The day started with the presentation on update on FREL/FRL submissions by Ms. Dona Lee, Consultant, FAO. The presentation highlighted about the FREL elements and overview of FREL submissions from other countries. An overview of the presentation are as follows:

25 countries have submitted 26 FREL or FRLs and 4 countries have submitted REDD+ results to the UNFCCC as of January, 2017. Countries have improved measurement of emissions from deforestation (forest to non-forest), but still struggle to measure change within the forest reaming forest (e.g. degradation and forest growth) and non-forest to forest (afforestation/reforestation).

The key challenges of degradation lies with the definitions, because UNFCCC and IPCC do not provide a definition. Some countries used stock-change method by repeated NFI over time, which is so far the best in terms of emission estimation from degradation. Some other countries used timber extraction statistics, remote sensing and ground inventories, modeling, use of proxy statistics, and burned areas. Similarly, key challenges of enhancement lies with the definitions, because enhancement can be either forest remaining forest and non-forest to forest.

Overview of the different elements of FREL/FRL as well as construction approach used by the countries are presented the Figure 4 and Figure 5.

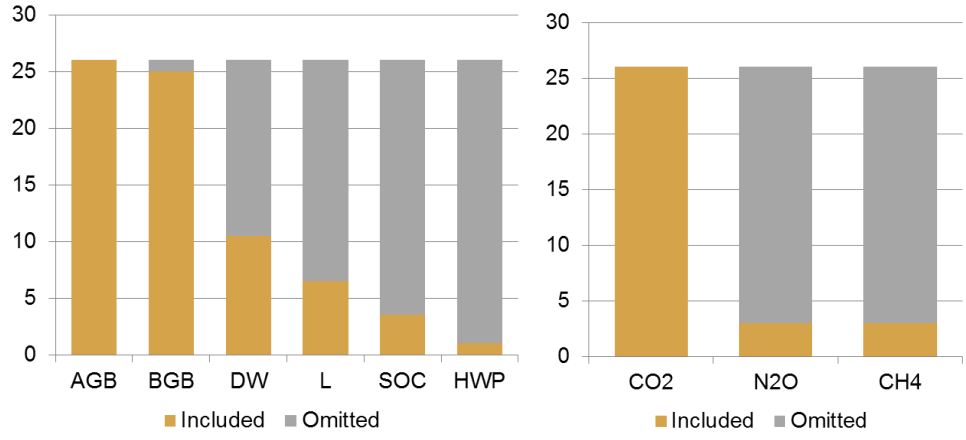

Figure 4: Pools (right panel) and GHG (left panel) used by the countries.

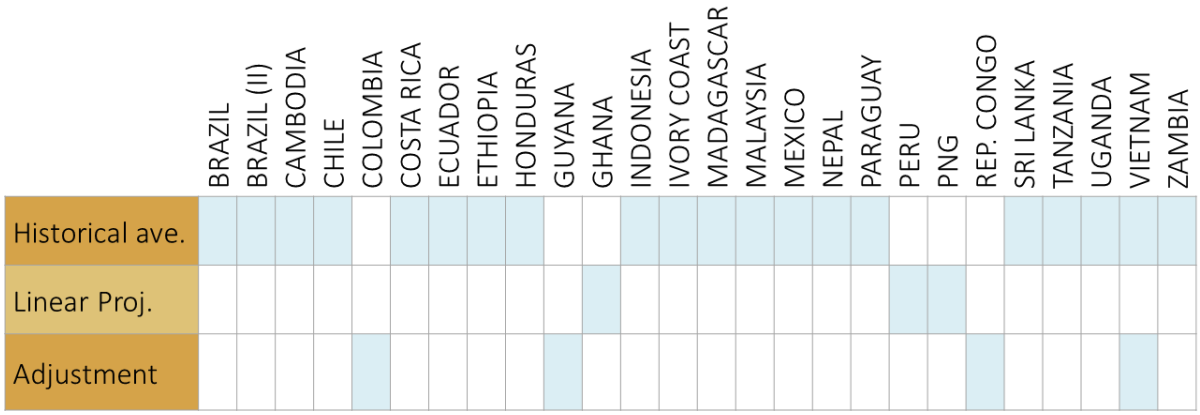

Figure 5: Construction approach adopted by the countries.

