



প্রশিক্ষণ ম্যানুয়াল

প্রাকৃতিক সম্পদ সহ-ব্যবস্থাপনা ও জলাভূমি সংরক্ষণ

(সরকারী ও বেসরকারী প্রতিষ্ঠানের কর্মকর্তাদের জন্য)

Training Manual on Natural Resources Co-management and Wetlands Conservation



জুন, ২০১২



বান্তবায়নে ঃ পরিবেশ ও বন মন্ত্রণালয়ের অধীন বন অধিদপ্তর ও পরিবেশ অধিদপ্তর মৎস্য ও প্রাণিসম্পদ মন্ত্রণালয়ের অধীন মৎস্য অধিদপ্তর সহযোগীতায়ঃ ইউএসএআইডি-র সমন্বিত রক্ষিত এলাকা সহ-ব্যবস্থাপনা (আইপ্যাক) নিসর্গ প্রকল্প





cÖwkÿY g"vbyqvj

cÖvK...wZK m¤ú‡`i mn-e"e⁻'vcbv I Rivf,wg msiÿY

- cÖKvkK t BDGmGAvBwW-i AvBc¨vK cÖKí Ges mn‡hvwMZvq eb, grm¨ I cwi‡ek Awa`ßi| XvKv-1213 ‡dvbt 9873229, 9871553
- iPbv I m¤úv`bvq t Gg. G. Iqvnve Bwbw÷wUDkbvj K¨vcvwmwU wewis †⁻úwkqvwj÷ †gvnv¤§` Avwgiæj Bmjvg †U^awbs mv‡cvU© †⁻úwkqvwj÷

mvwe©K mn‡hvwMZv

- I civg‡k© t Wt ivg kg©v
- cÖ_g cÖKvkbv t Ryb, 2012
- **Kwc ivBU** t AvBc[°]vK wbmM[©] cÖKí

gyLeÜ

evsjv[‡],[‡]ki 25wU iw¶Z eb, Rjvf~wg Ges cwi[‡]ekMZ msKUvcbœ GjvKvi Rxe‰ewPÎ[¬] Dbœqb I msi¶[‡]Yi Rb[¬] Ômn-e[¬]e[¬] vcbvÕ cÖwµqv wbwðZ Kivi j[‡]¶[¬] 2008 mvj [†]_[‡]K BDGmGAvBwW-i Avw_©K mnvqZvq eb Awa`ßi, grm[¬] Awa`ßi Ges cwi[‡]ek Awa`ß[‡]ii mv[‡]_ mwµqfv[‡]e KvR K[‡]i hv[‡]"Q mgwš^Z iw¶Z GjvKv mn-e[¬]e[¬] vcbv (AvBc[¬]vK) wbmM© cÖKí

cÖKífy³ GjvKv,‡jv‡Z cÖvK...wZK cwi‡e‡ki ^ewkó["] cybiæ×vi Ges mgwš^Z e["]e⁻'vcbvi gva["]‡g GKwU ⁻^v⁻'"Ki I Drcv`bkxj cwi‡ek ^Zwi Kivi j‡¶["] MVb Kiv n‡q‡Q ÔwbmM© †bUIqvK©Õ| hv‡Z K‡i bvbvwea Kvh©µ‡gi gva["]‡g wbKU⁻' RbMY Z_v mvgwMÖKfv‡e mviv‡`‡ki gvbyl jvfevb nq|

gvV ch©v‡qi miKvix Kg©KZ©vMY- eb wefv‡Mi mnKvix eb msiÿK, grm[¬] Awa`β‡ii wmwbqi Dc‡Rjv grm[¬] Kg©KZ©v I Dc‡Rjv grm[¬] Kg©KZ©v Ges cwi‡ek Awa`β‡ii mnKvix cwiPvjK, ⁻'vbxq RbM‡Yi mnvqZvq mn-e[¬]e⁻'vcbv cÖwµqvq cÖvK...wZK m¤ú` I Rxe‰ewPÎ[¬] msiÿ‡Y KvR Ki‡Q| Zv‡`i †UKmB mejZv Dbœq‡bi j‡¶[¬] Ávb, m‡PZbZv Ges `¶Zv e,,w×i welq‡K we‡ePbv K‡i ^Zix Kiv n‡q‡Q g[¬]vbyqvjwU| Zv‡`i GB mvg_©Zv e,,w× g~jZt cÖK‡íi j¶[¬] mvab I AR©‡b Ae`vb ivL‡e Ges Rxe‰ewPÎ[¬] msiÿY I Dbœqb Kv‡R AskMÖn‡Y cÖ‡bvw`Z Ki‡e|

g¨vbyqvjwU mvwe©Kfv‡e MZ wZb eQ‡ii †ekx mg‡qi AvBc¨vK cÖK‡íi Kvh©µg I cÖwk¶‡Yi AwfÁZv, e¨envi, cwiPvjbv, cix¶v-bxwi¶vi wfwˇZ cÖYqb Kiv n‡q‡Q| Kv‡RB †mw`K †_‡K cÖwk¶Y g¨vbyqvjwU‡Z AZx‡Zi AwfÁZv, welqe¯', cÖwµqv, c×wZ, e¨envi BZ¨vw`‡K AšÍf©~³ Kiv n‡q‡Q| GB g¨vbyqvjwUi wfwˇZ MZ ‡g, 2012 mv‡j `yB e¨vP ÒcÖvK...wZK m¤ú` mne¨e¯'vcbv I Rjvf,wg msiÿYÓ wel‡qi Dci cÖwkÿY †Kvm© AbywôZ nq| GB cÖwk¶‡Y eb wefv‡Mi mnKvix eb msiÿK, grm¨ Awa`B‡ii wmwbqi Dc‡Rjv grm¨ Kg©KZ©v I Dc‡Rjv grm¨ Kg©KZ©v, cwi‡ek Awa`B‡ii mnKvix cwiPvjK Ges †emiKvix cÖwZôv‡bi Kg©KZ©vMY AskMÖnY K‡i hv‡Z Zviv gvV ch©v‡q ebf,wg, Rjvfw,g Ges cÖwZ‡ekMZ msKUvcbœ GjvKvq Rxe‰ewPΨ msiÿY Kvh©µg mn-e¨e¯'vcbvi gva¨‡g cwiPvjbv Ki‡Z cv‡i| gʻvbyqvjwUi ^ewkóʻ n‡''Q GwU‡Z wKQz Qwe I cÖwkÿ‡Y Dc⁻'vwcZ welqmg~n nʻvÛ-AvDU AvKv‡i ms‡hvRb Kiv n‡q‡Q †hLv‡b Lye mnR, mvaviY Ges we⁻ÍvwiZfv‡e cÖwk¶‡Yi welq, D‡Ïk¨, DcKiY I cÖwµqvmg~n e¨envi Kiv hvq Ges GKRb cÖwk¶K mn‡R ey‡S DV‡Z cv‡i Ges ⁻^v'Q>`Zvi mv‡_ cÖwk¶Y cwiPvjbv Ki‡Z cv‡i| m‡e©vcwi Gi gvaʻ‡g GKwU mwµq AskMÖYg~jK cwi‡ek m,,wó n‡e| GB gʻvbyqv‡j cÖvK...wZK m¤ú` mn-e¨e⁻'vcbv I Rxe‰ewPΨ msiÿ‡Yi ,iæZ₁; evsjv‡`‡ki eb I Rjvf,wgi †kÖYxweb¨vm I cÖKvi‡f; Rxe‰ewPΨ, Rjvf,wg I cwi‡ek msiÿ‡Y eb, eb¨cÖvYx, grm¨ Ges cwi‡ek AvBb I aviv mg~n; evsjv‡`‡ki eb I Rjvf,wgi j`vÛ‡⁻ <‡c mn-e¨e⁻'vcbv; eb I Rjvf,wgi cwi‡ekevÜe cybtiæ×vi Ges RjR AfqvkÖ‡gi Dci †gvU 14wU Awa‡ekb mshy³ Kiv n‡q‡Q| hv‡Z gvV ch©v‡qi miKvix I †emiKvix cÖwZôv‡bi Kg©KZ©vMY Zv‡`i `ÿZv AR©b K‡i cÖvK...wZK m¤ú` iÿvq mÿg nq Ges Rxe‰ewPΨ msi¶‡Y ‡UKmB mne¨e⁻'vcbvi ,iæZ; eyS‡Z cv‡i|

g[°]vbyqv‡j ewY©Z cÖwk¶Y c×wZ Ges DcKiYmg~n civgk©g~jK Z‡e ‡Kvb †Kvb †¶‡Î cÖwk¶KMY Zv‡`i Ávb I AwfÁZv‡K m¤ú,,³ K‡i cÖwk¶Y‡K mg,,w× mvab Ki‡eb hv cÖwk¶Y‡K DbœZi Ges wkL‡bi cwi‡ek ‰Zix‡Z mnvqZv Ki‡e|

GB cÖwk¶Y g¨vbyqvj e¨envi K‡i hw` `wi`^a I wcwQ‡q cov Rb‡Mvwôi wKq`sk Dbœqb, ¶gZvqb Ges Rxe‰ewPΨ msi¶‡Y mnvqZv nq Zvn‡j Avgv‡`i k^ag mv_©K n‡e| g~jZt GB g¨vbyqvjwU cÖYq‡b AvBc¨vK cÖK‡íi Bbw÷wUDkbvj K¨vcvwmwU wewìs I cÖwkÿY wUg Ges Iqvì© wdm †m>Uvi I grm¨ Awa`ßi ‡_‡K h_vµ‡g Wt †Mvjvg †gv⁻Ídv Ges Wt ‰mq` Avjx AvRnvi KvR K‡i‡Qb Ges Gi mg,,w× mva‡b Av‡iv huviv mn‡hvwMZv Ki‡Qb Zuv‡`i‡K ab¨ev` Ávcb I K...ZÁZv cÖKvk KiwQ|

GB g¨vbyqv‡j †Kvbi*f*c fvlv I Z_[¨]MZ wKsev KvwiMwi f,j _vK‡j Avgv‡`i civgk© w`‡q mg,,× Ki‡j L~kx n‡ev|

Wt ivg kg©v Ryb, 2012 GKwUs wPd Ad cvwU© AvBc¨vK cÖKí

Training Program Schedule

on

Natural Resources Co-Management and Wetlands Conservation (for Government and NGO Officials)

Integrated Protected Area Co-management (IPAC) Project

Venue:

Date:

Course Duration: Two Days

Time	Training Session/Topics	Training Mathod	Resource Person for
		Wiethou	Training Facilitation
Day 1:			
9.30-9.45 am	Registration	Registration Form	Facilitator
9.45-10.15 am	Inauguration and Welcome	Lecture, Pair/Self introduction	Representative from Government Departments/ Facilitator
10.15-11.15 am	Importance of Natural Resources Co-Management and	PPP/Large Group	Resource Person

	Biodiversity Conservation: Global and Local Perspective	Discussion/Q&A	
11.15-11.30 am	Health and Tea Break		
11.30-12.15pm	Sustainable Landscapes Co-management: Forests, Wetlands and Community	PPP/Large Group Discussion/Q&A	Resource Person
12.15-1.30 pm	Classification, Types and Profiles of Forests & Wetlands in Bangladesh	PPP/Large Group Discussion/Q&A	Resource Person
1.30-2.30 pm	Health and Lunch Break		
2.30-3.45 pm	Forests, Wildlife and Environment Acts and Rules for Biodiversity, Wetlands and Environment Conservation	PPP/Large Group Discussion/Q&A	Resource Person
3.45-4.00 pm	Health and Tea Break		
4.00-5.00 pm	Co-Managing Open Water Fisheries Resources	PPP/Large Group Discussion/Q&A	Resource Person
5.00 pm	Day Close		
Time	Training Session/Topics	Training Method	Resource Person for Training Facilitation
Day 2:		1	
9.30-10.30 pm	Sundarbans Wetlands Co-Management: A Case Study	PPP/Large Group Discussion/Q&A	Resource Person
10.30-11.15 am	Fisheries Co-Management and Fisheries Regulations	PPP/Large Group Discussion/Q&A	Resource Person
11.15-11.30 am	Health and Tea Break		
11.30-12.30 pm	Fisheries Ecology, Biodiversity and Conservation	PPP/Large Group Discussion/Q&A	Resource Person
12.30-1. 30 pm	Climate Change Impacts on Forests and Wetlands in Bangladesh	PPP/Large Group Discussion/Q&A	Resource Person
1.30-2.30 pm	Health and Lunch Break		
2.30-3.15 pm	Co-Managing Landscapes of Forests and Wetlands for Climate Change Mitigation and Adaptation	PPP/Large Group Discussion/Q&A	Resource Person
3.15-3.30 pm	Tea Break		
3.30-4.15 pm	Eco-Restoration of Wetlands and Forests: A Case Study of Chunati Wildlife Sanctuary	PPP/Large Group Discussion/Q&A	Resource Person

4.15-4.45 pm	Aquatic Sanctuary: A Case Study of Baikka Beel	PPP/Large Group Discussion/Q&A	Resource Person
4.45-5.15 pm	Course Closing and Certificate Giving Session	Participatory Discussion	Representative from Government Departments/Resource Person/Facilitator

m~PxcÎ

w`b	Awa‡ekb	welq	c,,ôv
	Awa‡ekb	AskMÖnYKvix‡`i bvg wbeÜb, ⁻ ^vMZ e ³ e I D‡Øvab	1
	1.1		
	Awa‡ekb	cÖwk¶Y cwi‡ek m,,wó I ci®ú‡ii mv‡_ cwiPq	3
	1.2		
	Awa‡ekb	cÖwk¶Y †Kv‡m©i D‡Ïk¨ I cÖZ¨vkv	4
1g	1.3		
	Awa‡ekb 2	cÖvKwZK m¤ú` mn-e¨e¯ 'vcbv I Rxe‰ewPΨ msiÿ‡Yi	5
		,iæZit ^elwqK I⁻'vbxq Ae⁻'vi Av‡jv‡K	
	Awa‡ekb 3	[‡] UKmB j [¨] vÛ [‡] <c mn-e<sup="">¨e⁻ 'vcbvt eb, Rjvf,wg I Kgy[¨]DwbwU</c>	14
	Awa‡ekb	evsjv‡`‡ki ebf,wgi †kÖYxweb¨vm I cÖKvi‡f‡`i mswÿβ	23
	4.1	cwiwPwZ	
	Awa‡ekb	evsjv‡`‡ki Rjvf,wgi †kÖYxweb¨vm I cÖKvi‡f‡`i mswÿβ	44
	4.2	cwiwPwZ	
	A + 11 7		<u> </u>
	Awa‡ekb 5	Rxe‰ewPI [°] , Rjvf,wg I cw1‡ek ms1ÿ‡Y eb, eb [°] cOvYx Ges	51
		cwi‡ek AvBb I aviv mg∼n	

	Awa‡ekb 6	Db¥y ³ Rjvk‡q grm [¨] m¤ú‡`i mn-e [¨] e [¯] 'vcbv	62
	Awa‡ekb 7	my>`ie‡bi Rjvf,wgi mn-e¨e¯ 'vcbvt GKwU †Km ÷¨vwW	74
	Awa‡ekb 8	grm [°] m¤ú ⁺ ₁ `i mn-e [°] e ⁻ 'vcbv I grm [°] AvBb, 1950	82
	Awa‡ekb 9	grm¨ m¤ú‡`i B‡KvjwR, Rxe‰ewPΨ I msiÿY	94
2q	Awa‡ekb 10	evsjv‡`‡ki eb I Rjvf,wgi Dci Rjevqyi cÖfve	103
	Awa‡ekb 11	Rjevqy cwieZ©b cÖkgb I Awf‡hvR‡b eb I Rjvf,wgi j"vÛ‡ ⁻ <‡c mn-e ⁻ e ⁻ 'vcbv	115
	Awa‡ekb 12	eb I Rjvf,wgi cwi‡ekevÜe cybtiæ×vit PzbwZ eb¨cÖvYx Afqvi‡Y¨i GKwU †Km ÷¨vwW	118
	Awa‡ekb 13	RjR AfqvkÖgt evB°v we‡ji GKwU †Km ÷ vwW	127
	Awa‡ekb 14.1	†Kvm© g~j¨vqb I ch©v‡jvPbv	134
	Awa‡ekb 14.2	cÖwkÿY †Kvm© mgvcbx I mb`cÎ weZiY	136

cÖwk¶‡Ki KiYxq

 Awa‡ekb ïiæi c~‡e© cÖwkÿY KvwiKzjv‡g wba©vwiZ Awa‡ek‡bi Dci c~Y© cÖ⁻'wZ †b‡eb;

- ïiæi c~‡e©B Awa‡ekb cwiPvjbvi Rb[¨] cÖwk¶Y DcKiY Ges mnvqK mvgMÖx cÖ⁻ 'Z K‡i ivL‡eb| mKj DcKiY h_vh_ Ges mwVK µgvbymv‡i e[¨]envi Ki‡eb;
- 3. Awa‡ekb ïiæ Kivi Av‡M cÖwk¶Yv_x©‡`i Kzkj Rvb‡Z PvB‡eb| Gi d‡j cÖwk¶Yv_x©iv Avcbv‡K Zv‡`iB GKRb e‡j g‡b Ki‡eb;
- 4. Awa‡ekb‡K cÖvYešÍ ivLvi †Póv Ki‡eb| m¤¢e n‡j wewfbœ Awa‡ek‡bi ïiæ‡Z A_ev gv‡S gv‡S Avb>``vqK wKQy Kiv‡bvi e¨e¯'v Ki‡eb hv‡Z cÖwk¶Yv_x©iv Avb>` cvq| wb‡R hZUyKy m¤¢e nvwmLywk _vK‡eb;
- 5. Awaţekb Dc⁻'vcbKvţj †Kvb aviYv †`qvi mgq cÖwk¶Yv_x©ţ`i cwiwPZ e⁻w³ţ`i †K>`^a Kţi Ggb †Kvb D`vniY †`ţeb bv, hvţZ Zviv e⁻w³MZfvţe wee^aZ nb ev gvbwmKfvţe Kó cvb;
- 6. e[°]w³we[‡]k[‡]li cÖwZ AwZwi³ g[‡]bv[‡]hvM †`qvi cÖeYZv cwinvi Ki[‡]eb| cÖ[‡]Z[°]K cÖwk¶Yv_x©i cÖwZ mgvb g[‡]bv[‡]hvM I `,,wó w`‡eb;
- 7. cÖwk¶‡Y hv‡Z mK‡ji AskMÖnY wbwðZ nq †m w`‡K †Lqvj ivL‡eb| g‡b ivL‡eb, me cÖwk¶Yv_x©i wk¶v MÖn‡Yi I AskMÖn‡Yi ¶gZv mgvb bq| †KD †KD †ek mvejxjfv‡e `‡ji g‡a¨ K_v ej‡Z cv‡ib hv Ab¨ A‡b‡KB cv‡ib bv;
- c^awk¶Yv_x©iv Lye mn‡R †Kvb cÖ‡kœi DËi w`‡Z bv cvi‡j wKsev DËi w`‡Z fyj Ki‡j gbt¶zbœ n‡eb bv A_ev weiw³ cÖKvk Ki‡eb bv eis GiKg Ae⁻ vq cÖwk¶Yv_x©iv hv Rv‡b ZvB ejvi Rb⁻ Drmvn w`b;
- 9. Av‡jvPbvi mgq Av‡jvPbv hv‡Z gyj welq‡K Qvwo‡q AcÖvmw½K wel‡q Xy‡K bv c‡o, †m wel‡q mZK© _vK‡Z n‡e| GiKg cwiw⁻ 'wZi m,,wó n‡j cÖwk¶Yv_x©‡`i AvMÖn bó bv K‡i AZ⁻šÍ †KŠk‡j g~j Av‡jvPbvq wd‡i Avm‡eb;
- 10.GB mnvwqKvq Awa‡ekb Dc⁻'vcbvi Rb¨ †h c×wZ wb‡`©k Kiv n‡q‡Q, me©ÎB †h Zv A¶‡i A¶‡i cvjb Ki‡Z n‡e Ggb †Kvb K_v †bB| cwi‡ek I cwiw⁻'wZ Abymv‡i cÖ‡qvRb n‡j cÖwk¶‡Yi c×wZ I cÖwµqv cwieZ©b K‡i cÖwkÿYwU cÖvYešÍ Ki‡Z n‡e|

cÖwk¶‡Yi D‡Ïk¨

cÖwk¶Y †k‡l cÖwk¶Yv_x©MY

- cÖvK...wZK m¤ú‡`i mn-e¨e¯'vcbv I Rxe‰ewPΨ msiÿ‡Yi jiæZj m¤ú‡K© Rvb‡Z cvi‡eb;
- ‡UKmB j¨vÛ‡¯ <c mn-e¨e¯ 'vcbvi ‡KŠkj wel‡q aviYv cv‡eb;
- evsjv^{*}₁ ^{*} [‡]ki eb I Rjvf, wgi [†]kÖYxweb^{*}vm I cÖKvi[‡]f^{*}₁ i mswÿβ cwiwPwZ e^{*}vL^{*}v Ki[‡]Z cvi[‡]eb;
- Rxe‰ewPÎ["], Rjvf,wg I cwi‡ek msiÿ‡Y eb, eb["]cÖvYx Ges cwi‡ek AvBb I aviv mg~n m¤ú‡K© m‡PZb n‡eb;
- Db¥y³ Rjvk‡q grm["] m¤ú‡`i mn-e["]e⁻'vcbv Rvb‡Z cvi‡eb;
- my>`ie‡bi Rjvf,wgi mn-e[¨]e⁻ 'vcbv welqK aviYv jvf Ki‡eb;
- grm["] m¤ú⁺₁ i mn-e["]e⁻ vcbv I grm["] AvBb mg~n Rvb⁺₂ Z cvi⁺₂eb;
- grm["] cÖwZ‡ek, Rxe‰ewPÎ["] I msiÿY m¤ú‡K© aviYv cv‡eb;
- evsjv^{*}^{*} ki eb I Rjvf, wgi Dci Rjevqy cwieZ©^{*} bi cÖfve e^{*}vL^{*}v Ki^{*}Z cvi^{*} eb;
- Rjevqy cwieZ©b cÖkgY I Awf‡hvR‡b eb I Rjvf,wgi j¨vÛ‡¯<‡c mne¨e¯'vcbv m¤ú‡K© AeMZ n‡eb;
- Rjvf,wg I e‡bi cwi‡ek evÜe cybtiæ×vit PzbwZ eb¨cÖvYx Afqvi‡Y¨i GKwU †Km÷¨vwW Rvb‡Z cvi‡eb;
- RjR AfqvkÖgt evB°v we‡ji GKwU †Km ÷ vwW eY©bv Ki‡Z cvi‡e