The next presentation on 20th August was about linking the FREL/FRL to REDD+ strategy by Ms. Dona Lee, Consultant, FAO. The presentation highlighted about the link between FREL and other elements of REDD+ with a focus on REDD+ strategy. An overview of the presentation are as follows:

A forest reference level should not be developed apart from a REDD+ strategy, both should be informed by each other. All Warsaw Framework should be in place to receive results-based finance. National strategy or action plan, National forest monitoring system, and Safeguard Information System should be in an operational REDD+ web platform, and FREL or FRL and Results (in BUR Annex) should be submitted to UNFCCC. Donors are more willing to see "transformational" approaches in National strategy or action plan; robust estimates and tracks conversion of natural forests by National forest monitoring system; protections of indigenous people and address of benefit sharing plan in Safeguard Information System; and conservative payment baseline for the FREL and Results.

The Reference Period and result period should be chosen with the FRL objective in mind. UNFCCC provides no guidance for reference period, and the Reference Period of submitted FREL span from 8 to 22 years. On the other hand, for Results-based payments Donors prefer ~10 years and not more than 15 years. So, considering this a country can decide reference period and result period, and most cases the result period is immediately after the reference period.

The scale of FREL/FRL can be determined based on the expected results from national strategy and action plan during the result period. In relation to set national strategy or action plan, FREL/FRL can be national or sub-national. For example, Chile submitted a subnational FRL that only represents 22% of its territory and 41% of its forests. Depending on the national strategy or action plan, FREL/FRL can be national, but can be stratified by REDD+ priority areas, for example, Tanzania provided separate FRLs for its mainland and the island of Zanzibar. REDD+ Activities can be chosen based on the most likely positive results from REDD+ strategy. Depending on the national strategy or action plan separate "FRLs" for each activity can be present instead of combining.

The next presentation on 20th August was about the update of NATIONAL STRATEGY development of Bangladesh by Mr. Nasim Aziz, Program Manager, UN-REDD National Program Bangladesh. An overview of the presentation are as follows:

The country has conducted deforestation and forest degradation (D&D) study as a part of the development of national REDD+ strategy and action plan. The identified key direct and indirect drivers at the national level are presented in Figure 6. The country has also identified the barriers and future drivers, which can influence the REDD+ implementation presented in Figure 7**Error! Reference source not found.**.

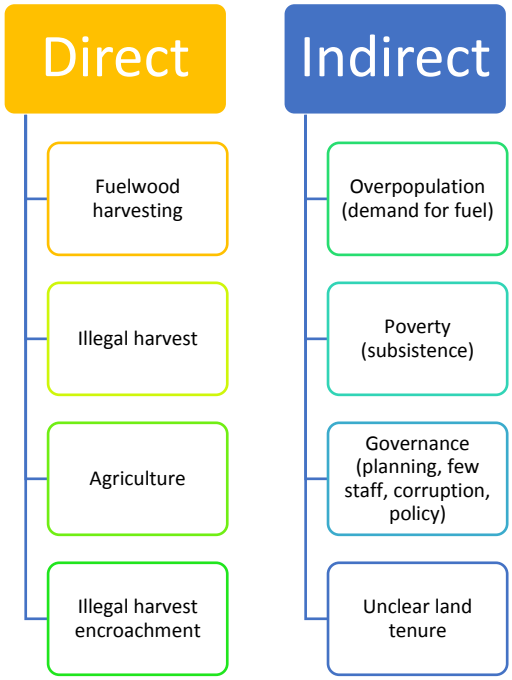

Figure 6: Direct and indirect drivers of deforestation and forest degradation in Bangladesh.

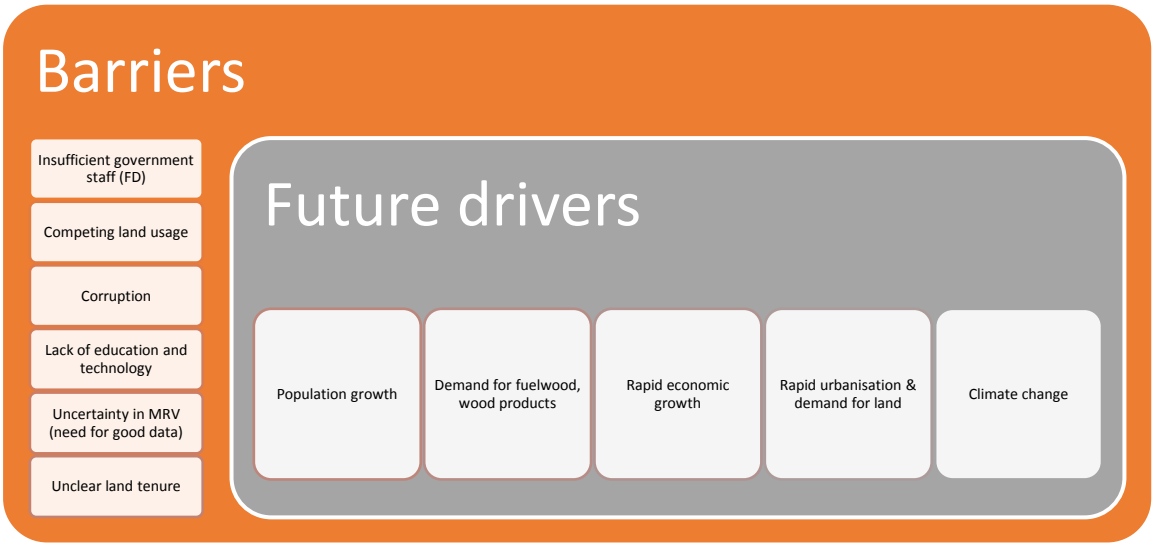

Figure 7: Barriers and future drivers having potential influence on REDD+ implementation.

As part of the national strategy and action plan development national goals and targets are reviewed such as- (i) draft Forest Policy: sustainable management, enrich degraded areas, enhance land areas under forest/tree cover; and (ii) 7TH Five Year Plan (2016-2020): By 2021 ninety percent of designated for forests (1.6% of land) comprises of regenerating native trees; 20 thousand acres of the denuded Chokoria-Sunderbans Reserve Forest shall be restored.

As a part of the institutional arrangement National REDD+ Steering Committee, Technical Working Committee, 3 Technical Working Groups, REDD Cell, and REDD+ Stakeholder's Forum has established. Apart from this, UNDP is also working related with regulatory framework of REDD+, but for safeguard no component is included under the current in National Program, hence need to curve out budget or look for additional funding.

The next day 21st August was focused on FREL/FRL draft development of Bangladesh, which is discussed in the section 4.2 and 5.

The presentation on 22nd August was about Technical Assessment procedure by Ms. Dona Lee, Consultant, FAO. An overview of the presentation are as follows:

Technical Assessment process coordinated by the UNFCCC Secretariat, and Assessment team prepare a report. Assessment team consist of 2 LULUCF experts from UNFCCC roster of experts from Annex 1 and Non-Annex 1 country as well as a possible Non-Annex 1 observer. During the assessment the extent of information provided is assessed in terms of the following aspect:

- Consistency with the GHG inventory: Forest definition, AD & EF, Activities identifiable as IPCC categories.
- Forest definition: Why and how a definition was chosen, whether it is different than the GHGi or other reporting.
- Scale: Whether the FREL is national or covers less than the entire territory.
- Scope: Activities, pools and gases included in the FREL and justification for any omissions.
- Historical data: How has historical data been taken into account?
- Information: Should include methodologies, data sets, approaches, models (if used) and any assumptions.
- Consistency of FREL: Is the FREL consistent with information provided?
- Policies: A description of relevant policies and plans.
- Changes: Any changes made to previously submitted FRELs (taking into account the stepwise approach).

Countries can modify their submission after feedback from the Assessment Team (AT). Most countries re-submit "Modified" FREL/FRLs. Some do not change the overall FREL/FRL estimate, but provide more information, others modify the FREL/FRL emission estimate as a result of the technical assessment, or changes may include adding or omitting activities, pools or gases.