wbeÜb, ⁻ ^vMZ e³e^{..} I D‡Øvab

Awa‡ekb AskMÖnYKvix‡`i bvg wbeÜb, ⁻ ^vMZ e³e["] I

D‡Ïk t GB Awa‡ekb †k‡l AskMÖnYKvixMY cÖwk¶‡Yi cÖK…wZ Rvb‡Z cvi‡eb

mgq t 15 wgwbU

c×wZ t cÖwk¶Yv_©x wbeÜb dig (K¬v÷vi KZ©,,K mieivnK...Z dig e¨envi Ki‡eb) |

DcKiY t †jKPvi I Av‡jvPbv|

cÖwµqv t

- Awa‡ek‡b AskMÖnYKvix‡`i AvšÍwiKfv‡e ⁻^vMZ I ï‡f'Qv Rvbv‡eb;
- wb‡¤œi ZvwjKv/wbeÜb dig AskMÖnYKvix‡`i g‡a¨ weZiY Kiæb| cÖwk¶bv_©xiv D³ dig c~ib Ki‡eb I ^v¶i Ki‡eb;
- Gevi cÖwk¶‡Yi aiY m¤ú‡K© Ges cy‡iv cÖwk¶Y †Kvm©wU‡Z AskMÖnYg~jK wewfbœ c×wZ e¨env‡ii gva¨‡g cwiPvwjZ n‡e Zv Zz‡j aiæb;
- GB cÖwk¶‡Yi cÖavb ‰ewkó" D‡jøL K‡i ejyb Avgiv mK‡jB Av‡jvPbvq AskMÖnY Ki‡ev;
- GLv[‡]b Avgiv mK[‡]j wg[‡]j cÖwZwU welq Av[‡]jvPbv Ki[‡]ev| Avjvc Av[‡]jvPbvi gva^{*}[‡]g ci⁻úi ci⁻ú[‡]ii wbKU [†]_[‡]K wk¶v MÖnY Ki[‡]ev| KviY Dcw⁻'Z Avgv[‡]`i mK[‡]jiB wbR⁻^ Ávb I AwfÁZv Av[‡]Q;
- cÖwk¶‡Yi bvg I mgqKvj m¤ú‡K© ejyb;
- AZtci Avevi mKj‡K Av‡jvPbvq mwµq AskMÖnY Kivi I cvi⁻úvwiK mn‡hvwMZvi Aby‡iva Rvbvb;
- Gevi Avgwš¿Z AwZw_‡`i e³‡e¨i gva¨‡g cÖwkÿ‡Yi D‡Øvab ‡Nvlbv Kiæb Ges GB Awa‡ekb †kl Kiæb|

cÖwk¶K mnvqK DcKiY

ZvwiL:

cÖvK...wZK m¤ú‡`i mn-e¨e¯ 'vcbv I Rjvf,wg msiÿY welqK **cÖwkÿY** (miKvix I †emiKvix Kg©KZ©v‡`i Rb^{..})

AskMÖnYKvix‡`i bvg wbeÜbKiY QK

K¬vmUvi:

c^awk¶Y⁻'vb: mgq:

AskMÖnYKvixi bvg cÖwZôvb ‡gvevBj ⁻^v¶i c`we μwg b¤^i I B-K bs ‡gBj

Awa‡ekb cÖwk¶Y cwi‡ek m,,wó I ci®ú‡ii mv‡_ cwiPq

\mathbf{D} **; \mathbf{\ddot{I}k} : t** GB Awa‡ekb †k‡l-

- 1. cÖwk¶‡Y AskMÖnYKvix‡`i mv‡_ G‡K Ac‡ii cwiwPwZi my‡hvM cv‡eb| cvi⁻úwiK ‡hvMv‡hv‡Mi euvav,wj AwZµg K‡i cÖwk¶‡Y AskMÖn‡Y ⁻^v"Q>` Abyfe Ki‡eb;
- 2. m,,Rbkxj Dcv‡q cwiPq wewbg‡qi gva"‡g cÖwk¶Y Av‡jvPbvi †¶Î ^Zixi Rb" mnR m¤úK© ^Zwi Ki‡Z cvi‡eb;
- 3. GKwU RoZvgy³ fqfxwZnxb Avb>``vqK AskMÖnYg~jK wkLb cwi‡ek m,,wó n‡e;
- 4. AskMÖnYKvixiv wb‡Ri, †ckvMZ I KwgDwbwU m¤ú‡K© Zv‡`i avibv cÖ`vb Ki‡eb|

mgq t 15 wgwbU|

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- bvg, wVKvbv I ‡ckv;
- fvj jv‡M Ggb GKwU wel‡qi bvg Ges g>` jv‡M Ggb GKwU wel‡qi bvg;
- †RvovwfwEK Av‡jvPbvi Rb[¨] wZb wgwbU mgq w`b;

- mgq ‡k‡l cÖwk¶Y K¬v‡m c~‡e©i b¨vq em‡Z ejyb| AZtci cÖ‡Z¨K †Rvov‡KB G‡K G‡K mvg‡b G‡m wbR-wbR Z_¨,‡jv w`‡Z ejyb| D‡jøL¨, Gch©v‡q †Rvovi G‡K A‡b¨i Z_¨,‡jv mK‡ji D‡Ï‡k¨ ej‡eb| (cÖ‡Z¨K ‡Rvov G Rb¨ †`o wgwbU K‡i mgq cv‡eb);
- cwiPq cÖ`vbKvjxb cÖwk¶K/mn‡hvMx †bg Kv‡W© bvg wjL‡eb;
- cwiPq I Ab["]vb["] Z_" wewbg‡qi ci ejyyb, GLb ‡Kgb jvM‡Q?
- Zviv ⁻^vfvweKfv‡eB RoZvgy³ I A‡c¶vK,,Z fvj jvMvi cwi‡e‡ki K_v ej‡Z cv‡ib;
- cÖ[†]Z[¨]K[‡]KB Zvi wbR wbR [†]bg KvW©wU cÖ^vb Kiæb Ges hv[‡]Z mK[‡]jB [†]L[‡]Z cvq Ggb ⁻'v[‡]b AvUwK[‡]q ivL[‡]Z ejyb| Zviv hv[‡]Z cÖwk¶YKvjxb KvW© jvwM[‡]q iv[‡]L, [†]m e[¨]vcv[‡]i AvMvg Z[¨] w^{*}b|

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- $\begin{array}{l} \uparrow_{\pm}K & \uparrow Kvm \\ \bigcirc m^{\mu} wK \\ \bigcirc Z & wKQz & welq & \uparrow R^{\pm}b^{\pm}Qb \\ \bigcirc GB & \uparrow c \\ \bigcirc w\P^{\pm}Z \\ Avcbv^{\pm}iI & nq^{\pm}Zv & we^{\pm}kl & wKQz & welq \\ Rvbvi & AvM^{a}n \\ _vK^{\pm}Z & cv^{\pm}i \\ \hline \end{array}$
- AZtci cÖ‡Z¨K‡K wbR wbR cÖZ¨vkv ejvi my‡hvM w`b I †m,‡jv †ev‡W© wjLyb|

- Gevi †Kv‡m©i D‡Ïk¨ wd¬cPv‡U©/wcwcwc Gi gva¨‡g Dc⁻ 'vcbv Kiæb| cvkvcvwk Zv‡`i cÖZ¨vkvmg~n †Kv‡m©i D‡Ïk¨i mv‡_ mvgÄm¨c~b© wKbv wgwj‡q †`Lyb| GB wd¬cPvU©/wcwcwc‡Z hv _vK‡Z cv‡i-
 - cÖvK...wZK m¤ú‡`i mn-e¨e¯'vcbv I Rxe‰ewPΨ msiÿ‡Yi ,iæZit [^]elwqK I¯'vbxq Ae¯'vi Av‡jv‡K;
 - ‡UKmB j¨vÛ‡¯ <c mn-e¨e¯ 'vcbvt eb, Rjvf,wg I Kgy¨DwbwU;
 - evsjv‡`‡ki eb I Rjvf,wgi †kÖYxweb¨vm I cÖKvi‡f‡`i mswÿβ cwiwPwZ;
 - Rxe‰ewPÎ["], Rjvf,wg I cwi‡ek msiÿ‡Y eb, eb["]cÖvYx Ges cwi‡ek AvBb I aviv mg~n;
 - Db¥y³ Rjvk‡q grm["] m¤ú‡`i mn-e["]e⁻'vcbv;
 - my>`ie‡bi Rjvf,wgi mn-e¨e¯ 'vcbvt GKwU †Km ÷¨vwW;
 - grm["] m¤ú‡`i mn-e["]e⁻'vcbv I grm["] AvBb mg~n;
 - grm⁻ cÖwZ‡ek, Rxe‰ewPÎ⁻ I msiÿY;
 - evsjv‡`‡ki eb I Rjvf,wgi Dci Rjevqy cwieZ©‡bi cÖfve;
 - Rjevqy cwieZ©b cÖkgY I Awf‡hvR‡b eb I Rjvf,wgi j¨vÛ‡¯<‡c mne¨e¯'vcbv;
 - Rjvf,wg I e‡bi cwi‡ek evÜe cybtiæ×vit PzbwZ eb¨cÖvYx Afqvi‡Y¨i GKwU †Km ÷¨vwW;
 - RjR AfqvkÖgt evB°v we‡ji GKwU †Km ÷ vwW



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Awa‡ekb 2

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- 1. cÖvK...wZK m¤ú‡`i †kÖYxweb¨vm m¤ú‡K© Rvb‡Z cvi‡eb;
- 2. cÖvK...wZK m¤ú` e¨e¯'vcbv eY©bv Ki‡Z cvi‡eb;
- 3. mn-e⁻e⁻'vcbv I Gi cÖwµqv e⁻vL⁻v Ki‡Z cvi‡eb;
- 4. Rxe‰ewPÎ^{..} I msiÿY wel‡q aviYv cv‡eb|

mgq t 60 wgwbU|

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DcKiY t gvwëwgwWqv, wd¬cPvU© KvMR, wd¬cPvU© †evW©,

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- AskMÖnYKvix[†]i wbKU [†][‡]K cÖvK...wZK m¤ú[†]i mn-e[¨]e⁻'vcbv m¤ú[‡]K© Rvb[‡]Z Pvb;
- AskMÖnYKvix[†]i Av[‡]jvPbv[‡]K mgš^q mvab Kiæb Ges wb[‡]¤œewY©Z welqwU Zz[‡]j aiæb

Natural Resources: Definition and Classification

- **Natural resources** are naturally occurring substances that are considered valuable in their relatively unmodified **natural** form.
- A **commodity** is generally considered a natural resource when the primary activities associated with it are extraction and purification, as opposed to creation.
- Thus, **mining**, **petroleum extraction**, **fishing**, **hunting**, and **forestry** are generally considered natural-resource industries, while **Agriculture** is not.

Classification of Natural Resources

 Natural resources are mostly classified into Renewable and Non-renewable

Renewable Resources

Renewable resources are generally living resources (fish, reindeer,, coffee, and forests for example), which can re-stock (renew) themselves if they are not over-harvested but used sustainably.

Once renewable resources are consumed at a rate that exceeds their natural rate of replacement, the standing stock will diminish and eventually run out. The rate of sustainable use of a renewable resource is determined by the replacement rate and amount of standing stock of that particular resource. Non-living renewable natural resources include **soil** and **water**.

Non-renewable Resources

A non-renewable resource is a natural resource that exists in a fixed amount that cannot be remade, re-grown or regenerated as fast as it is consumed and used up.

Some non-renewable resources can be renewable but take an extremely long time to renew. Fossil fuels, for example, take millions of years to form and so are not practically considered 'renewable'.

Natural Resource Management

> Management of natural resources such as land, water, soil, plants and animals.



> Managing the way in which people and natural landscapes interact.

Sustainable development, a basis for sustainable global land management and

environmental governance to conserve and preserve natural resources.

> Environmental management



What is Co-management?

- Simply resources management by all concerned stakeholders.
- Process of management where government shares power with resource users, with each given specific rights and responsibilities relating to information and decisionmaking.
- Situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources.

Co-management or Collaborative management is "A situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources." (Borrini-Feyerbund, IUCN: 2000).

Where Co-management is required?

Forests and Fisheries resources, since resources are:

- common resources
- common property
- open access



Why Co-management?

- Decentralization of managerial power
- Participation of all stakeholders
- Ownership establishment
- Planning at local level
- Biodiversity conservation
- Increase of yield-Fish, Forest etc
- Livelihood development

Co-management process

A point of Departure	 Need Assessment Assess Available Resources Establish Start up team
Preparing for the Partnership	 Gather information and tools Identifying primary way Launching and maintaining social communication initiatives Contracting actors, facilitating appraisal exercises Helping actors for proper sharing Set Rules of Procedure
Negotiating the management agreements	 Agreeing negotiation rules and procedures Ritualizing agreed common vision Developing common vision of desired future Review socio-ecological situation and trends
	 Agree on strategy towards common vision Negotiate specific co-management plan and agreements Agreeing up CM organisations and institutionalize CM Legitimising and publicising Plans, agreements and organisations
Implementing and revising the agreements	 Applying and implementing the plans, agreements Clarify entitlements and responsibilities of actors Collecting information and data on results and process Identifying main factors impacting upon natural resource and stakeholders Organizing review meetings and evaluate, modify

plans and agreements as on when necessary

Bio-Diversity

- Variety and variability among living organisms and the ecological complexes in which they occur.
- The number of different items and their relative frequency.



Conservation

- Protection, preservation, management, or restoration of wildlife and natural resources.
- Sustainable maintenance of habitats which are threatened due to natural and/or human activities.
- Balance between Ecosystem and Environment



- It is a situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources.
- Protection, preservation, and careful management of natural resources and of the environment

In-situ and Ex-situ Conservation



Conservation can broadly be divided into two types:

In-situ: Conservation of habitats, species and ecosystems where they naturally occur. This is insitu conservation and the natural processes and interaction are conserved as well as the elements of biodiversity.

Ex-situ: The conservation of elements of biodiversity out of the context of their natural habitats is referred to as ex-situ conservation. Zoos, botanical gardens and seed banks are all example of ex-situ conservation.

Which areas to conserve?

Hotspots of Biodiversity

- Areas prioritized, most in need of conservation.
- Hotspot-used to define regions of high conservation priority combining high richness and high threat.

Threatened Species

- Over years many species have become extinct
- Extinction rate is on the increase
- Causing due to the influence of human activity.

IUCN Red List

• Taxa facing a high risk of global extinction are catalogued and brought in the List of Threatened Species

Threatened Habitats

- Forests/wetlands to simple changes in farming, housing practices and with other very destructive use of these natural resources.
- Causing changes on the overall surrounding habitat.
- Resulting other species under threat.
- Experiencing some species extinct.
- And some other becoming





endangered.

Flagship and Keystone Species

- For two reasons, conservation efforts focused on single species.
- 1. Species key to the functioning of a habitat and their loss would lead to greater than average change known as keystone species.
- 2. Humans will find the idea of conserving one species more appealing than conserving others.

Some endangered species reappeared in the catch after establishment of sanctuary in Bangladesh



Newly found Critically Endangered fishes after establishment of sanctuary in Bangladesh

- Bagha Air (*Bagarius bagarius*)
- Pangus (Pangasius pangasius)
- Sharputi (*Puntius sarana*)
- Vagna/Vangol Bata (Labeo boga)
- Ghora maach (*Labeo pangusia*)





Ramsar sites – designated under the Convention on Wetlands of international Importance.

Biosphere reserves - designated under the UNESCO Man and The biosphere Programme

Biogenetic reserves – designated under the Berne Convention

World Heritage sites – designated under the UNESCO Convention for the Protection of World Cultural and Natural Heritage.

European sites and candidate European sites – Includes Special Areas of Conservation (SAC's) - designated under the Habitats Directive. Special Protected Areas (SPA's) designated under the Wild Birds Directive.

European Diploma sites – designated by Council of Europe

Co-Management: Experiences in Bangladesh

- New Fisheries Management Policy

 'Jal jar-Jola tar'
 DoF initiative & National Fisherman's Assoc. involved
- CBFM-I, CBFM-II----DoF, DFID, ICLARM-WorldFish Center, NGO involved
- ▶ 4th Fisheries Project– DoF, World Bank, NGO involved
- MACH Project– DoF, USAID and NGO involved
- ▶ ECFC Project- DoF, UNDP, FAO and NGO
- ▶ IPAC Project—DoF, FD, USAID and NGO involved

Co-management: Global Perspective

- India: Joint Forest Management Plan, WB
- Nepal: Biodiversity Conservation Network Project (BCN), Humla District (Forest)
- Vietnam: Co-management in protected areas: the case of Cat Tien national park SouthernVietnam (Forest)
- Brazil: Ceara Reservoir Fisheries Project,
- Congo: Conkouati game reserve
- Indonesia: Marine Sasisen, a traditional fisheries management system in Central Maluku (Marine)
- Philippine: Co-management of renewable natural resource on a coastal zone, Palawan site (Forest and Fisheries)

Capture Fishery Management





‡UKmB j¨vÛ‡¯ <c mn-e¨e¯ 'vcbv

Sustainable Landscapes Co-management

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- 1. j[°]vÛ‡⁻ <c I †UKmB Dbœqb e[°]vL[°]v Ki‡Z cvi‡eb;
- mn-e[¨]e⁻ 'vcbvq weKí RxweKvqb Ges GjwWGd wel‡q eY©bv Ki‡Z cvi‡eb;
- mn-e¨e¯ 'vcbv msMV‡bi `ÿZv Dbœqb I Aby`vb cÖKí mg~‡ni djvdj m¤ú‡K© AeMZ n‡eb;

 cÖKí cÖ⁻ Ívebv [^]Zix, ev⁻ Íevqb I cwiexÿY cÖwµqv mg~n Rvb‡Z cvi‡eb|

mgq t 45 wgwbU|

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- AskMÖnYKvix^{*}₁ Kv^{*}₂Q Rvb^{*}₂Z Pvb j["]vÛ^{*}₁ «c ej^{*}₂Z Kx ey^{*}₂Sb Ges mne["]e⁻ vcbvq weKí RxweKvqb Ges GjwWGd Kx?
- Gici wb[‡]¤œewY©Z GjwWGd welqwU Zz[‡]j aiæb|

The Landscape

Landscape comprises the visible features of an area of <u>land</u>, including:

- the physical elements of landforms
- water bodies such as rivers, lakes and the sea
- living elements of <u>land</u> <u>cover</u> including indigenous <u>vegetation</u>
- human elements including different forms of land use, buildings and structures
- transitory elements such as lighting and weather conditions
- Combining both their physical origins and the cultural overlay of human presence, often created over millennia
- landscapes reflect the living synthesis of people and place vital to local and <u>national</u> <u>identity</u>
- Landscapes, their character and quality, help define the self image of a region, its sense of place that differentiates it from other regions





- It is the dynamic backdrop to people's lives
- 5-10 KM areas varies by PA

The Sustainability

- Sustainability is the capacity to endure. For humans, sustainability is the long-term maintenance of responsibility, which has environmental, economic, and social dimensions, and encompasses the concept of <u>stewardship</u>, the responsible management of <u>resource use</u>.
- In <u>ecology</u>, sustainability describes how biological systems remain <u>diverse</u> and productive over time, a necessary precondition for the well-being of humans and other <u>organisms</u>. Long-lived and healthy <u>wetlands</u> and <u>forests</u> are examples of sustainable biological systems.

Sustainability and Economy

- Human sustainability interfaces with economics through the voluntary trade consequences of economic activity. Moving towards sustainability is also a social challenge that entails, among other factors, <u>international</u> and national <u>law</u>, <u>urban</u> <u>planning</u> and <u>transport</u>, local and individual <u>lifestyles</u> and <u>ethical consumerism</u>.
- Ways of living more sustainably can take many forms from controlling living conditions (e.g., eco villages, eco-municipalities and sustainable cities), to reappraising work practices (e.g., using permaculture, green building, sustainable agriculture), or developing new technologies that reduce the consumption of resources.

Sustainability and Poverty

- A major hurdle to achieve sustainability is the alleviation of poverty. It has been widely acknowledged that poverty is one source of environmental degradation.
- It is therefore futile to attempt to deal with environmental problems without a broader perspective that encompasses the factors underlying world poverty and international inequality." Individuals living in

poverty tend to rely heavily on their local ecosystem as a source for basic



needs (such as nutrition and medicine) and general well-being.



Sustainable Development:

- Sustainable development is a pattern of economic growth in which <u>resource</u> use aims to meet human needs while preserving the <u>environment</u> so that these needs can be met not only in the present, but also for generations to come
- The environmental <u>sustainability</u> problem has proven difficult to solve. The modern <u>environmental movement</u> has attempted to solve the problem in a large variety of ways. But little progress has been made, as shown by severe <u>ecological</u> <u>footprint</u> overshoot and lack of sufficient progress on the <u>climate change</u> problem.

Forward to Sustainability

- The level of sustainability focuses on the small environmental actions that when calculated collectively result in a large environmental impact. It centers on individual efforts, <u>behavior modification</u> and creating attitudinal changes, which result in an environmentally conscious individual or community.
- Also, it encourages sustainable changes through change agents, which are individuals that are encouraged; and therefore, foster positive environmental action inside their

own <u>sphere of influence</u>. Examples include <u>recycling</u>, efficient use of energy, reducing usage through conservation, modifying habits or patterns to reduce waste and consumption.

IPAC Approach to sustainable PA Conservation

Grants: a responsive tool

IPAC's LDF and other leveraged grants contribute to long-term sustainability through building sustained institutional capacity of Co-Management Organizations while providing demonstrable economic benefits to PA dependent communities



Alternative Livelihoods for Co-management

- Livelihoods improvement is a must and it is closely inter-linked to conservation of the Protected Areas (PA)
- In support of that, alternative income generation of PA dependent people is very much needed
- Also, to make the Co-management approach successful, local community could be the trusted partners of both CMO and FD

LDF and its support

- LDF is Landscape Development Fund Program
- This is implemented at the PA attached/surrounding areas (Landscape)
- LDF support alternative income generating activities while addressing the Improved biodiversity conservation and Climate Change adaptation and mitigation process

CMO capacity development

Through the LDF Program CMO develops and strengthen its capacity in the following areas:

- Project Proposal development
- Project Implementation and Monitoring
- Organizational and Financial Management
- Grants management and GoB compliances

• In future, this CMO will develop PP to seek fund from other Donors, and implement grants for its community, so it will be a continuous process

Grants project's Outcome

- Economic benefits & Improve livelihoods
- PA dependency reduction
- Adaptive capacity to cope with GCC vulnerability
- Empowerment through capacity development
- Active participation in Biodiversity conservation
- Sustainability

Grants Project by CMOs

- LDF is a USAID small Grants Program
- IPAC use the LDF as a tool for the capacity building of CMO
- LDF is granted to Co-Management Organization (CMO)
- Fund directly be sending to CMO's Bank A/C\
- Project is managed by the CMOs

Technical Approach of Grants

Expected to:

- Emphasize community based alternative income generating activities that focus on livelihood improvement and reduces their dependency on the protected area, and build up conservation mentality
- Address the Global Climate Change adaptation and/or mitigation process
- Focus potential advantages for Women and Youth and CPGs
- Concentrate sustainable and tangible impacts





Alternative earnings make them forest protectors

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from Cox's Basear	for livelihood are now con-		markets.
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Budget and Period

- Project Period should be maximum 1 (one) year
- Budget is limited as BDT 3 to 14 Lac excluding CMO/ Community's contribution (cost sharing)
- Project direct associated cost
- Administrative costs (maximum 5% of total cost, including audit cost)
- Cost Sharing (minimum 10% of total cost should be provided as CMC and/or community contribution)

PP Review Process

Grants Team:

- Develops Checklist for PP Review
- Reviews LDF First Stage Application
- Prepares Synopsis of each PP, Summary
- Develops and present PPs (pp presentation)
- Form Grant Review Committee (GRC) involving Govt. Project Directors
- Invite, arrange and conduct GRC meeting
- GRC members review LDF PPs at the Second Stage
- Prepare Meeting Minutes

PP Approval Process

Grants Team:

- Compiles all documents including PPs, reviews, supporting documents
- Sends (including a forwarding letter signed by IPAC COP) for approval to USAID and
- USAID may ask additional queries to meet up
- USAID can Approve or disapprove PPs (any or all) and
- Grant Award letter to CMOs from IPAC COP
- Contractual Agreement between IPAC and CMO

Implementation

- Prepare and submit Fund Requisitions
- Finalization of Beneficiaries, and Agreements with them
- Procurement of input materials/services
- Orientation/Skill building
- Distribution among beneficiaries; no cash
- Harvesting/Production (making)/Business
 will be continuing





Monitoring:

- Periodical and/or ongoing site visits to see the progress of harvesting/business/production
- Prepare and submit Progress & Financial Reports
- Internal/External Audit/Evaluation may necessary
- Grants Closeout Financial Review

Regular update sharing on project progress with IPAC, FD, DOF, DOE, USAID and/or other Stakeholders.

R1 LDF Projects

PA	UPZ/District	CMOs	Approved Grants
			BDT
Khadimnagar NP	Sylhet	Khadimnagar CMC	393,782
Medhakachapia NP	Cox's Bazar	Medhakachapia CMC	452,900
Fasiakhali WS	Cox's Bazar	Fashiakhali CMC	560,200
Himchari NP	Cox's Bazar	Himchari CMC	687,000
Sundarbans East WS	Bagherhat	Sarankhola CMC	900,000
Do	Bagherhat	Chandpai CMC	803,000
Kaptai NP	Rangamati	Karnafully CMC	300,430

Do	Rangamati	Kaptai CMC	468,130
Total		8 CMOs	4,565,442

R2 LDF Projects

PA	UPZ/ District	CMOs	Requested Grants
Tanguar Haor ECA	Tahirpur, Sunamgonj	Tanguar Haor CCC	477,805
Hakaluki Hair ECA	Fenchugonj, Sylhet	Akota ECA BBSS	492,765
Teknaf WS	Teknaf, Cox's Bazar	Teknaf CMC	498,500
Teknaf WS	Teknaf, Cox's Bazar	Shilkhali CMC	499,800
Teknaf WS	Teknaf, Cox's Bazar	Whykong CMC	498,800
Madhupur NP	Modhupur, Tangail	Dokhola CMC	499,150
Madhupur NP	Modhupur, Tangail	Rasulpur CMC	499,400
Kangsha Malijhee RB	Sherpur Sadar, Sherpur	Aura Baura RMO	500,000
DDWS	Rangunia, Chittagong	Dudpukuria CMC	499,980
Total		9 CMOs	4,466,200

Leverage Funding

Arannayk Foundation: Each Project is Tk.1 Million

- Lawachara CMC of Lawachara NP
- Satchari CMC of Satchari NP
- Rema Kalenga CMC of Rema Kalenga WS

GIZ: Chunoti CMC: Tk.1,215,000

UNDP Equator Prize 2012: Chunoti CMC won from Bangladesh and will receive \$5,000 USD

Funding in Pipeline

• With technical support of IPAC Grants Team, 15 Project Proposals of each Tk.1,100,000 have been submitted to Arannayk Foundation that are under review process

- Southeast: Himchari, Medhakachapia, Fasiakhali, Jaldi
- Chittagong/CHT: Kaptai, Karnafuly
- Sundarbans: Sharankhola, Chandpai, Burigoalini, Dacope-Koyra
- Central: Dokhola, Rasulpur
- Sylhet: Khadimnagar, Rema Kalenga, Tanguar Haor
- Also, Dhopachari CMC under DDWS with IPAC LDF R3

Continued Technical Efforts

- Facilitated 5 cluster-based Grants and Financial Management Training where CMO's Office Bearers and Accounts persons attended.
- Developed and published Organizational Profile for all CMOs
- Developed and distributed Policy Manual on Financial, Procurement, Administrative, and HR Management for CMOs
- A Training Module on Grants and Financial Management for CMOs is under development



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Classification, Types and Profiles of Forests & Wetlands

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Country Profile

Situation	: Between 200 34' and 260
	38' North Latitude and 880
	01' and 920 41' East
	Longitude.
Area	: 1,47,570 Sq. Km.
Population	: 149 Million
Density	: 1229 per Sq./Km
Physiography	: 12%Tartiary Hills, 8%
	Plistecene and 80% Plain
	Land Alluvium.
Temperature	: 7.22-12.79°C to
	23.88-31.11°C (Winter)
	36.66°C to 40.50°C (Summer).
Rainfall	: 1229 to 4338mm (WARPO, 2000).



Bangladesh Forestry at A Glance

- About 17.07% Forestland, including 1.78% Protected Area of the country's area;
- GDP contribution from Forestry Sector is 2.1%;
- Per capita forestland is 0.02 ha.;
- Major Forest types:
- Hill forests,
- Sal forests,
- Mangrove forests and
- Village forests

Forest Land of Bangladesh



Forest types	Area (m. ha.)	% with respect to country's area
FD managed Forest	1.52	10.300%
Un-classed State Forest	0.73	4.947%
Homestead Forest	0.27	1.830%
------------------	------	---------
Total	2.52	17.077%



Forest Department Managed Forest Land

Forest Types	Area (m. ha.)	% with respect to country's area
Hill Forest	0.67	4.540%
Natural Mangrove Forest	0.60	4.066%
Mangrove Plantation	0.13	0.881%
Sal Forest	0.12	0.813%
Total	1.52	10.300%

Of the total forest area, 84% has been classified as natural forest and 16% as plantation forest (NFA 2005-2007).

Tree Cover of Bangladesh

SL.	Tree Cover Type	Area (Million Ha)
1	No Tree Cover (Agri & Water Body)	7.60
2	Less than 5% Tree Cover	2.89
3	5 to 10% Tree Cover	1.43
4	10 - 30% Tree Cover	1.27
5	30 – 70% Tree Cover	1.23
6	Over 70% Tree Cover	0.33
	Total	14.75

Forest Area (legal type)

SL	Type of Land under Forest	Area (in Hectares)
1	Reserved Forests	1222691.441
2	Notified under section 4 and/or 6 of Forest Act 1927	589947.96
3	Protected Forests	36996.71
4	Acquired Forests	8445.21
5	Vested Forests	3842.9

6

Un-classed State Forests under the management of FD



Land use classes area of major national LUCs (1000 ha)



[Source: NFA 2005-2007]

Forests of Bangladesh

Ecologically five major types of forests in Bangladesh are as under:

- **Tropical wet evergreen forests:** The hill forests of Sylhet and some part of Chittagong and Chittagong hill tracts belong to this forest. *Artocarpus chaplasha, Syzygium spp, Hopea odorata* and *Dipterocarpus spp.*
- **Tropical semi ever green forests:** most of the hill forests of Chittagong, Cox's Bazar and Chittagong hill tract. *Dipterocarpus spp, Swintonia floribunda, Albizzia spp.*
- **Tropical moist deciduous forests:** The Sal forest in greater districts of Dhaka, Mymensingh, Dinajpur etc. major species are *Shorea robusta*
- Fresh water wetland forests: Haor basin and wetland comprise this forest. *Barringtonia acutangula, Pongamia pinnata* are prime species.
- **Mangrove forests:** All coastal tidal forest and Sundarbans belong this forest. *Heritiera fomes, Sonneratia apetala, Excoecaria agallocha, Ceriops decandra* are major species.

Plantations Under Development & Revenue Budget

Type of Plantation	Year of Plantation		
	1996- 2010 Development	2002-2010 Revenue	2010-2011 Target
Block (ha)	116967.62	29460.24	10950.00

Strip (Km)	38670.70	2005.23	5782.00
Seedling (million no.)	110.90	0.76	3.30

14 investment projects, 2 TA projects and 11 Programmes are implementing during current 2010-2011 fiscal year.

Status of Biodiversity in Bangladesh

a) Ecosystem Diversity

- Forest Ecosystem
- Wetlands Ecosystem
- Coastal & Marine Ecosystem
- Homestead Ecosystem
- Agro Ecosystem
- b) Species Diversity
- c) Genetic Diversity

Floral & Faunal Biodiversity in Bangladesh

Fauna	Recorded sp.	Flora	Recorded sp.
Mammals	125	Angiosperms	3,000
Birds	778	Gymnosperms	5
Reptiles	136	Pteridophytes	200
Amphibians	23	Bryophytes	290
Fish	735	Algae	3,600
Invertebrates	2,672		

Threatened Species of Bangladesh

According to IUCN Bangladesh, 2000

Fauna:

- Mammals (43)
- Birds (47)

- Amphibians (8)
- Reptiles (63)
- Fishes (58)

Flora: CR (1), EN (1), VU (2), LR (3), DD (25)

Threats to Biodiversity in Bangladesh

(a) The Direct Threats of biodiversity loss:

- Change of land use (High population growth and natural resource consumption
- Fragmentation and loss of habitat
- Change in hydrological regime
- Pollution
- Uncontrolled tourism
- Unsustainable agricultural practices
- Invasive alien species
- Climate change

(b) The Indirect Threats of Biodiversity loss:

- Economic systems and policies
- Lack of knowledge and awareness
- Legal and institutional systems that promote unsustainable exploitation

Trends of Changes in Forest Ecosystems Diversity in Bangladesh

Forest cover loss in the country has not been comprehensively studied until now and the quantification of this loss is largely assessed by periodic visual observations. However, some scientific endeavour on this regards have also took place, such examples are shown here in Figure.





Forests Trends

- Wood production from Govt. forest is declining.
- Country's major wood supply comes from the homesteads.
- The homesteads tree resources are increasing at the rate of 2.62 Million Cu. M. per year at present. In future this rate of increase may not continue since the homestead size will shrink with the increase of population.
- Wood import is increasing.
- Forest cover loss has been 0.3 percent annually during 2000-2005 (FAO, 2005).
- Forest habitats are fragmented and scattered.
- No study has been carried out so far enumerating fragmentation index.

Causes of Deforestation

- Human pressure
- Deposition of coarse sand
- Salinity intrusion
- Jhum cultivation
- Monoculture
- Land use change
- Illegal encroachment
- Land use conflicts
- Land demand is increasing day by day for housing , construction of government complexes in Thanas(sub-district), industries, brick fields, roads and highways, flood protection embankments, defense installations, and educational institutions.

Description of Forests

Hill Forests

- Hill Forests represents Tropical Wet Evergreen Forest and Tropical Semi-Evergreen Forests and rich in diverse of flora and fauna.
- Spread over the hilly areas of Chittagong, Cox's Bazar, Sylhet and Chittagong Hill Tracts.
- Total Area of Hill Forests is 6,70,000 hectares, which is 4.65% of country's area and 44% of total forest land .
- Plantations have been in continuation in this forest area since 1871.



Sal Forests

- Sal (Shorea robusta) Forests cover Central & Northern part and are scattered and intricately mixed with habitations. It is classified as Tropical Moist Deciduous Forest.
- Sal Forest area is 1,20,000 hectares, which is 0.83% of country's area and 7.9% of forest land managed by the Forest Department



• A massive plantation program under Social Forestry program is in progress on the basis of benefit sharing mechanism.

Natural Mangroves: Sundarbans

- Unique largest tract of mangrove forests.
- Total area is 6,01,700 hectares; (4.16% of the Country).
- Flora -334 species and Fauna -269 species
- Composed of three wildlife sanctuaries comprising 1,39,700 hectares.
- Sundri *(Heritiera fomes),* the most common species occupies 73% of Sundarban.



• Flagship Species: Royal Bengal Tiger

Mangrove Plantations

Since 1960-61, Bangladesh Forest Department has developed 0.153 million ha. mangrove plantations along 610 km coastal frontier through indigenous technology.





Mangrove Plantations



Village Forests

The tree cover in village forest is 2,70,000 hectares.

A reasonable portion of the total demand of forest produces is being met from homestead forest.

According to the 1981 inventory report the village woodlots have a growing stock of 54.7 million cubic meters. Gross volume has increased from 4.5 cum/ha to 10.5 cum/ha in 2007.

Wood Volume Per Hectare Stratum Wise



Stratum wise Comparison of Wood Volume per ha. in Village Forests (1981 & 2006)

Silvicultural system

- **Hill Forest:** Clear felling system followed by Artificial Regeneration was followed before 1989.Since then moratorium has been imposed in natural forest felling. But in case of older plantation, clear felling is allowed. However, felling program is only practiced where the partcipatory reforestation is allowed.
- Sal Forest: During the zaminder period there was no organized management aproach system. When this forest came under the controll of forest deptt, coppice with standard had been followed.. However, no felling is allowed in sal forest.
- **Mangrove Forest:** In the sunderban mangrove forest, Selection System had been widely practiced, untill 1989.In this system minimum different girth class for different species was fixed.

Institutional Arrangements for Forest Management

Ministry of Environment and Forests: policy making, legal framework, and monitoring.

- Forest Department: afforestation, reforestation, forest protection, forest extension, yield regulation, wildlife conservation etc.
- Bangladesh Forest Research Institute: research and education.

Past Forest Management

- Scientific forest management in this sub-continent was started during British rule by the appointment of Sir Dr. Brandies as the IGF in 1865.
- A separate forest department was created for Bengal in 1876.
- Those days, forests were managed primarily for revenue collection under the control of Revenue Department.
- Only valuable trees were extracted from the forest to get more revenue.

Past Management Objectives

- 1. To manage the forest on a sustained yield basis.
- 2. To ensure the supply of forest products

- 3. To convert the stand into normal forest
- 4. To make the forest productive, planting with comercially valuable species replacing less important spp.
- 5. To improve the forest habitat for wildlife.

Keeping in mind the above objectives, a forest management plan or work plan is written for each forest division.

Past Management System

a. Hill forests

Forests of Chittagong, Cox's Bazar and Chittagong Hill Tracts

Conversion of natural forest to plantations of high yielding exotic species after clear felling.

In Sylhet, the first management plan (Das, 1938) prescribed a selection-cum-improvement system.

Trees above a certain diameter were removed followed by felling of dead, dying and suppressed trees on a 20 year cycle.

The management of bamboo forests has been followed by 4-year cutting cycle.



Carian faracte of Cav's Razaar

b. Sal Forests

- The management of plain land sal forests of Dhaka, Mymensingh and Dinajpur was originally in the hand of a number of landlords.
- General practice in those days was to lease out forests in big chunks, often mouza by mouza for 5 years and the lessee was allowed to cut all trees over one foot six inches in girth at 3 feet from the ground.
- These forests have been worked under clear felling system with either coppice or artificial regeneration.

c. Mangrove Forests (Sundarban forest)

- Managed on a selection system.
- Exploitable size of the trees is determined on the basis of dbh.
- The system is now known as selection-cum-improvement, as in addition to felling of trees above a certain exploitable diameter.
- Improvement felling are done for the removal of diseased dead, suppressed tree together with removal of some healthy trees for removing any congestion is carried out.



Sundarban forests

Sustainable Forest Management

- Forest management is being practiced in this country for over 100 years.
- Till recent time the basic concept of forest management was to get sustained yield i.e. almost equal quantum of harvest every year.
- For the purpose of sustained yield it is important to sustain the growing stock at a given level, preferably at least (if not enhanced) at the level when the first management plan was prepared.

Present Forest Management

Present forest management is primarily guided by Forestry Master Plan (FMP) completed in 1993.

The objectives of present forest management are-

- i) Enhancing environment preservation and conservation
- ii) Introducing rational forest land use
- iii) Increasing public participation and benefit from the forest
- iv) Creating forests on marginal and private lands
- v) Institutional restructuring and strengthening
- vi) Improving management practices
- vii) Improving efficient resource utilization.

New Approaches in Forest Management

The present management systems are evolved from the past ones through various modifications.

Some new forest management systems are also added to address new concept in forest management such as-

- agro-forestry, woodlot plantation in RF, PF, AF, VF
- homestead plantation
- strip plantation in roads & embankments
- participatory forestry on encroached forest
- mangrove afforestation on newly accreted coastal land
- Protected area management to preserve wildlife habitat and biodiversity

Biodiversity Restoration initiatives

- Six new Protected Area (PA) declared in 2011 and 2012.
- PA increased to 1.78% from 1.66% of country area.
- Integrated Protected Area Co-management project is now under implementation in 18 PAs during 2008-2013.
- Different Projects are under implementation process of which SEALS Project, Modhupur Re-vegetation Project, Core Zone plantation in Central Circle, Greater Rajshahi & Kustia Biodiversity Project, & Greater Jessore Biodiversity Project are Remarkable.
- 9 Eco-Parks has been established in different ecological zones.
- World Bio-diversity Day is observed every year on 22 May

Key Driving Forces for New Approach

- Population Boom
- Land Hunger
- Lower Priority to Forestry Sector
- Very High Demand of Timber
- Poverty and Socio-Economics
- Lack of Awareness
- Fund Availability
- Management Efficiency of FD

Protected Areas of Bangladesh:



- 34 notified PAs, as NP & WS
- Area 2,70,478.88 ha approx.
- Covering 10.72% of Total Forest Area
- Biologically rich and form important catchments.
- Have important socio-economic value supports livelihood of surrounding communities including Ethnic people

List of Protected Areas

SI	GOB Declared PAs in Bangladesh	Area (ha)	Notification dates
	National Parks		

1	Himchari National Park, Cox's Bazar	1,729.00	15-Feb-80
2	Bhawal National Park, Gazipur	5,022.27	11-May-82
3	Modhupur National Park, Tangail	8,436.13	24-Feb-82
4	Lawachara National Park, Moulovibazar	1,250.00	7-Jul-96
5	Kaptai National Park, Rangamati	5,464.78	9-Sep-99
6	Nijhum Dweep National Park, Noakhali	16,352.23	8-Apr-01
7	Ramsagar National Park, Dinajpur	27.75	30-Apr-01
8	Medhakachapia National Park, Cox's Bazar	395.92	4-Apr-04
9	Satchari National Park, Hobiganj	242.91	15-Oct-05
10	Khadimnagar National Park, Sylhet	678.80	13-Apr-06
11	Baryardhala National Park, Chittagong	2,933.61	6-Apr-10
12	Kadigarh National Park, Mymensingh	344.13	24-Oct-10
13	Singra National Park, Dinajpur	305.69	24-Oct-10
14	Nabab Gonj National Park, Dinajpur	517.61	24-Oct-10
15	Kuakata National Park, Patuakhali	1,613.00	24-Oct-10
16	Alta Dighi National Park, Naogaon	264.12	24-Dec-11
17	Birgonj National Park, Dinajpur	168.56	24-Dec-11
	Wildlife Sanctuaries		
18	Char Kukri-Mukri Wildlife Sanctuary, Bhola	40.00	19-Dec-81
19	Rema-Kalenga Wildlife Sanctuary, Hobiganj	1,795.55	7-Jul-96
20	Pablakhali Wildlife Snactuary, Rangamati	42,087.00	20-Sep-83
21	Chunati Wildlife Sanctuary, Chittagong	7,763.97	18-Mar-96
22	Teknaf Wildlife Sanctuary, Cox's Bazar	11,614.57	24-Mar-10
23	Sundarbans East WS, Bagerhat	31,226.94	6-Apr-96
24	Sundarbans West WS, Satkhira	71,502.10	6-Apr-96
25	Sundarbans South WS, Khulna	36,970.46	6-Apr-96
26	Fasiakhali Wildlife Sanctuary, Cox's Bazar	1,302.43	11-Apr-07

27	Hazarikhil Wildlife Sanctuary, Chittagong	1,177.53	6-Apr-10
28	Dudpukuria Dhopachari WS, Chittagong	4,716.57	6-Apr-10
29	Sangu Wildlife Sanctuary, Bandarban	2,331.98	6-Apr-10
30	Tangragiri Wildlife Sanctuary, Patuakhali	4,048.58	24-Oct-10
31	Dudhmukhi Wildlife Sanctuary, Bagerhat	170.00	29-Jan-12
32	Chandpai Wildlife Sanctuary, Bagerhat	560.00	29-Jan-12
33	Dhangmari Wildlife Sanctuary, Bagerhat	340.00	29-Jan-12
34	Sonarchar Wildlife Sanctuary, Patuakhali	2026.48	24-Dec-11
	Total PA area	270,478.88	

Eco-park, Safari Park and Botanical Garden in Bangladesh

SI	Name	Name of District	Year of establishment	Area (ha)
1.	Banskhali Eco-Park	Chittaging	2003	1200
2.	Madhob-Kunda Eco-Park	Maulovi Bazar	2001	266
3.	Kua-Kata Eco-Park	Patuakhali	2006	5661
4	Botanical Garden and Eco-Park, Sitakunda, Chittagong	Chittakunda	1998	808
5.	Madhutilah Eco-Park	Sherpur	1999	100
6.	Tilahgarh Eco-Park	Sylhet	2006	46
7.	Borshizora Eco-Park	Moulovibazar	2006	325
8.	Dhanshiri Eco-Park	Jhalokathi	proposed	20
9.	Dulahazra Safari Park	Cox's Bazar	1999	900
10.	National Botanic Garden, Dhaka	Dhaka	1961	84

Policy, Governance and Institutional Framework

Some of the existing policy, governance and related issues are discussed hereunder.