AT has particular focus on Justification for omission of pools or activities. Many countries' FRELs are not consistent with past GHG inventories. In such case, country may indicate that future GHG inventories will be consistent with the submitted FREL, and that differences with past inventories are due to more recent data and/or IPCC guidance used in the FREL. Once a country submits a FREL/FRL and it has been technical assessed, a country may report on results through a BUR Technical Annex that is also subject to technical assessment.

The workshop ended with the presentation on outcome of the workshop is discussed in the section 4.2.

4.2 Bangladesh's FREL/FRL building blocks

Based on group discussion and group exercise participant were reached in consensus on the following elements as well as draft of the FREL/FRL report.

- National context: The national context of the FREL/FRL report should cover overview of Forest classification and forest in Bangladesh (e.g. Zones, Designated forest land, land cover, tree cover), importance of trees outside forest (it was decided the contribution of tress outside the forest for carbon storage will be reported in the document but not will not be accounted for the scope of REDD+, importance of conservation(e.g-Sundarbans), and Bangladesh strategy to address losses and increase removals of CO_2 in different Govt plan such as- 7th 5 year plan, SDG, etc.
- Activities: Bangladesh can consider Deforestation, Degradation, Enhancement (Afforestation/Reforestation, Restoration and Enrichment), and calculation will be also performed considering Conservation and will be discussed during national consultation.
- Carbon pools: Based on data Above ground biomass, and Below Ground Biomass will be included for the FREL/FRL development in Bangladesh.
- Gases: Only CO_2 will be considered, and depending on data in future other non- CO_2 gases can be considered.
- Forest Definition: Earlier forest definition used in the NFA 2005-2007 and 2nd national communication consistent with FAO definition. Because of height threshold *Ceriops decandra (Goran)* may exclude. So, the definition was revised as *"Land spanning more than 0.5 hectares with trees higher than 5 meters (exception for the Ceriops decandra with height of 2 meters) and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under rural settlement, agricultural or urban land use, therefore trees grow outside forest are considered as non-forest trees."*
- Emission factor: Harmonized emission factor data of past inventories of 1997, 2001, 2007, 2009, 2010, 2014 covering entire Bangladesh or some specific forest area will be used for the FREL/FRL development.
- Scale: Trends of deforestation, degradation and enhancement among the major forest types are different and not comparable across the zones. Hence, specific strategies, action plans and management activities needed for each zone to address the drivers of forest cover change. So, FREL/FRL submission of Bangladesh will be at national level with segregated figures for five major zones, viz. Hill, Sal, Sundarbans, Coastal, and village.
- Construction methodology: Construction of the FREL/FRL of Bangladesh will based on Reference period 2000-2015 using historical average construction method.

4.3 Calculations

The calculation procedure of FREL/FRL practiced in the workshop is described here:

Step 1: The dummy Activity data is prepared based on Land cover map 2000 and 2015 and Tree cover map 2000 and 2015. The emission factor is developed from the harmonization of the past inventories of 1997, 2001, 2007, 2009, 2010, and 2014. Historical forest inventories were harmonized to generate average biomass estimates (in ton biomass/ha) for each land cover where inventories were conducted.

Step 2: REDD+ activities are defined as-

- Deforestation = change from forest land cover to non-forest land cover.

- Enhancement (Reforestation) = change from a non-forestland cover to a forest land cover.
- Degradation or enhancement (Restoration) = change from a forest land cover to another forest land cover of lower tree cover (means lower carbon stock-degradation) or increase of tree cover in areas remaining in the same forest land cover class (means higher carbon stock-enhancement form restoration).

Step 3: Calculation of the average percent tree cover (ptc) of each class over the reference period from Tree cover map 2000 and 2015.

Land cover class	avg ptc 2000 [1]	total area 2000 [2]	avg ptc 2015 [A]	total area 2015 [B]	avg ptc [PTC] = ([1]*[2] + [A]*[B])/([2]+[B])
Built-up area	7	1453	14	1820	10.89
Plain Land Forest (Sal Forest)	68	354	65	287	66.66
Hilly Forest	87	102	76	56	83.10

Step 4: Calculation of the average carbon stock of each percent tree cover of each class from the harmonized biomass estimates (Average biomass per ptc= AGB per land class / Average ptc per land class.