- Forestry Research
- Bangladesh Forest Research Institute (BFRI), Chittagong is the only forestry research organization in Bangladesh.

- Existing policy and legislative framework are as follows:
- Four Forest Policies have been declared for this part of the world since 1894.
- Forest Policy 1894
- Forest Policy 1955
- Forest Policy 1979
- Forest Policy 1994

The following National Policies also have direct or indirect impact on the Forestry Sector of Bangladesh.

- The National Environment Policy, 1992. (NEP)
- Coastal Zone Policy, 2005
- The Wetland Policy (Draft)
- National Environnent Management Action Plan 1992
- National Biodiversity Strategy and Action Plan (NBSAP)
- National Land use Policy
- National Water Policy
- Bangladesh Climate Change and Action Plan 2009

Salient Feature of 1994 FP:

- Current Forest Management is based on FP 1994 which includes mainly-
- To bring about 20% of the country's land(including Char land, USF, private land) under the afforestation programs by year 2015.
- NGOs participation in SF programme.
- Expansion of Social Forestry in forest land, khas land, Char land, private land, marginal land, roads & embankments etc.
- Private initiatives will be encouraged to implement programs of tree plantation and afforestation on fallow and hinterland, the bank of the pond and homestead land, which are under private ownership.
- Attempts will be made to increase the amount of this protected area by 10% of the reserved forest land by the year 2015.
- Multiple use of forest, water and fish of Sundarbans through sustained management will be ensured .
- State-owned reserved forest cannot be used for non-forestry purposes
- Laws, rules and regulations relating to the forestry sector will be amended and if necessary

Amendment (at 13 Jan 2010) in SF Rules 2004

• Provision of community investment in forest land, Khas land & Land of govt. autonomous body for SF purposes.

- Procedure of participants selection to engage community people for SF invested by them.
- Procedure of cancellation of such programme.
- Preference of indigenous people in SF scheme.
- New PBSA for community investment.

Proposed Amendment in WL act 1974

- CITES species of flora and fauna are incorporated
- Declaration and mgt. of CCA, PA included
- According to CBD Co-mgt, CCA, Rights of indigenous people are recognised
- Provision of compensation for human killing & injury, damage of dwelling houses, loss of agriculture etc. by WL.
- More punishment prescribed
- Conservation of Bio-diversity is emphasized.

Expected Amendment in Forest Act 1927

- To be Changed Preamble & included conservation
- Declaration of RF procedure should be more simplified but people oriented and time bound
- More punishment for offences
- People oriented mgt. prescription
- More definitions may be included for clear clarification Like- CCA, PA, Co-mgt., Perishable Forest Products etc.
- Forest mgt. & plantation system in the USF
- Some sections for coastal forest protection & mgt.

Proposed Protected Area (PA) Rules

- All PA would be managed in collaborative mgt. system
- Duties & Responsibilities of co-mgt council; co-mgt. committee; peoples forum & other stakeholders identified
- PBSA described
- AIG activities

Problems in Forestry Sector

- Fund crisis
- Poor institutional capacity
- Mismatch of FD with general administrative setup
- Land litigations
- Image crisis
- Under valuation of forestry sector in GDP

- Integration at policy level
- Monitoring and accountability

Conclusion and Recommendation

- Strengthening of FD is a must.
- Though some changes are being noticed in recent years; the activities of FD personnel, still centre around the *Reserved Forest*.

The following specific actions may help the situation:

- Drastic institutional reorganization
- Major improvement of FD's financial management
- Capacity building of the FD personnel
- Strengthen FD's management information system
- Introduce a very intensive and meaningful monitoring and evaluation system
- Undertake social forestry and co-management approach
- Private investment for forest production in Govt. forestland
- Enhancement of governance, accountability and transparency
- Enhancement in the allocation of funds to FD

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Types and Profiles of Wetlands in Bangladesh

Wetlands are invaluable components of the environment, ecology, resource potential and biodiversity in Bangladesh. They are integral part of the local ecosystem based cultures. About half of the area of the country can be considered as wetlands. These consist of wide variety of types ranging from lakes, rivers and coastal forest to deepwater paddy fields and ponds. All these wetlands form a unique mosaic of habitats with extremely rich diversity of flora and fauna, much of it as yet biologically undiscovered. The wetlands also support the livelihood of millions of people from such diverse activities as fishing to collecting honey and materials for thatching and fuel wood.

Definition of Wetland

IUCN at the convention on wetlands of international importance especially as Waterfowl habitat better known as Ramsar convention adopted the following definition of wetlands .In the text of the Convention (Article 1.1), wetlands are defined as: "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is

static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres"

The Ramsar Convention identifies a grand total of 42 different types of wetlands. It splits these into 3 broad categories: marine and coastal wetlands; inland wetlands; and manmade wetlands.

Categories of Wetlands

Wetlands in Bangladesh can be divided into six major divisions. Such as

- a) The Ganges-Brahmaputra-Meghna floodplain basins and
- b) The haor basin of north-east region,
- c) Lower Punarbhaba floodplain,
- d) Gopalganj-Khulna beels,
- e) Chalan beel, and
- f) Surma-Kushiyara flood plain

Different types of Wetlands in Bangladesh

Bangladesh possesses enormous wetland areas, and indeed during the rainy season, about half of the country could be classified as wetland. The principal wetlands are rivers and streams, shallow freshwater lakes and marshes (haors, baors and beels), water storage reservoirs, fishponds, seasonally flooded cultivated plains, and estuarine systems with extensive mangrove swamps. The numerous permanent and seasonal freshwater lakes and marshes of the flood plains are known as haors, baors and beels.

Haor A haor is a bowl-shaped depression between the natural levees of a river, or a succession of such depressions. Haors are flooded every year by the monsoon floods, and most retain some water throughout the dry season. Most are found in eastern Mymensingh and Sylhet, in a region known as the Haor Basin.

Baor A baor is an oxbow lake or other wetland formed in a dead arm of a river. Baors range in size from about 50 ha to 1,300 ha, and most retain water throughout the year. All are situated in the moribund delta of the Ganges in Kushtia, Jessore and Faridpur.

Beels Beels are usually saucer-like depressions which generally retain water throughout the year. Most become overgrown with marsh vegetation during the dry season, but a few dry out completely. There are over a thousand beels in the country, the greatest concentrations being in the main delta region (Rajshahi, Pabna, Kushtia, Jessore, Faridpur, Comilla and Noakhali) and in the Haor Basin (eastern Mymensingh and Syihet). There are very few beels in the Chittagong region, and most of these contain water only in the rainy season. There are, however, extensive

grass and reed marshes along many of the rivers in the Chittagong Hill Tracts, particularly along the lower course of the Sajjak river.

Lake A lake is a body of relatively still fresh or salt water of considerable size, localized in a <u>basin</u>, that is surrounded by land apart from a river, stream, or other form of moving water that serves to feed or drain the lake. Lakes are inland and not part of the <u>ocean</u> and are larger and deeper than <u>ponds</u>. Lakes can be contrasted with <u>rivers</u> or <u>streams</u>, which are usually flowing. However most lakes are fed and drained by rivers and streams. The true lakes in the country: Rainkhyongkine and Bogakine in the Chittagong Hill Tracts. The only large artificial lake is Kaptai Reservoir, a hydro-electric dam which was completed in 1963 and has since flooded over 76,600 ha of forested valleys and cultivated land in the Chittagong Hill Tracts. Other artificial water bodies include many thousands of small tanks and fish ponds scattered throughout the country, and large areas of shrimp ponds, particularly in the Chittagong and Khulna regions.

Area of Wetlands

The total area of wetlands in Bangladesh has been variously estimated at between seven and eight million hectares, i.e. about 50% of the total land surface. This includes at least 480,000 ha of permanent rivers and streams, 610,000 ha of estuaries and mangrove swamps, between 120,000 and 290,000 ha of haors, baors and beels, over 90,000 ha of large water storage reservoirs, 150,000-180,000 ha of small tanks and fish ponds, 90,000-115,000 ha of shrimp ponds, and some 5,770,000 ha of land which is seasonally inundated to a depth of 30 cm or more.

Environment of Wetlands

Compared with other major natural forms of landscape, a wetland is young, dynamic and physically unstable. Variously called *jalah*, *doloni*, *pitoni*, *doba*, *hola* or *gadeng*, it can change in a season or even in a single storm, as conditions range from virtually perennial aquatic lowlands to seasonally dry uplands. It changes with the <u>vegetation</u>, <u>sedimentation</u>, or <u>geological</u> <u>subsidence</u>. The key to vegetation development and community dynamics here is <u>hydroperiod</u>, affected by topography, flooding and flood type, precipitation, and water table fluctuations.

Due to continuous submergence, wetland habitat is characterized by <u>anaerobic</u> conditions which inhibits normal plant growth apart from a group of plants known as <u>hydrophytes</u> are adapted to withstand these conditions. The Haor Basin is the only region in Bangladesh where remnant patches of freshwater <u>swamps</u> and reed lands still exists. Once extensive forests of Hijal in the area used to provide an important source of firewood, but these forests are now almost completely destroyed. In recent times, various herbs and aquatic plants are being collected for use as fuel. On top of that, aquatic plants are also being collected for use as fertilizers. Only a few patches remain of the swamp forests that once dominated the area, featuring flood tolerant trees like Hijal (<u>Barringtonia acutangula</u>) and Koroch (<u>Ponogamia pinnata</u>).The Hijal or Hual, Korij or Koroch, Bhui Dumur (<u>Ficus heterophyllus</u>), Nol (<u>Arundo</u>)

donax), Khagra (*Pharagmites karka*), Ban Golap (*Rosa involucratia*) and Barun (*Crataeva nurvala*) are the main plant species found in the swamp forests. All of them are flood-tolerant species and can survive in the submerged condition for extended periods of time. However, among these, hijal, tamal and koroj trees are of the greatest value to the people and the environment. Other plant species available in Bangladesh wetlands include Madar (*Erythrina varieqata*), Gab (*Diospyros peregrina*), Makna (*Euryale ferox*), Singara (*Trapa bispinosa*), Jaldumur (a kind of Ficus), Chitki (*Phyllanthus reticulatus*), Thankuni (*Centella asiatica*), Kalmi (*Ipomoea aquatica*), Helencha (*Enhydra flactuans*), Hogla (*Typha elephantina*), duckweed, water hyacinth, lotus and water lily. Eight plant communities have identified in the haor area (number of species in parentheses): submerged plants (20), free floating plants (15), rooted floating plants (15), sedges and meadows (35), floodplain grassland, reed swamp (7), fresh water swamp forest (7), crop field vegetation (60), and homestead vegetation (63).

The extinct fauna of the area includes a few species that are included in the IUCN *Red Data Book* as highly endangered species, including One-horned Rhinoceros (*Rhinoceros unicornis*), Swamp Deer (*Cervus duvauceli*), Hispid Hare (*Caprolagus hispidus*), Swamp Partridge (*Francolinus gularis*), Bengal Florican (*Eupodotis bengalensis*) and Marsh Babbler (*Pellorneum palustre*).

Role of Wetland for Ecosystem Services

The major role of wetland are: Ground water recharge, Ground water discharge, storage of flood water, shoreline stabilization and reduction of erosion, sediment trapping, nutrient retention/removal, support for food chains, fish production, habitat for wildlife, water based tourism, natural heritage values, biomass production, water transport, bio-diversity and micro-climate stabilization.

The wetlands in Bangladesh have great ecological, economic, commercial and socio-economic importance. They contain very rich components of biodiversity of local, national and regional significance. Among the estimated 5,000 species of flowering plants and 1,500 of vertebrates in the country, up to 300 plant species and some 400 vertebrate species are judged to be dependent on wetlands for all or part of their life span. Wetland also provide habitat for a variety of resident and migratory waterfowl, a significant number of endangered species of international interest, and a large number of commercially important ones. The inland capture fishery is based on the vast freshwater resources with some 260 species of fin fishes and 25 shell fish. There is substantial basis for the view that the country's natural resources, especially the Sundarbans, could support development of richer tourism. Wetlands also support a significant range of other activities such as extraction of reed, harvesting if edible aquatic vegetation and their products, medicinal herbs, shell, etc.

Bangladesh wetlands also play an important role in flood control and storm surge protection. They also support fisheries, wildlife and forest resources. Wetlands are unique for their rich biodiversity and cultural heritage. It is the combination of all these function, yields and values that makes wetlands so important to the country.

Degradation Status of the wetlands in Bangladesh

Since independence there has been an accelerated expansion of physical infrastructure in the floodplains and haor areas. In recent years, decentralization of administration at the Upazila level also led to a rapid expansion of roads and feeder roads even in the rural areas of the haor basins. These infrastructures were often done without proper planning or due regard to natural water flows. These poorly planed roads and drainage structures created water logging and had serious impact on the water regimes in the flood plains.

Degradation of wetlands in Bangladesh were mainly due to: high population growth and expansion of settlements; conversion of wetlands into crop fields; flood control and irrigation project for enhancement of agricultural productivity; national, local and rural infrastructures like roads; embankments, culvert etc.; over-exploitation of wetland trees; over-grazing by livestock; over-fishing and associated disturbances; siltation due to degradation of watershed areas which are often transboundary in nature; indiscriminate control/ regulation / use of water flows of main river systems in upper riparian; and pollution of water due to industrial, urban, agrichemical and other types of pollutants including pollution from transboundary sources.

Due to the construction of embankments, sluice gates, culverts and other structures, monsoon floodwater can not enter into the floodplains quickly and there is less floodwater. Fish fry could not enter into the floodplains, because of the delay in floodwater flow into the area. Wetland degradation results in :

- Serious reduction in fish habitat, fish population and diversity;
- Extinction and reduction of wildlife including birds, amphibians and reptiles;
- Extinction of many indigenous varieties of rice
- Loss of many indigenous aquatic plants, weeds and shrubs;
- Loss of natural soil nutrients;
- Livelihood of local population is under stress
- Loss of natural water reservoirs and
- Degeneration of wetland-based ecosystems, occupations, socio-economic institutions and cultures.

Wetland Area Legislation

There is no specific legislation relating to wetland conservation. Various Acts, Ordinances, and regulations have been promulgated for the purpose of conserving natural resources, and several of these pertain to wetlands. They include:

- 1. The Forest Act, 1927.
- 2. The East Bengal State Acquisition and Tenancy Act, 1950 (Act XXVIII of 1951).
- 3. The East Bengal Protection and Conservation of Fish Act, 1950 (East Bengal Act XVIII).
- 4. The Bangladesh Wildlife (Preservation) Order, 1973, promulgated under Presidential Order No. 23 in March 1973 and subsequently enacted and amended as the Bangladesh Wildlife (Preservation) (Amendment) Act, 1973.
- 5 The Haor Development Board Ordinance (Ordinance No. IX of 1977).

6. The Protection and Conservation of Fish Rules, 1985.

Bangladesh joined the World Heritage Convention in August 1983.

Conservation Value of Wetlands

The international significance of the wetlands of the haor basin for their <u>waterfowl</u> populations was first drawn to the attention of the international conservation community at an International Regional Meeting on Conservation of Wildfowl Resources held in <u>Saint Petersburg</u> in September 1968.

Three zones of international importance for conservation and sustainable utilization - <u>the</u> <u>Meghna estuary</u>, <u>Tanguar haor</u> - have been declared as Ramsar sites under the <u>Ramsar</u> <u>Convention</u> for protection of wetlands, of which Bangladesh is a signatory. The Bangladesh government has also declared the Tnaguar haor an <u>Ecologically Critical Area</u>. The Sundarbans is also another Ramsar site in the country.

Migratory birds in Wetlands

About 207 species of birds live or visit Bangladesh. Among the birds 30% are waterfowls, 26% waders, 20% bush and her bland birds and the rest are grassland, air hawking prey. Of these fresh water birds 129 species (62.3%) are resident and the other are migratory. The list of extinct wetland birds include spotbill pelican, pelican, scavenger vulture, Bengal florican, pinkheaded duck, greater adjutant and king vulture. There are also several endangered species.

Economic importance of Wetlands

The contribution of the haor region has an average around 6-8% of the national GDP. These haors and beels support major subsistence and commercial fisheries, while the seasonally flooded lake margins support major rice-growing activities. The total rice production area of Bangladesh is about 10.57 million ha. of which about 16%(1.74 million ha.) fall in the haor region. About 5.25 metric ton of rice is produced in haor area, which is about 18% of the total rice production in Bangladesh. The main crop grown in the haor basin is boro rice or dry season rice. Early monsoon flash floods often cause extensive damage to the boro crop. Protection in the form of full flood dykes or submersible dykes is being constructed in some of the developed areas. The abundant aquatic vegetation in wetlands provides rich grazing for domestic livestock and an alternative source of fuel and fertilizers for the local people.

Haors and baors, along with the rivers, canals and the floodplain, are a major source of fish production. Wetlands support breeding as well as feeding ground for the fish species. But, due to siltation, and harvesting of excessive amounts of fish to meet the demand of growing populations production of fish from this source is gradually decline. In recent years, the

wetlands have also been used for rearing domestic ducks. In fact more than 24 % of the country's total duck production exists in the haor region.

Due to scarcity of cultivable land, government lands (*Khas* land) including the wetlands are getting transferred to private ownership in Bangladesh. Thus most of the haors and beels have now been sold or leased to private individuals for cultivation during the dry season. This transfer is governed by the Haor Development Board Ordinance (Ordinance No. IX of 1977) are under the direct control of Ministry of Land represented by Additional Commissioner (Rev) at the district level.

Tourism Value of Wetlands

Haors are unique wetlands and historically local people enjoy the beauty of nature in boats. The best time to visit the haors is at the end of the monsoons, when they are full with water. Thereafter, the water in the haors starts receding but still provides an awe-inspiring sight. In winter, the haors and beels receive thousands of migratory birds. It is the ideal season for bird-watchers, but then the haors are reduced in size and lose much of their watery grandeur. As summer sets in the haors are no more there, but one can still see numerous beels. In different wetlands of the country racing of boat is an important cultural events that attract many tourist to enjoy it. Extra-ordinary beauty of the Sundarban attracts not only domestic but also international tourist.

Name of Important Wetlands in Bangladesh

- Hail haor
- Hakaluki haor
- Tanguar haor
- Dekhar haor
- St. Martins Island
- Chokoria Sundarban
- Baikka beel
- Chalan beel
- Meda beel
- Aila beel
- Kuri beel
- The sundarbans
- Kaptai reserviour
- Bostami pond
- Bogakine lake
- Teknaf peninsula and Naf estuary
- Char kukri mukri , hatia island etc.



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Policy

National policies are informal rules made by the administrative ministries and require approval of the Cabinet Division.

Law of Parliament

- Laws set out standards, procedures and principles that must be followed.
- A law is more formal and has to be passed by the Parliament.
- Laws must be guided by current government policy.
- Breaking law is punishable in the court

Constitutional Provisions

The Fifteenth Amendment of the Constitution inserts a new article 18A, namely:—

"18A. Protection and improvement of environment and biodiversity.

 The State shall endeavour to protect and improve the environment and to preserve and





safeguard the natural resources, biodiversity, wetlands, forests and wild life for the present and future citizens."

Bangladesh Law

Law

- Article 152 of the Constitution of People's Republic of Bangladesh, 1972, the Supreme Law of the Land defines law as "Act, ordinance, order, rule, regulation, bye-law, notification or other legal instrument, and any custom or usage, having the force of law in Bangladesh".
- Section 3 (8aa) of the General Clauses Act, 1897 (Act No. X of 1897). "Bangladesh Law" shall mean any Act, Ordinance, Regulation, Rule, Order or bye-law in force in Bangladesh.

Types of Law

Supreme Law

The Constitution is the Supreme Law of Bangladesh. Article 7(2) runs for the Supremacy of the Constitution as "This Constitution is, as the solemn expression of the will of the people, the supreme law of the Republic, and if any other law is inconsistent with this Constitution that other law shall, to the extent of the inconsistency, be void".

Administrative Law

Example: The Government Servant (Appeal & Disciplines) Rules, 1985

Court Law

Example: The Forest Act, 1927

Substantive law

Examples: Forest Act, Wildlife Act, Penal Code

Procedural or Adjective Law

Examples:

- The Code of Criminal Procedure (Act V of 1898)
- The Code of Civil Procedure (Act V of 1908)
- Evidence Act, 1872 (Act I of 1872)
- Limitation Act, 1908 (Act No. IX of 1908)

Parent or Primary Law

i.e. Act of Parliament, President's Order (PO), Acting President's Order (APO) and Ordinance.

Secondary Legislation

i.e. Rules and Regulations etc. are Subordinate Legislation or Delegated Legislation.

The Indian Penal Code

- Macaulay started drafting from 1939
- The Indian Penal Code (Act XLV of 1860) was enacted on <u>October 6, 1860</u> and came in to operation on the 1st of January 1862.
- Only omits to give alms to a starving beggar is not defined as an offence in the Indian Penal Code. Otherwise
- it is apparent that there is nothing which by itself a crime, unless it has been declared by the legislature as punishable.



Thomas Babington Macaulay 25 October1800 28 December1859

Need of Forest Act

Forests contain a great variety of produces, each liable to its own special injury. i.e. petty theft, trespass, mischief, etc., which constitute "forest offences" are very varied and are best treated by a special law;

In addition -

Ignorant people consider forest as no man's or rather every man's property owing to its natural origin;

Further,

The forests under management are often burdened with right adverse to the public interests which make it necessary to deal with in a special way;

Moreover,

A forest is peculiarly liable to accidents; both natural and due to carelessness or malice of men. It is necessary to have some provisions to prevent these accidents or to punish the culpable persons. Besides,

It requires to prevent even private owners from clearing their forests to prevent landslides, drying up of springs.

Above all,

For the protection of produce in transit.

AND

To have a special service vested with certain powers.

The Forest Act, 1927 (Act XVI of 1927)

- It has been revised many a time since its first enactment in 1927.
- After independence in 1971- In 1973 some words have been changed e.g., Taka for Rs. and Bangladesh for Pakistan.
- Later by the Forest Amendment Act, 1990 (Act VIII of 1990)
- Last one, by the Forest Amendment Act, 2000 (Act X of 2000)
- The latest revision is under process and the Forest (Amendment) Bill, 2012 has been placed before the Parliament on 29 February 2012
- The bill has been sent to the Parliamentary Standing Committee on the MOEF for scrutiny and reporting back to the House.
- FA 1927 has 13 chapters 86 sections

Chapter I

Preliminary

- 1. Short title and extent
- 2. Interpretation clause

Chapter II

Of Reserved Forests

• Sections 3-27

Chapter III

Of Village-forests and Social Forestry

- 28. Formation of village-forests.
- 28A. Social Forestry.
- 28B. Effect of other provisions of law on social forestry.

Chapter IV OF Protected Forests Sections 29-34

Chapter V

Of The Control over forests and land not being the Property of Government Sections 35-38 [Repealed by the Private Forest Ordinance, 1959 (E.P. Ordinance No. XXXIV of 1959) 38A. Operation of Private Forest Ordinance. 38B. Notice of forest management activities. 38C. Restricted activities. 38D. Abatement of forest nuisances. [Inserted by Act XX of 2000]

Chapter VI

Of the Duty on Timber and other Forest-produce Sections 39-40

Chapter VII

Of the Control of Timber and other Forest-produce in Transit Sections 41-44

Chapter VIII

Of the Collection of Drift and Stranded Timber Sections 45-51

Chapter IX

Penalties and Procedure

Sections 52-69A

- 52. Seizure of property liable to confiscation
- 57. Procedure when offender not known, or cannot be found.
- 62. Punishment for wrongful seizure.
- 63. Penalty for counterfeiting or defacing marks on trees and timber and for altering boundary marks.
- 63A. Some offence to be non-bailable.
- 64. Power to arrest without warrant.
- 67A. Appointment of forest Magistrate.
- 68. Power to compound offences
- 69A. Prosecution of forest-offences.

Chapter X

Cattle-trespass Sections 70-71 We also apply -The Cattle-Trespass Act, 1871 (Act I of 1871)

Chapter XI

Of Forest-officers Sections 72-75 72. Government may invest Forest-officers with certain powers.

- 73. Forest-officers deemed public servants.
- 74. Indemnity for acts done in good faith.
- 75. Forest-officers not to trade.

Chapter XII

- Subsidiary Rules Sections 76-77 76. Additional powers to make rules.
- 77. Penalties for breach of rules.
- 78. Rules when to have force of law.

Chapter XIII

- Miscellaneous
- Sections 79-86
- 79. Persons bound to assist
- 80. The joint property
- 82. Recovery of money due to Government.
- 84. Land Acquisition
- 85. Recovery of penalties due under bond.

Other Forest Acts/Rules

- 1. Drift Rules for Sundarbans, 1881
- 2. Drift Timber Rules for the Chittagong District and for the Chittagong Hill Tracts, 1917
- 3. Drift Timber Rules for Sylhet District, 1955
- 4. Sylhet forest (Protection from fire) rules, 1954
- 5. The Chittagong and Chittagong Hill Tracts Reserved Forest Fire Protection Rules, 1958
- 6. Hunting, Shooting and Fishing Rules, 1959
- 7. The Private Forest Ordinance, 1959 (E.P. Ordinance No. XXXIV of 1959) [Repeals the Bengal Private Forests Act, 1945 (Act No. XI of 1945)
- 8. The Private Forest Management Rules, 1959
- 9. The Private Forest Fire Protection Rules, 1959
- 10. The Vested Forests' Costs and Profits Rules, 1959
- 11. Rules to Regulate Shooting, Hunting and Fishing within the Controlled and Vested Forests, 1959
- 12. Rules for Disposal of Forest Produce under Private Forest Ordinance, 1959
- 13. Saw-Mill (Licence) Rules, 1998 (Amended in 2002)
- 14. Social Forestry Rules, 2004 (Amended in 2010 & 2011)
- 15. Brick Burning (Control) Act 1989 (Act No. 8 of 1989) (Amended in 1992 & 2001)
- 16. Forest Transit Rules, 2011

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- 6L| cvnvo KvUv m¤ú‡K© evav-wb‡la;
- 6M| SyuwKc,Y© eR^{..}© Drcv`b, Avg`vbx, gIRy`KiY, ‡evSvBKiY, cwienY, BZ^{..}vw` msµvšÍ evav-wb‡la;
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- 60 Rjvavi m¤úwK©Z evav-wb‡la;
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- 15K| e[°]w³, ‡Mvôx, ¶wZMÖ⁻' RbMY, A_ev Zvnv‡`i c‡¶ gnvcwiPvjK ¶wZc,i‡Yi `vex‡Z gvgjv `v‡qi Kwi‡Z cvwi‡eb;
- 15L| Aciv‡ai mwnZ mswkøó e⁻ ' hš¿cvwZ ev‡Rqvwß;
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- 17| ¶wZc,i‡Yi gvgjv `v‡qi;
- 18 mij wekiv‡m K,,Z KvRKg© i¶Y;
- 19| ¶gZv Ac©Y;
- 20 wewa cÖYq‡bi ¶gZv;
- 21| iwnZKiY I ‡ndvRZ;
- The Environmental Pollution Control Ordinance, 1977
- (Ordinance XIII of 1977)

Other Environment Act & Rules

- Environment Conservation Rules, 1997
- The Environment Court Act, 2010 (Act No. 56 of 2010)
• The Sound Pollution (Control) Rules, 2006

The Bangladesh Wild Life (Preservation) Order, 1973

(President's Order No. 23 of 1973)

There are 48 articles in the P.O. 23. These deal with :

- 1. Short title and Extent
- 2. Interpretation clause
- 3. Appointment of officer
- 4. Constitution of Bangladesh Wildlife Advisory Board
- 5. Game and protected animals defined
- 6. Acts prohibited
- 7. Use of hawks for hunting
- 8. Animal, trophies and meet deemed to be government property
- 9. Date fix for lawful possession of wildlife and issue of certificate
- 10. Penalty for failure, concealment and counter fitting of lawful possession of wild animals
- 11. Transfer of animal under lawful possession
- 12. Import of wild animals and their parts and duty of custom officers
- 13. Export of game animals
- 14. Transit of animals through Bangladesh
- 15. Dealer's permit
- 16. Power to stop for checking any animal, person. Package, vessel, vehicle on suspicion by an authorized officer
- 17. Seizure of animals along with firearms, nets, traps etc.
- 18. Demand of lawful possession certificate
- 19. Person bound to assist under this Order
- 20. Disposal of seized property subject to speedy and natural decay
- 21. Acts not to be an offence
- 22. Animals, trophies, meet under proceedings deemed to be government property
- 23. Constitution of Wildlife Sanctuary, National Park and Game Reserve
- 24. Constitution of Private Game Reserve
- 25. Interference in the discharge of duties of an authorized officer is an offence
- 26. Punishment
- 27. Cognizance of offence
- 28. Implications of other laws
- 29. Confiscation in absence of the offender
- 30. Mobile Court
- 31. Power to arrest without warrant
- 32. Power to release offender under bond
- 33. Lawful means to prevent commission of offence
- 34. Offences under this Order to be tried by First Class Magistrate
- 35. Summary trial

- 36. Compound offence
- 37. Registration of fire arms
- 38. Power of officer
- 39. All officers deemed to be public servant
- 40. Fire arm to be treated as part of uniform up to the rank of Junior Wildlife Scout
- 41. Indemnity
- 42. Duties of police officer
- 43. Use of fire arms for private defence
- 44. Delegation of power to the subordinates
- 45. Permission for killing of animals
- 46. Power of Government to exclude or include animals from schedule
- 47. Rule making power
- 48. Acts repealed.

First Schedules

Part I

List of Mammals, Reptiles and Birds of Bangladesh which are open to shooting and mat be hunted on an ordinary game hunting licence

Part II

List of Mammals, Reptiles and Birds of Bangladesh for the hunting of which a special permit is required

Second Schedule

Animals, trophies or meat for the possession, transport or import of which certificate of lawful possession is required.

Third Schedule

Protected animals i.e. Animals which shall not be hunted, killed or captured

Criminal Procedure

The Code of Criminal Procedure, 1898 (Act V of 1898)

The basic procedures are as follows

- 1. An arrest or complaint must be based on probable cause;
- 2. A government prosecutor files a complaint;
- 3. Jurisdiction of the court;
- 4. Issue of process to the accused;
- 5. Charge frame;
- 6. Trial starts
- 7. Recording witness
- 8. Order/Judgment
- 9. Conviction/acquittal of the accused
- 10. Appeal, Review of Revival



How to draw a Prosecution Offence Report (POR)

(Ref: Chapter XIX of CrPC 1898)

- Sufficient description of offence;
- Particulars of Time, Place and Person
- Manner of committing offence;
- Ingredients of POR;
- How to quote law;
- Adding unnecessary information is not safe!

Legal Terminology

Act of Parliament



Ordinance



Ordinance

When **Parliament stands dissolved or is not in session**, the President may make and promulgate Ordinances. Ordinances have the like force of law as an Act of Parliament.

(Without re-number)

The Private Forest Ordinance, 1959 (E.P. Ordinance No. XXXIV of 1959) The Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ordinance II of 1982)

(With re-number)

- The Forest (Amendment) Ordinance, 1989 (Ordinance No.11, 1989)
- The Forest (Amendment) Act, 1990 (Act 8 of 1990)
- The Public Servants (Retirement) (Amendment) Ordinance, 2009 (Ordinance No. 7 of 2009)
- The Public Servants (Retirement) (Amendment) Act, 2010 (Act No. 5 of 2010)
- The Public Servants (Retirement) (Amendment) Ordinance, 2011 (Ordinance No. 3 of 2011)
- The Public Servants (Retirement) (Amendment) Act, 2012 (Act No. 2 of 2012)
- In the form of The Public Servants (Retirement) (Amendment) Bill, 2012 was placed before the Parliament on 14 February 2012.
- The said bill has been sent to the Parliamentary Standing Committee on the Ministry of Public Administration for scrutiny and report back to the House.
- Passed by the Parliament on 15 February, 2012
- Received accent of the President on 20 February 2012
- Published Extraordinary Gazette on 20 February 2012 Pages 1029-1030
- The Public Servants (Retirement) (Amendment) Act, 2012 (Act No. 2 of 2012)

Legal Terminology

Regulations : According to Section 3 (46) of the General Clauses Act, 1897 (Act No. X of 1897). "Regulation" shall mean a Regulation made by any person or authority empowered under any constitutional instrument and in force in Bangladesh.

Order

- Pre-shipment Inspection Audit Order, 2000
- President's Order

Notification: Any Notice – appointment or any written direction

Bye-laws: by the municipal bodies, corporations or other local government

SRO: Statutory Rules and Orders./ Statutory Regulatory Order

Gazette: Section 3 (37a) of the General Clauses Act, 1897 (Act No. X of 1897). "Official Gazette" or "Gazette" shall mean the Bangladesh Gazette



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National Importance of Fish

- Agricultural Sector Contribution in GDP is 19.4%
- Fisheries sector as a whole account for 6% of GDP
- Contribute in Export earning more than 4.76%
- Contribution of open water 42% of total fisheries production
- About 12 million people involvement, about 80% of rural population engaged in fishing in flood lands
- 63% of the total animal protein consumed in the country comes from fish alone

Bangladesh Open Water Fisheries

- 3rd largest freshwater fishery in the world
- Around 260 species in inland waters
- Open water provide fishes and other aquatic products
- Around 80% rural households depends on wetlands resources



Environmental impact on Fisheries





Hydrological Impact on Open Water Fisheries



Open Water Habitats

Habitat	Status	Dry season status	Wet season status
Rivers	Perennial	Mostly isolated, linked with secondary, tertiary rivers	Connected with floodplain
Khals	Seasonal	Isolated from floodplain, poor link with rivers	Connected with rivers and floodplain
Beels	Perennial	Isolated from khals/rivers,	Connected with rivers,
Haors	Seasonal	Part becomes crop lands,.	Connected with rivers & floodplain
Floodplain	Seasonal	Dry, crop land grassland	Merged with vast sheet of water
Baors	Perennial	Isolated, edges crop cultivation	Isolated, some are linked with floodplain
Pagars	Perennial	Isolated, often pumped for fishing	Flooded and merged with vast basin

Open Water Ecosystem

Flood plain and beel

- Seasonal water flow
- Beel & River residence species
- Abundance of juvenile fishes
- Feeding grounds
- Rapid changes





Flowing River

- Year round water flow
- Mostly River residence Species
- Abundance of adults fishes
- Over-wintering ground
- Very slow changes

Fishing practices in relation with Seasons, Habitats & Biological function

Seasons	Habitat Quality	Fish BiologicalFunctions	Fishing Practices
Dry Season (Dec-Feb)	Highest pollution,	Biological functions reduced,	High Fishing intensity,
Pre-Monsoon (Mar-May)	Water quality improves	Biological functions initiate, fish perform migrations	Less fishing, catching of migrating fish
Monsoon (Jun-Aug)	Best water quality, rich fish food	Peaks biological functions of fish	Fishing in flooded areas but harmful gears

Post	Water quality	Fish migrate to their dry	Fishing peaks in khals &
Monsoo	remains good,	season refuge areas	beels
n			
(Sep-Nov)			

Key threats to Open Water Fishery

- Habitat loss and degradation
- Overexploitation & consumption
- Overpopulation
- Pollution
- Introduced species
- Fish catch fell from 80% to 60%
- 40% of fish threatened
- Fish consumption fell by 38% among poor
- Global climate change

Co-Management Approaches

Over a ten year period, the co-management approaches has successfully established fishing rights for many small scale fishers to fisheries resources.





- In Bangladesh, the co-management approaches formed Community-Based Organizations (CBOs), Res Managt. Org (RMOs), Fisheries Managt. Committee (FMC) etc. comprised of mainly poor fishers.
- > The community groups involved both direct and indirect beneficiaries.

Why Co-management Approaches

- A more transparent, accountable and autonomous management system;
- A more democratic, economical and participatory.
- Fishers take responsibility for a number of managerial functions;
- Makes maximum use of indigenous knowledge.
- Improved stewardship of coastal resources and management;
- Localized solutions to local problems, can minimize social conflict;

Co-management approaches



The first approach includes identification of fishers, and forming groups. These group representatives will be the members of the Management Committee. DOF and other Government agency will assist the community



MACH Approaches (1998-2008)

- Include all floodplain resources fish, plants, wildlife,
- Support entire resource users: poorer fishers, farmers, landless labourers, women, local elites & gov. officials,
- Two groups at each region of the sites, Federation for Resource Users Groups (FRUGs) and Resource Management Organisations (RMOs), with separate NGO for each type of group,
- Adequate IGAs to reduce fishing pressure,
- Human resources development,
- Adaptive management and policy initiatives.

MACH Model



Reserve fishing rights in public waterbodies for RMOs

Support for alternate livelihoods for poor through FRUGs



FFP Approaches (2000-06)

- Include open water fisheries resources,
- CBOs are from fishers communities; 10% rural elites,
- Subsidies stocking programme with beneficiaries contribution,
- Fish sanctuary for enhanced natural fish stock,
- Habitat restoration excavation/re-excavation,
- Human resources development (training, field visits).



CBFM Approaches (2001-07)

- Community based approaches through i) fishers-led, ii) community-led, iii) women-led
- Rural champions included in few sites, based on local situation,
- Management interventions (Sanctuaries, gear bans, closed seasons, .),
- Revolving fund from project & credit fund through NGOs,
- Habitat restoration excavation/re-excavation,
- Human resources development,
- Action/grants research programme.



Linkage for Cluster of Water Bodies





CBO can perform Fishery Management option

Species Number	# of Beels in Year 1	# of Beels in Year 2	# of Beels in Year 3	# of Beels in Year 4
10 to 20	5	1	1	0
21 to 30	7	3	1	1
31 to 40	12	12	10	5
41 to 50	3	9	9	11
51 to 60	1	4	6	8
61 to 70	0	0	3	4
Total no. of species	Year 1	Year 2	Year 3	Year4
recorded	74	87	96	106

e.g., Co-management- Benefits to Biodiversity

Addressing Climate Change risks

Most of Co-management

- Increased Drought plantation, crop introduction of sensitive
- Increased
 habitat restoration
- Increased flooding /wave afforestation, habitat

interventions are valid for CC adaptation habitat restoration (water reservoir), diversification, fish sanctuary, respecies rainfall/erosion-watershed managt,

action/erosion – swamp and riparian rehabilitation

- **Higher temperatures** crop diversification, habitat rehabilitation (water reservoir), fish sanctuary
- Building resilience and adaptive capacity all stakeholders

Integrated wetlands management with focus on balanced use of water is the key in adapting to CC

Lesson Learned from such activities

- Holistic approach by involving all stake holders brings good result,
- Use of religious gathering is effective,
- Conducting mobile court is less effective rather mass motivation found result oriented,
- Patronization of local administration found very effective,



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Sundarbans

- Total area 7620 Km² including coastal belts (4143 Km² land; 1874 Km² water, 1603 Km² marine zone)
- Water area is 33% of the total SRF (connected with 4 major rivers systems, more than 450 canals)
- > Highly rich in fisheries and aquatic resources.

The Sundarban plays an important role in economy of the southwest region of Bangladesh and Wetlands Co-Management is vital for sustainability of Sundarbans resources.

The goals of the Wetlands Co-management is to ensure the long term conservation, improve wetlands ecosystem and sustainable utilization of the Sundarbans resources.

River Systems of the Sundarbans

Sundarbans is characterized by extensive network of rivers & canals and major rivers are;

Raimangal: West of the SRF and border between Bangladesh and India. The river Raimangal and Jamuna comprise the system.

Arpangasia: East of raimangal. The river Arpangasia and Bhadra comprise the system.

Shibsha-Pasur: Middle of the SRF. The two rivers Shibsha and Pasur merge together to the extreme south of SRF.

Baleshar system: The Baleswar makes the eastern boundary of the SRF.

Importance of Sundarban Wetlands

- > Contribute 3-5% of total capture fisheries.
- Annual production: 1,120 m.t (2009-10, FD)
- Annual Revenue: Tk. 5.3m (2009-10).
- > 40,000-70,000 boats, 0.2m fishers
- ▶ Livelihood: 0.2m HH, 11m people.
- > 16 type stakeholders.
- > Artisanal fishery contributes 85–95% of coastal & marine catch.
- Supports main land shrimp farming.
- > Forest and mudflats provide vital breeding and nursery ground.
- > Supports offshore and deep sea fisheries as nursery ground.

Types of Sundarbans Fishery

- > 204 bony & 20 cartilaginous species: >40 commercially important
- Prawn & Shrimp: 26/24 Species Golda & Bagda high commercial value.
- Crab: About 7 species, Mud Crab high commercial value.
- 53 species of pelagic fish (27 families),
- > 124 species of demarsal fish (49 families),
- 24 species of shrimps (5 families),
- 7 species of crabs (3 families),
- 2 species of gastropods
- ➢ 6 species of pelecypods
- 8 species of locust lobster and
- ➢ 3 species of turtles (IUCN 1994).
- Mammals: Dolphin: biodiversity indicator, and role in tourism expansion.
- Post Larvae: Bagda and Golda, high economic value.
- > Dry Fishery: Dublar char-Seasonal income source for poor fishermen

Management of Sundarbans Fishery:

- Manager: Forest Department since 1869.
- First management plan in 1892
- Fisheries management System (FMS) developed in 1994.
- Management through Resource Management Plan.
- > 17 Station offices, Key role in management & control

- ➢ 4 Range office, 2 Divisional Offices, one Circle Office
- Boat License Certificate (BLC) Issue Annual.
- > Permit issue, against boat, 1 week fishing/permit.
- Revenue: fishing & catch amount.
- Revenue rate on species-base.