Step 5: Calculation of the average carbon stock of each polygon.

Polygon ID	area (ha)	land cover 2000	land cover 2015	ptc 2000 [3]	ptc 2015 [C]	avg biomass per ptc 00 [4]	avg biomass per ptc 15 [D]	Cstock 00 [5]=[4]*[3]	Cstock 15 [E] = [D]*[C]
1	44	Hilly Forest	Hilly Forest	100	76	0.75	0.75	75	57
2	1708	Plain Land Forest (Sal Forest)	Built-up area	42	15	0.96	0.92	40.32	13.8
3	391	Built-up area	Built-up area	7	15	0.92	0.92	6.44	13.8

Step 6: Calculation of the emission or removal factors (efrf) and emission or removals (er).

Polygon ID	area (ha) [HA]	land cover 2000	land cover 2015	...	Cstock 00 [5]=[4]*[3]	Cstock 15 [E] = [D]*[C]	efrf [EFRF] = [5] - [E]	er [ER] = [HA]*[EFRF]
1	44	Hilly Forest	Hilly Forest	...	75	57	18	792
2	1708	Plain Land Forest (Sal Forest)	Built-up area	...	40.32	13.8	26.52	45,296
3	391	Built-up area	Built-up area	...	6.44	13.8	- 4.36	-1,705

Step 7: Land use change matrix with emissions and removals is developed and REDD+ activities are identified based on the definition set.

tCO2e		2015			
		Hilly Forest	Plain Land Forest (Sal Forest)	...	Built-up area
2000	Hilly Forest	792			
	Plain Land Forest (Sal Forest)				45,296
	...				
	Built-up area				-1,705

Emission from Degradation Enhancement from forest restoration

Emission from Deforestation Enhancement from reforestation

5. RECOMMENDATIONS FOR NEXT STEPS

1. More accurate data should be generated in future on activity data and emission factors from the ongoing NFI.
2. Other two REDD+ activity 'Sustainable Forest Management' and 'Conservation' should be included in future and necessary guidelines and certification scheme should be taken for future FREL framing.
3. Adoption of procedure/methods for considering non-CO_2 GHG emissions from forest fire, mangroves and wetlands.
4. Develop measurement techniques for other carbon pools of forest ecosystems, like soil organic carbon (SOC), Litter, dead wood (DW) to include in REDD+ process.
5. Harvested Tree Wood (HTW) can be included based on data availability.
6. Future plan:
   (a) In order to submit the FREL/FRL to UNFCCC on January 2018 a writing team consisting of the following officials of the Bangladesh Forest Department is formed.

Name	Responsibilities
1. Hossain Md. Nisad	Future improvement
2. Mariam Akter	Coordination and Data related section (Emission factor data)
3. Zaheer Ikbal	Data related section activity data, uncertainty
4. Marufa Akter	National contexts (1 page)

5. Gobinda Roy	Forest Definition (10 line), Scope and Scale, With the help of Nazmul
6. Rakibul Hasan	FREL/FRL except national circumstances
7. Baktiar Nur	National Circumstances
8. Ariful Haque Belal	Future improvements opportunities

Co-ordination of international support will be provided by K M Nazmul Islam, National Consultant: GHG inventory and FREL/FRL, FAO Bangladesh.

(b) In order to review the FREL/FRL report prepared a review team consisting of the following officials of the Bangladesh Forest Department, MoEF and academician is formed.

1. Abdul Mabud
2. MoEF representative
3. Dr. Al-amin, CU
4. Dr. Rakkibu, KU
5. Dr. Rashid, SU
6. Dr. Sadat, KU
7. Dr. Mahmud, SPARSO

(c) Following timeline is agreed to meet the submission requirement of FREL/FRL on January, 2018.