Rules & Regulations of the SRF Fisheries Management

- > FD is empowered to mange fisheries in the SRF and 20km marine zone.
- > 18 canals are under permanent fishing ban.
- > No crab fishing in SRF from December to February.
- Fishing ban from 01 May to 30 June for five species- Pangas, Kkhorul, Kaown magur, Golda chingri and Kakra.
- Permanent fishing ban in three wildlife sanctuaries. Sundarbans ES: Compartment no. 4, 5, 6 & part of 7 with an area of 31,227 ha. Sundarbans SS: Compartment no. 43 and 44 with an area of about 36,970 ha. Sundarbans WS: Compartment no. 53, 54 and 55 with an area of about 71,502 ha.
- > Placing net across a canal and complete blocking is illegal.
- > Catching of Ilish and River Pangas below 23 cm is illegal during November-April
- > Use of poison, explosive and other noxious substance is prohibited.
- Use of small mesh net is also prohibited

Key issues in Sundarban Wetlands Co-management

- Over recent decades the emphasis of Co-management initiatives in the fisheries sector of Bangladesh has been on inland freshwater systems;
- This has resulted in a constant lack co-management capacity and information regarding coastal and mangrove fisheries and fishers;
- This has also resulted in a lack of recognition of the value of Sundarban Wetlands resources and their current and potential contribution to food security and poverty alleviation in rural coastal areas;

Current Issues: Sundarban Wetlands Resources

- Indiscriminate PL Collection
- Zatka Fishing
- Destructive fishing gear (Set-bag net, gill net, Char pata etc.)
- Illegal fishing (Use of explosives, poison fishing)
- Insufficient freshwater supply
- Siltation and rising of riverbeds and forest floor
- Increased Trawling
- Pollution in mangrove water
- Improper implementation of fishing rules and regulations
- Destruction of fish habitat (nursery, breeding ground)

How do we hub Sundarban Wetlands Co-Management

"What constrains of work?"

"How can these bottle-necks be rectified?"

"Can the Co-management help?"

"How do can this knowledge be delivered?"

How should we guide Wetlands Co-management



"Conservation and Co-management should be undertaken together"

What need to be done towards Sundarban Wetlands Co-management



Key Management performance

- Program to ensure flow of freshwater in the rivers
- Technical Expert specifically for aquatic resources
- Management policy reform: e.g., Co-management
- Increase Support and Services for the Forest Officials/Staff
- Alternative Livelihoods Option for resource users
- Provision of ID Card and Work Permit
- Role Playing from Responsive Organizations
- Adaptive Research initiatives
- Ban on Shrimp PL and other juvenile Collection
- Close Monitoring through involving CMCs
- Controlling water pollution
- Discourage to future oil and gas exploration program

Wetlands Resources Management



Record Keeping and Reporting



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Monitoring: Wetlands Resources management







How we will measure management performance and MSY

Production

Catch per unit area (CPUA)
 Sustainability

- Catch per fisher's
- Catch per permit
- Biodiversity indicators
- Fishing Intensity
- Destructive fishing practices
- CMCs participation



Management performance: Annual catches, Number of fishers



Catch per fishers versus fisher density

- The concept of catch per fisher per year was used to estimate:
- The maximum level of fisher density per sq. km.
- ➢ Fisher density showed an increasing trend.
- The annual catch/fisher decreased from 2001 to 2005, also increased from 2006 to 2008 and sharp decreased in 2009.
- SRF could have supported a fisher density not exceeding 125 fishers per sq. km.

Wetlands Resource improvement measures

- Attention should be taken for implication of conservation measure through stakeholders,
 - Fishing Area restriction
 - Close season
 - Gear restriction
 - Mesh size regulation
 - Limit Boat License Certificate (BLC)
 - Limit Fishing Permit
 - Limit Fishing duration
 - Species Ban
 - Fish Size Limit
 - Incompliance of Conservation measure









- Attention should also be taken,
 - Habitat identification and Restoration
 - Awareness building
 - Capacity building
 - Resource Assessment
 - Monitoring and evaluation
 - AIGA opportunities
 - Participatory management (Comanagement)
 - Resource ownership
 - Fisheries Unit within FD
 - Revenue Revision
 - Fish preservation, Value chain and marketing





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Why Co-management?

- > Search for better management approaches
 - Ineffective centralized fisheries management is the need to change the structure of governance. Fishers can no longer depend on government to solve their problem,
 - Conventional fisheries management approach has been widely called part of the problem rather than of the solution of resource exploitation,
 - The crisis in fisheries and coastal community is pressuring national governments to look for alternative management strategies, (Many gov. view co-management as a way to deal with the crisis)
 - International donors and development agencies constitute another force driving comanagement

Quota system do not work well when the resource is used by many coastal communities (rather than a few large companies), when the total allowable catch cannot be forecast, where there is a mixed fishery and an incidental catch problem, and when fishing units are small and enforcing quotas not feasible (Wilson et al. 1994)

Why Focus on Small-scale Fisheries Management?





- In ASEAN countries small-scale fisheries constitute the major part of the fishery sector
- Contributions to local food security
- Sustainable livelihoods and poverty alleviation
- Weak sub-sector in terms of financial and technical capabilities
- Require support from the government to maintain social and economic securities in the rural area.
- Coastal waters are often considered as critical habitats for commercially important aquatic resources.
- High pressure of fisheries problem: open access condition, over fishing capacity, and declining of fisheries resources
- Crucial to develop appropriate fisheries management system and conservation mechanisms

What is Fisheries Co-management?

- Co-management is not a regulatory technique. It is a participatory and flexible management strategy that provides and maintains a forum or structure for action on participation, rule making, conflict management, power sharing, leadership, dialogue, decision-making, negotiation, knowledge generation and sharing, learning, and development among resource users, and government.
- More dynamic partnership using capacities and interest of local fishers and communities, complemented by the state's abilities to provide enabling legislation, enforcement and other assistance.
- Shift away from centralized, top-down form of management to new strategies. Fishers jointly manage the fisheries with the government.



Co-management spectrum Government:

			Consults	Instructs	Centralised Government management
	Affirms	Advises			
	Inform	Quantum			
		Consults			
Community			Advises		
management				Listens	

User groups

Seven steps of participation – level of co-management

- 1. Informing: Community is informed about decision that the government has already made.
- 2. Consultative: Mechanism exists for government to consult with fishers: gov. make decision
- 3. Cooperative: Community has input into management
- 4. Communicative: Two-way information exchange: local concerns are represented in management plans
- 5. Advisory: User advise government of decisions to be taken and government endorses these decisions Partnership:
- 6. Partnership of equals with joint decision-making
- 7. Community Control: Power delegated to community to make decisions and inform government of these decisions
 - 1. Informing
 - 2. Consultative
 - 3. Cooperative
 - 4. Communicative
 - 5. Advisory
 - 6. Partnership
 - 7. Community Control
 - No one model, but a spectrum of management approaches

• Consider now the roles of the community and of the Government: "Particularly with respect to management functions"

Co-management Spectrum

	Roles/Management functions	Community	Government
	Make regulations		
	Enforcement/patrolling		
	Stock Enhancement		
	Fish marketing		
	Capacity building		
	Conflict management		
	Facility/equipment Dev.		
Ċ	Formulate fisheries management plan		

CBFM is people-central and community- focused, Having narrow scope than Co-management Sometimes view gov. as an external player to be brought into the project only at a late	 Co-management focused on people and community including partnership arrangement between government and the local community and resource users Co-management often addresses issues
	 actional level) Gov. has crucial and active roles in Comanagement Developing trust between the partnerships.

Co-management

- Only government can legally establish and defend user rights and security of tenure at the community level
- Government serves a number of important functions: provision of policies and legal supports, fostering of participation and dialogue, legitimate community rights, initiatives

and interventions, enforcement, address the problems beyond communities scope, coordinate at various levels, financial and technical assistances.

Categories of Co-management

- 1. Community-centered Co-management
 - people-centered, community-oriented, resource-based and partnership-based
 - Seems to be found most often in developing countries
 - More complex, costly and time consuming to implement.
- 2. Stakeholder-centered Co-management
 - More common in developed countries,
 - Emphasis on getting the users participating in the resource management process.
 - Could be characterized as government-industry partnership.
 - Little or no attention is given to community development and social empowerment of
 - fishers.

Advantage of Co-management

Environmental Gains

- Sustainable utilize fisheries resources: Create ownership on the resources: a powerful
- ncentive, long-term asset.
- Conservation of fishing habitat: coral, mangrove, sea grass.

Social Gains

- More open, transparent autonomous management process,
- Minimize social conflict and maintain social cohesion: compliance with rules and regulations
- Create ownership and allow fishers take responsibility for number of managerial
- Functions, allowing the community to develop flexible and creative management
- Strategies that meet fishers' needs and local condition,
- Adaptive management: lesson learn and adjustment
- Through the process, communities (individual) are empowering: knowledge, cognitive and practical skill,
- Can make maximum use of indigenous knowledge and expertise,

Economic Gains

- More economical than centralized system, less spend on admin... and enforcement,
- Sustainable income from fishing occupation.

Limitations of Co-management

- May not be suitable for every fishing community,
- Require leadership and appropriate local institution which may not exist in some communities,

- The risk involved in changing fisheries management strategies may be too high for some communities and fishers.
- The cost for individuals to participate in co-management strategies (time, money) may outweigh the expected benefits
- Sufficient political will may not exist,
- No guarantee that a community will organize itself into an effective governing institution.
- Particular local resource characteristics, such as fish migratory patterns, may make it impossible for the community to manage the resource.

Conditions Affecting the Success of Fisheries Co-management

• Supra-community Level

- > Policy support: Administration Arrangement and facilitating co-management
- > Legal support: Legal right to organize and implement co-management
- External agents: understanding and willingness

• Community Level

- Clear defined boundaries,
- Clear defined membership,
- Group cohesion,
- Participation by those effected (inclusivity)
- Cooperation and leadership at community level,
- Empowerment,
- Use rights over the resource,
- > Partnerships and having sense of ownership of the co-management, and
- Strong co-management institution

• Individual Level

- Individual incentive structure is responded
- Credible rules and effective enforcement

Conclusion

. Supported Policy and Legal Framework

Co-management Institution

- Management roles and functions: who to do what.
- Rules and regulations: how to do it.
- Legitimacy by law and represented community

Co-management Mechanism

• Floor to play the roles of co-managers

- Interaction between co-managers: partnership
- Transparence: dialogue and participatory
- Building up trust among each other
- Learning process and adaptive management

Co-management is a Means and an End

- Co-management is a process/ approach to achieve something.
- Co-management is an end product of doing something.

Possible CBFM Linkages for River Section



FUSSINIE COFINI LITINAZES IUI CIUSLEI AIEAS



Possible CBFM Linkages for Haor Areas:





Community based Co-management



Reserve fishing rights in public waterbodies for RMOs Support for alternate livelihoods for poor through FRUGs

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1| Pv‡li D‡Ïk¨ e¨ZxZ †Kvb e¨w³ (K) cÖwZ ermi RyjvB n‡Z wW‡m¤^i (Avlvp gv‡mi gvSvgvwS n‡Z †cŠl gv‡mi gvSvgvwS) gvm ch©šÍ 23 †mw>UwgUv‡ii (bq BwÂi) bx‡Pi AvK...wZi KvZjv, iæB, g,,‡Mj, KvwjevDm, Nwbqv; (L) cÖwZ ermi b‡f¤^i n‡Z GwcÖj (KvwZ©K gv‡mi gvSvgvwS n‡Z ^ekvL gv‡mi gvSvgvwS) gvm ch©šÍ 23



†mw>UwgUv‡ii (bq BwÂi) bx‡Pi AvK...wZi Bwjk (hv ÒRvUKvÓ bv‡g cwiwPZ);

(M) cÖwZ ermi b‡f¤^i n‡Z GwcÖj (KvwZ©K gv‡mi gvSvgvwS n‡Z ^ekvL gv‡mi gvSvgvwS) gvm ch©šÍ 23 †mw>UwgUv‡ii (bq BwÂi) bx‡Pi AvK...wZi cvsMvm;
(N) cÖwZ ermi †de³æqvix n‡Z Ryb (gvN gv‡mi gvSvgvwS n‡Z Avlvp gv‡mi gvSvgvwS) gvm ch©šÍ 30 †mw>UwgUv‡ii (evi BwÂi) bx‡Pi AvK...wZi wmjb, †evj I AvBo gvQ- aiv, wb‡Ri `L‡j ivLv, cwienb ev weµq Kiv wbwl×|

- 2| Pv‡li D‡Ï‡k¨ gvQ aivi Rb¨ h_vh_ KZ...©c‡¶i wbKU †_‡K (eZ©gv‡b mswkøó †Rjv grm¨ Awdm) wba©vwiZ wdÕi wewbg‡q jvB‡mÝ cÖvß bv n‡j wewae× 27wU b`x, Lvj BZ¨vw`‡Z wba©vwiZ mg‡q †h †Kvb AvK...wZi iæB, KvZjv, g,,‡Mj, KvjevDm Ges Nwbqv AvniY ev Avni‡Yi c`‡¶c MÖnY Kiv hv‡e bv|
- 3| Pv‡li D‡Ïk¨ e¨ZxZ mvaviYfv‡e b`x-bvjv, Lvj I we‡j ms‡hvM Av‡Q Gifc Rjvk‡q cÖwZ ermi 1jv GwcÖj †_‡K 31†k AvM÷ (^PÎ gv‡mi gvSvgvwS n‡Z fv`a gv‡mi gvSvgvwS) ch©šÍ †kvj, MRvi, UvwK gv‡Qi †cvbvi SuvK ev `¤úwZ gvQ aiv I aŸsm Kivi c`‡¶c MÖnY Kiv hv‡e bv|
- 4| Rj‡mP, eb¨v wbqš¿Y ev b`©gvi D‡Ïk¨ e¨ZxZ b`x-bvjv, Lvj Ges we‡j A¯'vqx ev¯'vqx euva ev †Kvbifc AeKvVv‡gv wbg©vY Kiv hv‡e bv|







- 5| b`x-bvjv, Lvj-we‡j⁻'vqx⁻'vcbvi gva[°]‡g (wd·W BwÄb) grm[°] AvniY Kiv hv‡e bv, Gifc †¶‡Î⁻'vqx ⁻'vcbv mxR, AcmviY Ges ev‡Rqvβ Kiv hv‡e|
- 6| we‡ùviK `ªe¨ e¨envi K‡i gvQ gviv hv‡e bv| Af šÍixY Rjvf~wg‡Z wel cÖ‡qvM, cwi‡ek `~lY, evwbwR¨K eR©¨ ev Ab¨wea Dcv‡q gvQ aŸs‡mi c`‡¶c MÖnY Kiv hv‡e bv|



7| gvQ aivi †¶‡Î 4.5 †mw>UwgUvi ev Z`‡c¶v Kg e¨vm ev ^`‡N©¨i duvm wewkó duvmRvj (cÖPwjZ bvg-Kv‡i>U Rvj) Gi e¨envi wbwl×|

- 8| DcK~jxq A‡j gvQ I wPswo †cvbv AvniY wbwl×|
- 9| grm[•] Awdmvi ev cywjk Awdmvi (mve B݇c±i c`gh©v`vi bx‡P b‡n) Gi Awf‡hvM ev wi‡cv‡U©i wfwˇZ grm[•] AvBb fsM Kiv Avgj‡hvM[•] Aciva (KMwbwRej A‡dÝ)|
- 10| (K) cÖ_gevi AvBb fsMKvixi kvw⁻ Í n‡e Kgc‡¶ 1 gvm n‡Z m‡e©v"P 6 gv‡mi mk^ag Kviv`Û Ges Armn m‡e©v"P 1,000/- UvKv Rwigvbv|
 (L) cieZ©x cÖwZevi AvBb fs‡Mi Rb⁻ Kgc‡¶ 2 gvm n‡Z 1 ermi mk^ag Kviv`Û
 - Ges Zrmn m‡e©v"P 2,000/- UvKv Rwigvbv

9

grm" m¤ú‡`i B‡KvjwR, Rxe‰ewPÎ" I msiÿY

Awa‡ekb 9	grm" m¤ú‡`i B‡KvjwR, Rxe‰ewPÎ" I msiÿY
D‡Ïk¨ t	GB Awa‡ekb †k‡l AskMÖnYKvixMY-
-	1. grm [°] m [°] u [*] i B [*] _x KvjwR I c [°] OwZ [*] _z ek e [°] vL [°] v Ki [*] _x Z cvi [*] _z eb;
2. grm ["] m¤ú [±] ⁱ Rxe‰ewPÎ ["] I msiÿY wel [±] q aviYv AR©b Ki [±]	
cvi‡eb	
mgq t	60 wgwbU
c×wZ t	wcwcwc/eo `jxq Av‡jvPbv/cÖkœ I DËi
DcKiY	t gvwëwgwWqv, wd¬cPvU© KvMR, wd¬cPvU© †evW©,
†nvqvBU †ev	W© I gvK©vi

cÖwµqv

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- AskMÖnYKvix^{*}₁ wbKU Rvb^{*}₂ Pvb grm⁻ m[×]u^{*}₁ B^{*}₄KvjwR I cÖwZ^{*}₂ek ej^{*}₂ Kx eywS?
- Gici grm[¬] m¤ú‡`i B‡KvjwR I cÖwZ‡ek welqK Av‡jvPbvi m~ÎcvZ Kiæb Ges cvIqvi c‡q>U cÖ`k©b I eY©bv Kiæb|
- aviYv,wj mgš^q K‡i wb¤œifc Dc⁻'vcbv Kiæb|

Ecosystem

An ecosystem consists of the biological community that occurs in some locale, and the physical and chemical factors that make up its non-living or abiotic environment. There are many examples of ecosystems – a pond, a forest, an estuary, a grassland etc. The study of ecosystems mainly consists of the study of certain processes that link the living, or biotic, components to the non-living, or abiotic, components.

প্রভিউসার সেকেন্ডারি কনজিউমার প্রাথমিক কনজিউমার উকম্পোজার

Components of an Ecosystem

ABIOTIC COMPONENTS	BIOTIC COMPONENTS
Sunlight	Primary producers
Temperature	Herbivores
Precipitation	Carnivores
Water or moisture	Omnivores

Soil or water chemistry (e.g., P, NH_4)Detritivoresetc.etc.

Main Components: Producer, Consumer & Decomposer

Different Cycles in Ecosystem: Nitrogen (N), Carbon (C), Hydrological etc







TT 1 1 1 1 A



Figure. Marine Resource Ecology



Figura Aquatia Fonsystam

Processes of Ecosystems

This figure with the plants, zebra, lion, and so forth illustrates the two main ideas about how ecosystems function: ecosystems have energy flows and ecosystems cycle materials. These two processes are linked, but they are not quite the same



Energy transformations and *biogeochemical cycling* are the main processes that comprise the field of ecosystem ecology. As we learned earlier, ecology generally is defined as the interactions of organisms with one another and with the environment in which they occur. We can study ecology at the level of the individual, the population, the community, and the ecosystem.

Sun

Photosynthesis

Photosynthesis is the process by which organisms that contain the pigment chlorophyll convert light energy into chemical energy which can be stored in the molecular bonds of organic molecules (e.g., sugars). Photosynthesis powers almost all trophic chains and food webs on the Earth. The net process of

photosynthesis is described by the following equation: $6CO_2 + 6H_2O + Light Energy$ = $C_6H_{12}O_6 + 6O_2$ This equation simply means that carbon dioxide from the air and water combine in the presence of sunlight to form sugars; oxygen is released as a by-product of this reaction.

Green Primary Plants producers Primary Herbivores consumers Secoundary consumers Carnivores Tertiary consumers Quaternary consumers Bacteria and fungi Decomposers

River System and connectivity

- 1. Main river
- 2. Branched river
- 3. Cannel
- 4. Flood Plain
- 5.Beel
- 6. Kua (depression)
- 7.Haor

Haor Ecology







Haor Ecosystem





evsjv‡`‡ki eb I Rjvf,wgi Dci Rjevqyi cÖfve

Awa‡ekb	evsjv‡`‡ki eb I Rjvf,wgi Dci Rjevqyi cÖfve
D‡Ïk¨	t GB Awa‡ekb †k‡l AskMÖnYKvixMY- 1. evsjv‡`‡ki eb I Rjvf,wg GjvKv mg~‡ni aviYv cv‡eb; 2. Rjevqy cwieZ©b I Gi KviY mg~n Rvb‡Z cvi‡eb; 3. eb I Rjvf,wgi Dci Rjevqy cwieZ©‡bi cÖfve e [°] vL [°] v Ki‡Z cvi‡eb
mgq c×wZ	t 60 wgwbU t wcwcwc/eo `jxq Av‡jvPbv/cÖkœ I DËi

DcKiYt gvwëwgwWqv, wd¬cPvU© KvMR, wd¬cPvU© †evW©,†nvqvBU †evW© I gvK©vi|cÖwµqvt

- AskMÖnYKvix^{*}₁ wRÁvmv Kiæb Rjevqy cwieZ©b Kx? Gi KviY I cÖfve mg~n Kx Kx?
- AskMÖnYKvix^{*}i Av^{*}jvPbv^{*}K mgb¥q mvab Kiæb Ges wb^{*}zœewY©Z welqwU Zz^{*}j aiæb

Introduction

- Bangladesh is a vulnerable country to various natural disasters;
- Climate change has added an extra dimension to this vulnerability;
- The country can be the worst victim of the negative consequences of climate change and climate related natural hazards;
- Its ecosystems are also vulnerable due to the impacts of climate change;
- It is universally acknowledged that the sea level along the Bangladesh coast is rising at about 3 millimeters a year;
- The surface temperature is also in a rising trend;
- It is defiantly creating a direct threat to the millions of people of the country;
- This country is not responsible for climate change but becomes the victim of it;
- The impacts of global warming and resultant climate change are worldwide;
- At present the issue is most critical as large part of the population is chronically exposed and vulnerable to a range of catastrophe, disaster, natural hazards;
- Already, the human suffering and cost to development is massive to the country and its people who are victims of human induced global warming by the developed countries;
- Global warming and climate change have become a serious threat to the survival of biological organisms and the well being of people around the world;
- Global warming and climate change are the principle scenarios of long term effect of the natural disaster;
- Climatic hazards, including extremes like floods, cyclones, tornado, tsunami, Ayla, Lyla, storm surge, water logging, tidal bore, saline water intrusion etc are not new to Bangladesh;
- The country has a scarred history claiming many lives and resulting in losses of assets including the Sundarbans and the coastal region of Bangladesh;
- The Forests of Bangladesh are under tremendous threat due to a number of anthropogenic and natural reasons;
- In addition apprehended climate change and sea level rise together would cause adverse impacts on the remainder of the forests;
- Climate change, with the increase in temperature and sea level rise, is a real threat to the ecosystems and biodiversity of the country, especially the Sundarbans;
- Sea level rise will cause the losses of tiger habitat in the Sundarbans.