- 1st draft (20 September, 2017)
- Review report(27 September, 2017)
- 2nd Draft(5 October, 2017)
- submission decision from MoEF(15 October, 2017)
- Notification(31st October, 2017)
- National Consultation (5 November, 2017)
- Final Report: sent to the MoEF for approval and submit(8 December, 2017)
- Submission (8th January, 2018)

APPENDIX 1. AGENDA

Training workshop on the national proposed reference level for REDD+		
Venue	**Forest Department**	
Wednesday 16 August 2017: Technical session		
09.00 – 09.15	Welcoming and Workshop's objective	Rakibul Hasan Mukul PD, UN-REDD National Programme
09.15 – 09.30	Introduction of participants	ALL
09.30 – 10.00	Brief introduction of the basic concepts of FREL and summary of previous workshops	Nazmul Islam
10.00 – 10.30	**Break**	
10.30 – 13.00	Definition used for FREL: REDD+ activities, tree cover, tree density	Mariam Akther
13.00 – 14.00	**Lunch**	
13.00 – 14.00	Activity data and emission factors	Anatoli Poultouchidou
14.00 – 15.00	Forest reference levels	Gael Sola
15.00 – 17.00	Discussion	All
Thursday 17 August 2017: Technical session		
09.00- 17.00	Exercise and discussion on FREL/FRLs	ALL
Sunday 20 August 2017		
09.30 – 11.00	Update on FREL/FRL submissions	Donna Lee
11.00 – 11.30	**Break**	
11.30 – 12.30	Linking the FREL/FRL to a REDD+ strategy	Donna Lee
12.30 – 13.00	UN-REDD Bangladesh National Programme: National Strategy	Nasim Aziz
13.00 – 14.00	Lunch	
14.00 – 17.00	Exercise: From maps and forest inventories to FREL/FRL estimates	Gael Sola
Monday 21 August 2017		
09.00 – 17.00	Discussion on the FREL report: "The submission of Bangladesh's Forest Reference Level for REDD+ under the UNFCCC".	All
Tuesday 22 August 2017		
09.30 – 10.30	Submitting a FREL and REDD+ Results Reporting to the UNFCCC	Donna Lee
10.30 – 17.00	Drafting the report ""The submission of Bangladesh's Forest Reference Level for REDD+ under the UNFCCC".	Group exercise
Wednesday 23 August 2017		
09.00 – 13.00	Exercise on counting emissions and removals for REDD+ and greenhouse gas inventory	ALL
13.00 – 14.00	Lunch	
14.00 – 17.00	Drafting the report ""The submission of Bangladesh's Forest Reference Level for REDD+ under the UNFCCC".	Group exercise
Thursday 24 August 2017		
09.30 – 13.00	Exercise: Questions on the overall issues addressed during the workshop	All
13.00 -14.00	Lunch	

APPENDIX 2. PARTICIPANT LIST

ID	Name	Gender	Designation & Organization	Email
1	Md. Rakibul Hasan Mukul	M	CF, Rangamati	lalpiprey@gmail.com
2	K.M Nazmul Islam	M	Consultant FAO	nazmul.islam@fao.org
3	Mariam Akhter	M	Forest officer - FAO	Mariam.Akhter@fao.org
4	MD. Nayan Miah	M	DOE- Senior Chemist	nbhuiyan6@gmail.com
5	Gobinda Roy	M	CF-Coastal Circle Barisal	gobinda_dcf@yahoo.com
6	Marufa Akther	F	CF- BFD	marufaakther@gmail.com
7	Md. Zaheer Iqbal	M	DCF- RIMS	z.iqbal60@gmail.com
8	Hossain Mohammad Nishad	M	DFO-BFD	hmnishad@gmail.com
9	Md. Ariful Hoque Belal	M	ACCF-MP-BFD	arifulhoquebelal@gmail.com
10	Md. Golam Rakibbu	M	Professor-Khulna University	golamrakkibu@yahoo.co.uk
11	Md.Baktiar Nur Siddiqui	M	DFO-BFD	baktiar1971@gmail.com
12	MD.Touhidur Rahman	M	Forester-RIMS-BFD	tauhidor.rahaman@yahoo.com
13	MD.Bablu Zzaman	M	Forester-FD	zzaman1978@gmail.com
14	Anatoli Poultouchidou	F	Consultant, FAO	Anatoli.poultouchidou@fao.org
15	Rashed Jalal	M	Consultant, FAO	Rashed.Jalal@fao.org
16	Nasim Aziz	M	UNDP	nasim.aziz@undp.org
17	Gael Sola	M	Consultant, FAO	gael.sola@fao.org
18	Luca Birigazzi	M	Consultant, FAO	luca.birigazzi@fao.org
19	MD.Mahmudur Rahman	M	PSO- SPARRSO	mahmudur@sparrso.gov.bd
20	MD.Nazmus Sadath	M	Professor-Khulna University	mnsadath@yahoo.com
21	DR.M Alamin	M	Professor- CU	prof.alamin@yahoo.com
22	Dona Lee	F	Consultant, FAO	donnalynettelee@gmail.com
23	Syeed Mahmud Riadth	M	UN-REDD-UNDP	sayeed.riadth@undp.org
24	Matieu Henry	M	CTA	Matieu.henry@fao.org