Forests

- There is an estimated 2.52 million hectare of forestland, which is about 17.08% of the total land of the country.
- Out of this total forestland 1.52 million hectare is owned and managed by Forest Department, covers both natural and plantation forest.
- Out of total forest land, 0.73 million hectares of Un-classed State Forest (USF) land is controlled by the concerned Deputy Commissioner, on the other hand 0.27 million hectares is owned privately.
- Total forest area of Bangladesh and area managed by the Forest Department is given below in Table –1 and Table-2.

Types of Forest	Area (Million Hectare)	Percentage of Total Forest Area of the country
Government Forest	1.52	10.30%
Un-classed State Forest	0.73	4.95%
Village Forest	0.27	1.83%
Total :	2.52	17.08%

Table 1 Forest Area of Bangladesh

Table 2 Forest Area controlled by Forest Department

Types of Forest	Area (Million Hectare)	Percentage of Total Forest Area of the country
Hill Forest	0.67	4.54%
Natural Mangrove Forest	0.60	4.07%
Manmade Mangrove Forest	0.13	0.88%
Sal (<i>Shorea robusta</i>) Forest	0.12	0.81%

Total :	1.52	10.30%

Forest Types

- Sundarbans Mangrove Forests
- Artificial Mangrove Forests
- Hill Forest
- Inland Sal (Shorea robusta) Forests
- Homestead forest

Wetlands & Ramsar Sites

Wetlands

- The haors, baors, beels and jheels are freshwater wetlands of fluvial origin in Bangladesh.
- An explanatory note on these local terms of wetlands is given in Appendix A.
- These wetlands are located in the floodplains and occupy four landscape units floodplains, freshwater marshes, lakes and swamp forests.
- Besides, there are about 700 rivers in Bangladesh, the estimated total length of which is 24,140 Km. The manmade wetlands including ponds, dighis and lakes are distributed all over the floodplains.

In the dialogue at international level, there is also variation in the definition of wetlands as shown below:

- 2006 IPCC Guidelines, Volume 4, Chapter 7: "Wetlands include any land that is covered or saturated by water for all or part of the year (e.g., peatlands), and that does not fall into the Forest Land, Cropland, Grassland or Settlements categories. It includes reservoirs and areas of peat extraction as a managed sub-division, and natural rivers and lakes as unmanaged sub-divisions.
- *Ramsar Convention on Wetlands*, Article 1.1: "Wetlands are areas of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters."

Explanatory Note on Local Terms of Wetland

Haors: This is a bowl-shaped depressions between the natural levees of a river subject to monsoon flooding every year. Such area mostly found in the eastern region of greater Mymenshingh and Sylhet districts, known collectively as Haor basin. Estimated total area of Haors is about 24,500 sq.km.

Baors: This type of area is also known as oxbow lake. Such land formed by dead arms of rivers. Baors are situated in the moribund delta of the Ganges in Kushtia, Jhenaidah, Jessore and Faridpur.

Beels: Beels are saucer like depressions which generally retain water through out the year and are overgrown with marsh vegetation during the dry season. e.. Chalan beel in the north western region.

Jheels: Jheels are low-lying land of perennial inundation due to water logging condition. Example of jheel is Moti jheel and hatir jheel.

True lakes: There are only three true lakes in Bangladesh. Viz. Rainkhyongkine and Bogakine in the Chittagong Hill Tracts and Ashuhila beel at the northern end of the Barind Tract.

Standard Classification of Wetlands (five major systems)

- Marine
- Etuarine
- Riverine
- Lacustrine
- Palustrine
- The total area under wetlands in Bangladesh has been variously estimated at seven to eight million hectares, which is about 50% of the total land surface.
- The areas of different categories of wetlands are given in the following Table 3.

Table 3. Types of Wetlands and their Areas (in sq km)

Rivers	7,497
Estuaries and mangrove swamps	6,102
Beels and haors	1,142

Inundable floodplains	54,866
Kaptai lake	688
Closed water	
Ponds	1,469
Baors (Oxbow Lakes)	55
Brackish-water farms	1,080
Total	72,899

Source: Akonda 1989 and Khan 1994

Akonda (1989) has also listed down the main wetlands of the country as shown in Table 4.

Table 4.	List of	Wetlands	in	Bang	adesh
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SI. No.		Area (ha.)				
1.	The Qange	The Qanges – Brahmaputra Flood Plains				
	1.a	Ata Danga Baor	-	102		
	1.b	Chalan Beel	-	26,000		
	1.c	Ramsagar	-	207.00		
	1.d	Beel Bhatia				
2.	The Haor Basin of Sylhet & Eastern Mymenshingh					
	2.a	Meda beel	-	122		
	2.b	Tangua Haor	-	1,566		
	2.c	Aila Beel	-	160		
	2.d	Dakhar Haor	-	>325		
SI. No.		Name		Area (ha.)		
	2.e	Kuri Beel	-	73		

	2.f	Erali Beel	-	320
	2.g	Dubrair Haor	-	156
	2.h	Hakaluki Haor	-	20,400 (including 4,440 ha. of beel)
	2.i	Kawadighi Haor	-	414.
	2.j	Hail Haor	-	3,643 (Dry season) 8,906 (rainy season)
3.	The Sunda	rbans (East, Sourth & West)	-	577,100
4.	Char kukri-Mukri		-	2,500
5.	Wetlands in Pablakhali Wildlife Sanctuary (Sanctuary area)		-	42,087
6.	Kaptai Reservoir		-	76,600
7.	Bostami Pond		-	0.50
8.	Bogakine lake		-	60
9.	Chokoria Sundarbans		-	20,000
10.	Teknaf Peninsula & the Naaf Estuary		-	16,000
11.	St. Martin's Island and Reef		-	600
12.	Hatiya Island & Neighbouring Chars		-	75,000

Source: Akonda 1989.

Ramsar Sites:

- Ramsar sites are designated wetlands of global importance.
- Wetlands with significant ecological characteristics are listed as Ramsar Site.
- Sundarbans and the Tanguar Haor are the two Ramsar sites in Bangladesh.

Sundarbans Reserve Forest (SRF)

 Sundarbans Reserved Forest has been declared as the 1st Ramsar Site of Bangladesh in 21 May 1992 and enlisted as 560th Ramsar Site of the world. • This is a unique forest ecosystem of global significance. Total area of this wetland is about 601,700 ha.

Tanguar Haor

- Tanguar Haor is the 2nd Ramsar Site of Bangladesh and designated as 1031st Ramsar Site on 10 July 2000.
- Total area of this wetland is about 9500 ha. and located in the district of Sunamganj.
- Range of elevation of this area is between 2-5 m.
- Tanguar Haor supports a significant number of rare and vulnerable species, including plants, birds and fish;
- 10 IUCN Red Data Book listed species and 22 CITES listed species are found here.
- Tanguar Haor annually supports 30,000-40,000 waterfowl, and occasionally as many as 60,000+ have been recorded in the area.

Climate Change

- According to the IPCC usages, climate change refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer.
- It refers to any change in climate over time, whether due to natural variability or as a result of human activity.
- The World Meteorological Organization (WMO) recommends 30 years as the minimum period for averaging these variables to ascertain variability (WMO 2003).
- Climate change is now a reality (Adger et al. 2005) and impacts of climate change and variability have become more and more evident in various forms in the world (Minura 2010).
- Anthropogenic activities are the main drivers in accelerating climate change.
- Bangladesh is one of the most climate vulnerable countries of the world.
- Rising global temperatures are likely to increase the frequency and intensity of cyclones in the Bay of Bengal as well as monsoon rainfall, resulting into catastrophic floods in the Ganges-Brahmaputra-Meghna Basin
- Sea level rise and consequent coastal flooding and saline intrusion in the coastal lands are serious threat.
- Such impact likely effects the livelihoods of millions of people of Bangladesh.

UNFCCC

The United Nations Framework Convention on Climate Change (UNFCCC) was formed at the UN Conference on Environment and Development (UNCED) held in Rio in 1992. The objective of the convention is expressed in Article 2 of UNFCCC. The objective that is expressed in article 2 is:

...stabilization of greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame **sufficient to allow ecosystems to adapt naturally to climate change**, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner (Smit et al. 2000). The UNFCCC was adopted in 1992 and entered into force two years later (Yamin & Depledge 2004).

Ratification Status of Bangladesh for UNFCCC and Kyoto

Climate Change Convention

Date of signature:	09 June 1992
Date of ratification:	15 April 1994
Date of entry into force:	14 July 1994
<u>Kyoto Protocol</u>	
Date of signature:	
Date of ratification:	22 October 2001
Date of entry into force:	16 February 2005

Causes of Climate Change

- A number of climatic and non-climatic drivers have been identified by IPCC to understand the causes of climate change. Rising concentration of CO₂ and resulting Green House Gas effect is the most important issue in climate change convention.
- Change of temperature and precipitation are the most sensitive climatic drivers as identified by IPCC.

Observed Trends of Climate Change for Asia and Bangladesh

- Increased frequency and occurrence of more intense rainfall events in Asia causing sever floods, landslides and debris and mudflows.
- An increase trend of 1°C in May and 0.5°C in November has been observed in Bangladesh during the period from 1985 to 1998.
- Decadal rain anomalies above long term average since the 1960s has been observed in Bangladesh.

- The frequency of monsoon depression and cyclone formation in the Bay of Bengal and the Arabian Sea has been on the decline since 1970, while the intensity is increasing causing sever floods: Serious and recurrent floods have been observed in 2002, 2003, 2004 and 2007.
- Increase of salinity intrusion in coastal area as mentioned by NAPA.

Table 5. Bangladesh

Year	Temperature Change (°C) Mean (Standard Deviation)			Rainfall Change (%) Mean (Standard Deviation)		
	Annual	DJF	JJA	Annual	DJF	JJA
Baseline Average 2030	1.0(0.11)	1.1(0.18)	0.8(0.16)	3.8(2.30)	-1.2(12.56)	+4.7(3.17)
2050	1.4(0.16)	1.6(0.26)	1.1(0.23)	+5.6(3.33)	-1.7 (18.15)	+6.8(4.58)
2100	2.4(0.28)	2.7(0.46)	1.9(0.40)	+9.7(5.8)	-3.0(31.6)	+11.8(7.97)

Note: DJF represents the months of December, January and February for winter and JJA represents the month of June, July and August for monsoon. Source: Agrawala et al 2003.

Common Trends of Climate Change

- Increasingly frequent and sever tropical cyclones
- Heavier and more erratic rainfall resulting into
- Heavier river flow
- River bank erosion
- Increased sedimentation
- Melting of the Himalayan glaciers
- Lower and more erratic rainfall
- Sea level rise
- Warmer and more humid weather

Impacts of Climate Change

Impacts on Forest

- Ravindranath (2007) has made an effort to explain the possible impacts of climate change on Forest.
- Taking insights from his interpretation, here an effort is made to find the climate change impacts on Forest in Bangladesh.
- Forest ecosystem is very important for the environmental sustainability and to provide ecosystem services to the million of poor people in Bangladesh.
- Among different services production of food, timber, non-timber products are direct benefits from the forest.
- Watershed protection and soil water conservation are indirect benefits from this forest.
- Disruption of this ecosystem services will significantly impact the livelihoods of local people, national economy and global environment.
- Forest ecosystems are now subject to a number of pressures due to anthropogenic activities such as land-use change, harvesting, grazing by livestock, fire, introduction of exotic species, and intrusion of alien species and natural hazards caused by climatic extreme events and variability.
- Climate change constitutes an additional pressure that could change or endanger these ecosystems.
- Modeling studies have already show potential disruption of ecosystems under climate change.

The AR3 of the IPCC (2001) has summarized some of the potential impacts of climate change on the forest ecosystems and are given below:

- Populations of many species that are already threatened are expected to be placed at greater risk by the synergy between the stresses of changing climate and land-use change that fragments the habitats.
- The latest vegetation distributional models suggest that mass ecosystem or biome movement is most unlikely to occur due to different climatic tolerance of the species involved, different migration abilities and the effects of invading species.
- Species composition and dominance could be altered, resulting in ecosystem changes.
- Some species that are currently classified as "critically endangered" could become extinct, without adaptation.
- Terrestrial ecosystems appear to be storing increasing quantities of carbon. Productivity gains are occurring due to changes in climate parameters as well as changes in uses and management of land.
- Global timber market studies that include adaptations through land and product management suggest that climate change would increase global timber supply and consumers will benefit from lower timber prices, while producers may gain or lose depending on regional changes in timber productivity and potential dieback effects.
- In arid or semi-arid areas (dry forests, woodlands and rangelands) where climate change is expected to decrease the available soil moisture, biomass productivity is expected to decrease.

- Forests or heathlands will replace some wetlands, and those overlying permafrost are likely to be disrupted as a result of thawing of permafrost.
- Though there are uncertainties with respect to projections of climate change impacts on forest ecosystems, evidence is growing to show that climate change, coupled with socioeconomic and land use pressures, is likely to adversely impact forest biodiversity, carbon sink, biomass productivity or carbon uptake rates, livelihoods of forest dependent communities and economies.

Impacts on Wetlands

- Wetlands are most sensitive ecosystems to the impacts of climate change.
- Wetland ecosystems are the most productive landscape units and provide a wide range of goods and services.
- Wetland ecosystems harbor extensive biodiversity, function as filters for pollutants, and are important for carbon sequestration and emissions.
- Rivers and streams transport water and nutrients from the land to the oceans and provide crucial buffering capacity during droughts especially if fed by mountain springs and glaciers.
- Lakes serve as sediment and carbon sinks and provide crucial repositories of information on past climate changes.
- Changing context of natural hazards has impacts on wetlands due to the direct effects of rising temperature and increasing concentration of CO₂ to the indirect effects caused by changes in the regional and global precipitation (IPCC 2007).
- Aquatic plants will disappear due to fluctuation of temperature and change of water table. These plants are climate sensitive.
- Productivity of wetlands will be reduced
- Siltation may take place due to excess run-off caused by heavy rain.

Impacts on Wetlands in Bangladesh

- Flooding
- Salt water intrusion
- Change in river morphology
- Loss of water body
- Coastal zone inundation
- Draught and low flow (NAPA 2005)

Response Options to Climate Change

- **Mitigation of Climate Change and Adaptation to Climate Change** are two fundamental response options to the risks posed by anthropogenic climate change.
- Risk refers to a combination of the magnitude of the potential consequence (s) of climate change impact (s) and the likelihood that the consequence (s) will occur.

- Mitigation refers to limiting global climate change through reducing the emissions of greenhouse gases (GHGs) and enhancing their sinks
- while adaptation primarily aims at moderating the adverse effects of un-avoided climate change through a wide range of actions that are targeted at the vulnerable system.
- Mitigation and adaptation have been considered separately in the global negotiations as well as literature.
- There is a realization on the need to explore and promote synergy between mitigation and adaptation while addressing climate change.
- There is potential synergy between mitigation and adaptation while considering forest and wetlands, which on the one hand is projected to be adversely impacted under the projected climate change scenarios and on the other provide opportunities to mitigate climate change.

Conclusion and Recommendation

- Adaptation measures are required to address the potential adverse impacts of climate change on forest and wetland ecosystems.
- Similarly mitigation measures should be undertaken to minimize these adverse impacts of climate change. Protection, conservation and management of forest and wetlands are potential area to address climate change and its impacts.
- It is necessary to explore the possibility of incorporating adaptation practices into mitigation programmes and projects, to reduce vulnerability and enhance resilience of forests and wetlands.
- Currently, there is inadequate knowledge about the potential synergy between mitigation and adaptation, particularly in biological sectors such as forests and wetlands.
- Thus, there is a need for research and field demonstration of the linkages and synergy between addressing climate change impacts through adaptation and mitigation measures.
- The synergy is very critical to biodiversity rich diverse forest ecosystems and wetlands of the country.
- Even the IPCC Assessment Reports so far have not addressed the issue of linking mitigation and adaptation strategies and practices, which also can be referred to the lack of scientific knowledge.
- Promotion of synergy between mitigation and adaptation will also advance sustainable development.
- All the examples of adaptation practices in mitigation projects, such as forest and biodiversity conservation, are also strategies to promote sustainable development, even in the absence of climate change concerns.

- Many of the mitigation projects of forestry indeed reduce vulnerability and promote adaptation, for example; forest and biodiversity conservation, protected area management and sustainable forestry.
- Also, many adaptation options such as social forestry, soil and water conservation and drought resistant varieties also contribute to mitigation of climate change.
- Thus, there is need for research and field demonstration of synergy between mitigation and adaptation, so that the cost of addressing climate change impacts can be reduced and co-benefits increased.



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Co-Managing Landscapes of Forests and Wetlands for

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Co-managing Landscapes of Forests and Wetlands for Climate Change Mitigation and Adaptation

Himalayan-Hindukush landscapes, with Tibet Plateau as the topmost headwaters comprising permafrost, glaciers and lakes, comprise mega watersheds of socio-economic and ecological importance to sub-continental countries including Bangladesh. They are sources of important perennial rivers, originating from glaciers and watersheds, which before flowing into Indian ocean including the Bay of Bengal, lead to huge river basins and deltas that inhabit large but mainly impoverished population with great socio-economic and ecological dependence on natural resources including forests and waters.

Gravity movement of huge waters through fragile mountains in the process provides on the one hand life support system to local population but on the other hand entails to them great risks of disasters that are largely water-induced (e.g. excess run off resulting in flood and flash flood, deficient run off resulting in droughts and salinity, landslides river ban and embankment erosion, siltation, bridge/culvert damage, debris flow, etc.). Climate change adaptation is mainly a peoples' function and so the risks stemming from climate change can largely be reduced by establishing gainful partnerships with local people who are organized to engage in co-managing forest and wetland ecosystems which have traditionally been managed by various government agencies.

Landscape collaborative management – or co-management – is defined as a situation in which two or more social actors or groups negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for an identified landscape endowed with a set of natural resources on which local community has livelihood dependence. An equitable sharing of benefits and costs of an ecosystem's protection and management among the stakeholders is, therefore, an important aspect of landscapes comanagement.

A landscape of terrestrial and/or acquatic ecosystems may be co-managed for a variety of reasons including biodiversity conservation and wilderness protection, preservation of species and genetic diversity, maintenance of environmental functions and services, protection of specific natural and cultural features, tourism and recreation, education, sustainable use of

natural resources, provision of wetland- and forest-based livelihood to local people, maintenance of cultural and traditional attributes, etc. The protection and conservation of the ecosystems comprising forests and wetlands are particularly important in view of significant loss of natural forests and wetlands in the landscapes of Bangladesh where adverse impacts of climate change are already visible.

Bangladesh's economy is primarily agrarian and so the well being of local people and the stability of life support systems depend on landscape co-management of natural resources including forests and wetlands. The traditional and community-based forest and wetland resources use systems, which gave way to centralized government systems during colonial times, are now increasingly being evolved in favor of landscape co-management. The government have enacted empowering policies and legislations, and also have established appropriate community institutions for co-management of forests and wetlands.

The country's terrestrial and aquatic ecosystems that are densely populated by poor have limited future prospects without the cooperation and support of local community. New relationships and arrangements are being evolved between ecosystem managers and local stakeholders as a co-management approach of landscape management is increasingly institutionalized under IPAC and other projects. As a result, conservation benefits to local stakeholders have started flowing in those protected areas where co-management practices are being currently operationalized.

Co-management practices have been implemented in forest and wetland ecosystems that have been accessible to local communities as common pool natural resources for their livelihoods. The future success of landscape co-management would depend on successfully implementing such lessons in establishing gainful partnerships with key stakeholders, who are empowered by enacting and implementing enabling policies and institutions. Socio-environmental functions and services from forest and wetland ecosystems need to be adequately publicized in order to be appreciated by policy makers and implementors.

Putting in place relevant institutional and financial mechanisms, and sustainability tools are equally important. Establishing water sanctuaries in identified watersheds that provide protection to forests for provision of regular water yield and other socio-ecological functions and services to local community will be helpful. Earmarking water sanctuaries will help in *in-situ* biodiversity conservation, and also for checking loss of forestland and wetland and control of degradation of vegetation cover and water bodies. In this process climate change mitigation and adaptation functions of both forests (green carbon) and wetlands (blue carbon) ecosystems will be strengthened by following a landscape co-management approach.