APPENDIX 3. EVALUATION RESULTS

		Frequency	Percentage
1	Male	7	100%
	Female	0	0%
2			
	First time	3	43%
	1-3 every year	3	43%
	More than 3 per year	1	14%
	Regularly (approximately one per month)	0	0%
3	**I would describe myself as?**		
	A professor/academic	2	29(
	A student	0	0%
	Forest Department staff	2	29%
	Government staff (outside Forest Department)	2	29%
	NGO staff	0	0%
	Private consultant	0	0%
	Other	1	14%
4	**My professional background relates most closely to:**		
	Forester	6	86%
	GIS/RS	3	43%
	Statistics	0	0%
	Social survey/assessment	1	14%
	Economics	0	0%
	Natural Resource Management	3	43%
	Ecology	0	0%
	other	1	14%
5	**My years of relevant experience is:4**		
	1-2 years	0	0%
	3-5 years	1	14%
	5-7 years	1	14%
	8-10 years	0	0%
	More than 10 years	5	71%
6	**The training was relevant to my daily work**		
	Strongly agree	4	57%
	Agree	2	29%
	Neutral	0	0%
	Disagree	1	14%
	Strongly disagree	0	0%
7	**I had enough previous knowledge to understand the content of the event**		
	Strongly agree	2	29%
	Agree	3	43%
	Neutral	2	29%
	Disagree	0	0%
	Strongly disagree	0	0%
8	**The training met my expectations in terms of the content and learning outcomes**		

	Strongly agree	3	43%
	Agree	2	29%
	Neutral	2	29%
	Disagree	0	0%
	Strongly disagree	0	0%
9	**The learning resources provided were adequate and useful**		
	Strongly agree	2	29%
	Agree	4	57%
	Neutral	1	14%
	Disagree	0	0%
	Strongly disagree	0	0%
10	**The resource person presented information in a way that i could understand and was easy to follow**		
	Strongly agree	3	43%
	Agree	4	57%
	Neutral	0	0%
	Disagree	0	0%
	Strongly disagree	0	0%
11	**I feel confident to be able to carry out the tasks described in the training without supervision.**		
	Strongly agree	2	29%
	Agree	5	71%
	Neutral	0	0%
	Disagree	0	0%
	Strongly disagree	0	0%
12	**I was pleased with the venue/meeting room/snacks etc**		
	Strongly agree	3	43%
	Agree	3	43%
	Neutral	1	14%
	Disagree	0	0%
	Strongly disagree	0	0%
13	**Are there other people/agencies/organizations that you think should have been included in the training?**		
	Yes, the NGOs representatives and the environment journalists etc.		
	1 or 2 retired professionals who are expert in natural resource management and ability to learn and accept new techniques.		
14	**Any other comments?**		
	This is very technical workshop where participants had to give comment to develop FREL report. Therefore it could be better idea to provide others country report and relevant resource before the workshop which could make participant to give more accurate and valid comments.		
	Specially liked exercises and drafting of FREL/FRL framing for Bangladesh during the workshop, that's certainly enhanced our capacity to do work independently in future.		
	Very good workshop		
	The programme seems to me not well organized.		