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Eco-Restoration of Wetlands and Forests: A Case Study of Chunoti Wildlife Sanctuary

Forest and Ecosystem

Bangladesh has 2.53 million hectares of forest lands. It includes 1.40 million hectares of tropical evergreen and semi-evergreen forests in the hilly regions in the east and south-east of the country (Hill forests), 0.74 million hectares of mangrove and coastal forests in the south, 0.12 million hectares of deciduous forests in the central and northern regions and 0.27 million hectares of homestead forests scattered all over the country. Out of the total 1.53 million hectares are under the administrative control of the Bangladesh Forest Department. The rest 0.73 million hectares of forests in the Chittagong Hill Tracts, the Un-classed State Forests, are managed by the district civil administration and the homestead forests are owned by private individuals.

From the zoo-geographical point of view Bangladesh is at the junction of the Indo-Himalayas and Indo-China sub-regions, one of the few countries where the species of two bio-geographic realms overlap. Because of its geographic location at the eastern end of the Indian subcontinent, Bangladesh is a transitional zone for the flora and fauna of the subcontinent and that of south-east Asia. The country, with its warm and humid climate, forms diverse ecosystem which support rich biodiversity. Bangladesh is a home of 1952 species of invertebrates. Among vertebrates, 653 fish species are recorded (3% of world's total fish species) of 251 are freshwater fishes, 402 are estuarine and marine fin fish including sharks and rays. Thirty-six

species of amphibians and 154 species of reptiles are also recorded in Bangladesh. A total of 690 bird species have been recorded (7.2% of the world's total species) of which 380 species are resident, 209 winter visitors, 11 summer visitors and 90 vagrants. One hundred twenty-one species of mammals (2.6% of the world's total species) are found in Bangladesh of which 5 are marine mammals.

Recent finding shows Bangladesh supports a total of 3611 species of Angiosperms and 7 Gymnosperms with a total of 300 Cyanobacteria, 1988 Algae, 248 Bryophytes and 195 Pteridophytes. At least 1000 species of forest plants are economically important; of these about 400 are considered tree species and about 450 as medicinally important. About 50 tree and about 100 shrubs and herbs are viewed as commercially important.

Wetlands of Bangladesh also support a large number of wild animals of the country. Nearly 50% (eight million hectares) of the total land surface of the country are considered as wetland which includes rivers, natural lakes, freshwater marshes, baors, beels, ponds, estuarine areas and mangrove forests.

Protected Area and Causes of Depletion:

In Bangladesh protected area (PA) covers only 10.7% of the total forest area of the country and only 1.82% of the total land area. Wildlife Act 1974 (Preservation) (Amendment) provides the legal framework for PAs in Bangladesh. Bangladesh is a signatory of Convention on Biological Diversity (CBD); and many international conventions and protocols. Hence, Bangladesh has a total of notified 34 PAs until today. The PA's have been designated wildlife sanctuaries, and national parks. The PAs fall mainly under IUCN categories IV, V and VI and are managed by the Forest Department.

The existing PAs are the remnants of luxuriant natural forests that once existed and serve as the last strongholds of most of the charismatic wildlife of the country. However, most of the PAs are very small and disturbed with lack of sufficient management. The main drivers threatening PAs are high population and poverty. Illegal harvesting; encroachment and shifting cultivation are the important problems in forest land use in Bangladesh. In Bangladesh, individual offences related to illegal harvesting are mostly for fuelwood, home, and farm implements or for the sale of goods in the market for personal daily livelihood requirements. The other factors responsible for degradation include but are not limited to lack of awareness, lack of clear land tenure and inadequate capacity to manage isolated PA system.

Forest Management: Paradigm Change

Bangladesh's forest has disappeared over 50% in the last 30 years and today the forest including PAs are critically threatened. If the trend of degradation continues then many unique flora and fauna will be lost forever from this country. Considering the alarming situation a change in forest management has been well adopted. Beside timber production present forest management is concerned to address habitat for wildlife, biodiversity, eco-tourism etc.

Involvement of local community in all aspect of forest conservation is also a major shift in comparison to the past management philosophy.

Some new forest management systems are also added to address new concept in forest management such as agro-forestry, homestead plantation, strip plantation, participatory forestry on encroached forest land, conservation area management to preserve wildlife habitat and biodiversity. Some of them are briefly described here:

a. Agro-forestry

As a concept, agro-forestry is not new in forestry practice. Forest Department has been practicing this in the name of Tangya in the hill forest for last 100 years. But as a science for natural resource management, it is new. Agro-forestry as the name implies is the practice of growing agriculture and forestry one the same land at same time to optimize the land utilization. In the plain land forest i.e. in Sal Forest, Forest Department is practicing this system for decades together on a participatory approach to replant the barren forest land and after harvest, a share will go to the participating members. This is a multipurpose approach to replant barren land with the help of participants and protect it by them to build up forest resources.

b. Participatory Forestry/ Social Forestry

In a developing country like Bangladesh the main thrust is to improve the living standard of the people who are living below poverty level. Participatory forestry practice is based on that theme. In this country, population density is very high and pressure on forest is enormous. Traditional protection measures are inadequate to protect the forest. Foresters and sociologists are advocating for the involvement of people for the management of forest on participatory basis and this is the sole approach that will be able to protect the forest land in this country.

This practice is working well in this subcontinent where population densities are high. In strip plantations, this practice is found successful. Now, this practice is intended to apply for managing the encroached and degraded forest land.

c. Co-management

To arrest the continued degradation, Nishorgo Support Project (NSP) was started with the financial support from USAID in 2004 with an aim to develop collaborative management (comanagement) approach by the collaboration of different stakeholders to lead measurable improvements in forest and resource conservation in the PAs and their buffer zones. Under this system of management, the dwellers living within and around the forests were involved in protection of PAs with consequent sharing of benefit arising from the PAs as well as through supporting their capacity building in other income generating activities. For management of PAs, all stakeholders of the localities were involved through formation of co-management council and co-management committees.

Eco-restoration

By definition true restoration involves, "the return of an ecosystem to a close approximation of its condition prior to disturbance". Some defined forest restoration as "the process of restoring a forest to its original state before degradation (same functions, same structure, and same composition)".

The problem of defining restoration objectives in this way results from the widespread difficulty in defining such a state with precision, because (1) forest ecosystem is dynamic, (2) the lack of historical information, (3) cultural values of nature and the views of different stakeholders have increasingly been incorporated into restoration objectives.

Core Forest Restoration

Principles Sound forest restoration requires an integrated, multi-disciplinary approach rooted in conservation biology and ecosystem restoration that includes preserving and protecting intact landscapes (particularly those that serve as reference or baseline conditions); allowing the land to heal itself; and, where necessary, helping it to do so through active restoration.

a. Ecological Forest Restoration Core Principle

Enhance ecological integrity by restoring natural processes and resiliency.

Effective forest restoration should have as its primary objective the reestablishment of fully functioning ecosystems. Ecological integrity can be thought of as the "ability of an ecosystem to support and maintain a balanced, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats within a region". A restoration approach based on ecological integrity incorporates the advantages of historical models while recognizing that ecosystems are dynamic and change over time. This is fundamental to the development of restoration approaches and is the core principle central to all related principles and criteria.

b. Ecological Economics Core Principle

Develop and employ the use of economic incentives that protect or restore ecological integrity.

Intact forest ecosystems provide the natural capital, including clean air and water, upon which all life and all human economies ultimately depend. Restoration of healthy ecosystems is an investment in regaining the natural capital that has been diminished by decades of forest degradation. An economic and institutional framework that fully accounts for this non-market ecological service should be created in order to recognize the value of intact ecological systems and to guide restoration efforts. As such, sound restoration must balance achieving restoration

goals with the cost of restoration, while giving priority to ecological effectiveness. However, because ecologically sound forest restoration is a long-term natural process that will not always provide short -term benefits and may not pay for itself, a time frame for economic analysis must be used that recognizes the long-term benefits of restoration (for example, clean water, restored fire regimes) often must take precedent over concerns regarding efficiency. Therefore, economic incentives that drive the degradation of forests must be replaced with restoration incentives that protect and restore ecological integrity.

c. Communities and Work Force Core Principle

Make use of or train a highly skilled, well-compensated work force to conduct restoration This approach has the potential to support the long-term viability of communities within the capacity and resiliency of forest ecosystems, while fostering a culture of environmental sustainability. A highly skilled, well-compensated work force is essential for restoration to meet high ecological standards. Building the restoration economy requires a commitment to regional training capacity (multi jurisdictional and inter disciplinary), skill certification, consistent funding over decades, and assuring workers' rights to organize and bargain collectively.

Chunoti Wildlife Sanctuary: Community collaboration and restoration approach

Chunoti Wildlife Sanctuary (CWS), located (21°40' North latitude and 92°07' East longitude) in the country's south-eastern region, falls within Banskhali and Lohagara Upzilas of Chittagong District, and Chakoria Upzila of Cox's Bazar district. The PA was established in 1986 and covers 7764 ha in Chittagong and Cox's Bazar districts, southeast Bangladesh where two comanagement councils and committees were established through NSP in August 2005 (Chunoti range) and August 2006 (Jaldi range). About a quarter of the area is under rice cultivation, and only about 1% is reported to be remnant native forest. The vast majority of the PA comprises of secondary growth, scrub and extensive areas of sun grass, including some areas where plantations of exotic trees were tried. Until the mid 1980s, when the PA was declared, much of this area still comprised of evergreen forests, but there was extensive logging and encroachment since that time. This accelerated when settlers moved into the area after the 1991 cyclone. By 2003 it was probably the most degraded PA in Bangladesh in terms of habitat and biodiversity. About half of the many villages and neighborhoods using the PA are located within the PA. While it is clear that many people live within the PA boundary, the actual number is uncertain with estimates of 15,000people living within the PA, or of 7,800 households (over 40,000 people) living in or adjacent to the PA and heavily dependent on it. Over 60% of these households are considered to be very poor, most make use of the PA to collect bamboo, firewood and sun grass, but they also collect fruits and hunt. Many households adjacent to the PA are involved in betel leaf cultivation and this has encroached into the PA. However, a major use is for the rice cultivation and some households have documents indicating that they were given rights to land in the PA as part of settlement of landless people by the district administration.

In, 2003, the forest co-management project, named Nishorgo Support Project (NSP) was launched as an undertaking of the Forest Department of Bangladesh together with support from USAID. Five forests of PA were included under this project at Northern and South-eastern of Bangladesh. The overall goal of the NSP is to enhance biodiversity conservation in the target protected areas through the active and formal involvement of the local communities dependent on forest resources. Two CMCs were formed in the PA separately under two ranges namely Chunoti and Jaldi.

We therefore, propose that the explicit aim of the proposed restoration project at Chunoti should simply be to restore to the extent possible that provides an improved habitat for wildlife and restoration of biodiversity. This pragmatic objective has the advantage of enabling progress to be evaluated relatively easily. Given such an objective, ecological restoration can be most readily achieved by recreating forest cover in areas that have been completely deforested, or by rehabilitating degraded forest ecosystems.

Approaches: There are several approaches to restoration. One such approach applies the ecological succession theory where the degraded area is left undisturbed to regenerate naturally. However, this will take years to regenerate and at the initial stages the pioneer plant life will not support wildlife of various kinds. As generally pioneer species offer limited food for the wildlife.

The alternative approach is to create plantations. The approach mostly recommended is "framework species method". In this method 20-30 pioneer and climax species are carefully selected based on some criteria then planted to attain the basic structure and functioning of forest ecosystems. Subsequently, biodiversity is restored when the planted framework trees attract seed-dispersing animals into planted sites. This approach was found practical and successful in other countries like tropical forests of Northern Thailand and Queensland, Australia.

Biodiversity Restoration Initiatives

This PA has been seriously degraded to meet demand of forest resources by the neighboring people. By conserving forests and developing plantations in Chunoti, forest landscape degradation can be halted, biodiversity and water conserved *in-situ*, and reforestation needs met by utilizing surplus labor. The reforestation activity would help restore the severely degraded forest of the sanctuary and also generate income locally from the sale of carbon credits.

The essential ecological characteristics of framework tree species are:

- \rightarrow high survival when planted out in degraded sites;
- \rightarrow rapid growth;
- → dense, spreading crowns that shade out herbaceous weeds and flowering and fruiting, or provision of other resources, attractive to wildlife, at a young age.
In the seasonally dry tropics, where man-made fires are frequent hazard (hills are burned to enhance regeneration of Sun grass in this locality), an additional desirable characteristic of framework species is resilience to burning. When fire prevention measures fail, the success of forest restoration plantings can depend on the ability of the planted trees to re-sprout from their rootstock after fire has burnt their above-ground parts (i.e. coppicing).

The essential nursery characteristics of framework species include:

- \rightarrow reliable seed availability;
- → rapid and synchronous seed germination and production of healthy seedlings in containers, preferably to a plantable size (40-60 cm) in less than 1 year. High quality seedlings important, as they have the best chance of surviving in hostile deforested environments.

Trees that showed better performance in the nursery will be planted out in the field. Planting need to be carried out with the participation of the local communities and the species should have ability to shade out weeds. An essential characteristic of framework tree species is attractiveness to seed dispersing wildlife. Various silvicultural treatments, to enhance performance of the planted trees are needed to be done. These included different weeding methods, mulching and fertilizer application regimes.

Upper Canopy			_	
Species	Sceintific Name	Common Name	Туре	Light demand
	Dipterocarpus turbinatus	Garjan	Deciduous	shade bearing in youth
	Tetrameles nudiflora	Tula	Deciduous	
	Dillenia pentagyna	Hargoza	Deciduous	light demander, late successional
	Bombax malabaricum / B.			
	ceiba	Simul	Deciduous	strong light demander
	Bombax ingigne	do	do	do
	Albizia lebbek	Koroi	Deciduous	light demander
	Albizia stipulata	Chakua Koroi	Deciduous	moderate shade
	Albizia procera	Sada koroi	Deciduous	stand moderate shade, light demander
	Artocarpus chaplasha	Chapalish	Deciduous	moderate shade, late successional
	Eugenia jambolana /			
	Syzygium cumini	Kala Jam	Evergreen	moderate shade
	Syzygium grandis	Dhaki Jam	Evergreen	light demander
	Eugenia operculata /			
	Syzygium operculatum / S.			
	mervosum		Evergreen	light demander
	Eugenia jambos / Syzygium			
	jambos	Gulap jam	Evergreen	moderate shade
	Lophopetalum fimbriatum	Raktan		

List of a few species of different canopy classes are given below:

	Duabangal sonneratioides	Ramdala	Deciduous (?)	light demander, early successional	
	Talauma phellocarpa	Tilsundi			
	Chickrassia tabularis	Chickrasi	Evergreen	light demander	
	Cinnamomum cecidodaphne	Gondroi	Evergreen		
	Amoora wallichii	rata, or pitraj			
	Alstonia scholaris	chhatim	Evergreen	moderate light (50-70%)	
	Mesua ferrea	Nageswas	Evergreen	strong shade bearer	
	Gmelina arborea	Gamar	Deciduous	light demander	
	Terminalia belerica	Bahera	Deciduous	light demander, stand shade in youth	
	Terminalia chebula	Haritaki	Deciduous	light demander, stand shade in youth	
	Amoora rohituka / Dysoxylum				
	hamiltonii	Pitraj	Evergreen	shade bearing in youth	
Lower Canopy	Phyllanthus emblica	amloki	Deciduous	light demander	
	Bauhinia variegata	Kanchan	Deciduous		
	Cordia dichotoma / C. myxa	Kalaujha, Bohal	Deciduous	moderate shade	
	Dillenia indica / D. speciosa	Chalta	Evergreen	shade bearer	
	Erythrina indica / E. variegata	Mandar	Deciduous	light demander	
	Protium serratum / Bursera		Evergreen or		
	serrata	Neur, Heru	semi	strong light demander	
	Vitex peduncularis / V. alata	Awal	Deciduous		
	Stereospermu personatum /	Pahari			
	S. chelonoides	Awal/Dharmara	Deciduous		
	Anthocephalus chinensis / A.	Kadam	Dociduous	oarly shado, later light	
		Kauaili	Deciduous	moderate chade	
	Sanium baccatum / S	Kallal ullga	Decladous		
	sebiferum	bolos	Deciduous ?	moderate shade	
	Ficus bengalensis	Bot	Evergreen		
	Ficus hispida	kak-dumur	Evergreen	moderate shade	
	Ficus clavata		Evergreen		
	Artocarpus lacucha	Dewa	Deciduous	vouth-shade, later light	
	Engelhardtig spicata	Kaimula	Deciduous		

Plantations of different forms and species have been raised in the core areas of the PA. Many of those were also raised with a single species i.e. *Acacia*. First a few years plantation shows luxuriant growth but subsequently fails due to lack of proper maintenance and participation by the communities. With the introduction of people's participation in the plantation activities a change is being apparent now. Plantation in the Chunoti and Jaldi Range has been raised so far is given below:

Plantation raised in the PA from 2002 to 2011 (including Nishorgo Support Project) is approximately 2,228 ha. Plantations other than NSP are mostly with *Acacia*.

Plantations raised under Nishorgo Support Project from 2005 to 2009:

Buffer	Enrichment	Natural	Fruit 8	Š	Fodder	Coppice	Total
zone		regeneration	fodder			maintenance	
343.71 ha	126.66 ha	58.86 ha	127.30 ha		15.00 ha	20.00 ha	691.53

Conclusion

Chunoti was once heavily degraded due indiscriminate resource extraction. Eco-restoration of a severely degraded site is always a challenge. Species selection should be done very carefully so that it can meet all the criteria to restore biodiversity and need for wildlife. Eco-restoration can never be achieved within a short span of time. A long term vision and plan can be drawn keeping in view the species interaction, viability, and durability to withstand adverse condition. Village community organized under co-management should be more actively involved in every step of plantation activities to ensure strong participation.



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Baikka Beel

- 1. Jaduria beel : 48.79 ha
- 2. Chapra Maguraduria beel : 8.86 ha
- Bora Gangina Khal : 5.485 ha
- Bora Gangina (Barakandi) :6.223 ha

MACH-IPAC: Goal, Activities and Achievements

Goal: Demonstrate environmentally sound community management of wetland resources (fisheries and other wetland products) for the sustainable supply of food to the poor of Bangladesh.

Co-management efforts are taking shapes

- MACH/
- IPAC







Problems Identified before MACH started:

- > Water scarcity in dry season
- Loss of biodiversity
- Blocking of linkage among haor, river, cannel, Floodplain and Beel
- Siltation
- Excessive fishing pressure
- Use of destructive fishing nets and gears
- Destruction of forest/trees
- Soil erosion in hill



Key Activities

- Environmental Awareness
- Wetland Co-Management
- Resource Management Organizations/Local government
 - Community Development
 - Resources User Groups
- Habitat Restoration
- Sanctuary creation
- Policy
- Pollution abatement
- Resource Monitoring
- Communication Materials Development

Proven Approach and Good Practices of MACH – 1

- Site Assessment, Stakeholder Identification and Participatory Action Plan Development
- Formation and training of Resource Management Organizations (RMOs) – access to leases
- Formation and training of Resource User Groups (RUGs) access to AIG, credit
- Inclusion of women members in RMOs and RUGs
- Institutional linkages with UP, UZ and wider forum
- Awareness building on wetlands / fisheries management





Proven Approach and Good Practices of MACH – 2:

- Establishment and management of sanctuaries
- Periodic ban on fishing (breeding season)
- Local controls and enforcement to stop use of destructive fishing gear
- Conflict resolution at the community level
- Habitat restoration through re-excavation and plantation



- Re-introduction and conservation of threatened fish species
- Contour planting of crops on hill slopes of watershed

Conservation in Baikka Beel

- 100 ha set aside as a sanctuary by Ministry of Land (2003).
- Responsibility Baragangina Resource Management Organization.
- Area selected and management plan developed through participation of all stakeholders.
- Supervision from local government (UFC).
- All fishing and hunting banned.

Baikka Beel Sanctuary







- Visitor fees and endowment fund cover costs.
- Benefits whole 13,000 ha haor by replenishing fishery.





- Reserve fishing rights in public water bodies for RMOs;
- Support for alternate livelihoods for poor through FRUGs.

Impacts

- Fish diversity increased, 3 locally rare species restored
- Natural breeding ground of Chital established
- Fish catches increased by 88% from 1999 baseline
- Fish consumption increased by 25-36%
- Revolving loan funds reduced dependence of 5,200 households on fishing by 2/3rds
- By 2006 a 24% increase in use value of the haor (largely from fish)

Lessons

- **Responses from Ecosystems** good, quite quick rejuvenating and functioning, providing benefits and services
 - Improved quality and quantity
 - Increased fish yields
 - Higher biodiversity

- Ecological richness
- **Responses from Communities** coming out from confusion to clarity responding favorably, taking responsibilities, transforming from wetlands NRM to local dev. issues
 - Removed barrier bunds from rivers,
 - Managing the national sanctuary
 - Influence local decision making processes
 - Taking part in local water management issues
 - Facilitating pro-poor NRM at local levels
 - Practicing adaptive learning joining national CBO networks
- **Responses from Policy Stakeholders** varied responses, gloomy and window of hope...
 - Mandate & territoriality issues among the Ministries & agencies
 - Appreciating project's successes, but slow/ reluctant to internalize the good practices /lessons
 - MoL (owner of wetlands) is not in the scene
 - DoF has little/ no role in LGED, BWDB, DAE, DOE projects in wetlands
 - Climate change impacts on wetlands getting less priority
 - Interests and capacity of MoFL and DoF are rising
 - Understanding of MoEF and DoE are rising
 - District administration assisting/favoring co-management
- Facilitating Social Change: Conservation practices changing traditional resource use systems/patterns and facilitating grass roots democracy around NRM and local development issues (new issues in village courts)
- **Facilitating Critical Consciousness:** CBOs developing conservation norms and rules based on their local situations and influencing others to follow
- **Building Capacity:** Capacity to challenge autocratic CBO leaders, influence local government decisions
- **Facilitating Collective Action:** Influencing policy through joining wider networks (all projects through new initiatives ALN, RIUP).

Lessons: Transformative growth of CBOs





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