

Nature-based Solutions in Bangladesh: evidence of effectiveness for addressing climate change and sustainable development goals

Supplementary information

Contents

1	Search and screening process.....	1
2	Coding template guidance.....	4
3	Guidance	11
4	Major NbS initiatives in Bangladesh	20
5	Positive outcomes for each type of intervention: robust evidence only	24
6	How NbS can contribute to the Sustainable Development Goals (SDGs)	25

1 Search and screening process

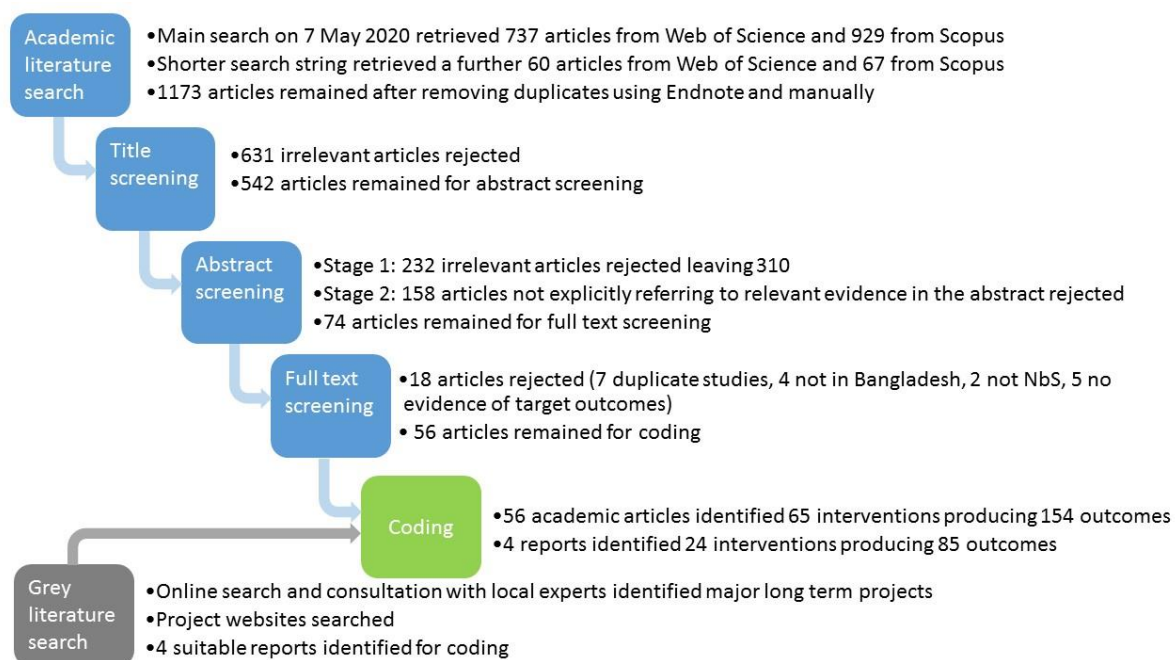
Table S1. Search strings used for the academic literature search and number of articles screened at each stage

Category	Terms
Intervention terms	TS=(“nature-based solution*” OR “nature-based approach” OR "ecosystem approach*" OR "ecosystem-based" OR "community-based" OR "disaster risk reduction" OR (natur* NEAR/1 (solution* OR approach*)) OR "no-regret" OR “natural flood management” OR (infrastructure NEAR/1 (green OR blue OR “green-blue” OR “blue-green” OR natural OR ecological)) OR (integrated NEAR/2 management) OR "natural resource management" OR (management NEAR/1 (traditional OR protected OR coast* OR river OR wetland* OR flood* OR catchment OR watershed OR forest OR woodland OR landscape OR rangeland OR ecosystem OR water OR sustainable OR environment*)) OR restor* OR protect* OR conserv* OR (agriculture NEAR/1 (conservation OR resilient OR sustainable OR ecolog*)) OR "climate-smart" OR "adaptation services" OR (engineering NEAR/1 (ecological OR ecosystem OR natur*)) OR agroforest* OR “re-vegetat*” OR revegetat* OR afforest* OR "land management" OR reforest* OR rehabilit* OR "agro-past*" OR agropast* OR silvopast* OR agroecolog* OR "rainwater harvesting" OR “floating garden*”) AND
Country terms	TS=(Bangladesh) AND
Intervention/associated terms - habitat type or direct intervention target	TS=(ecosystem* OR habitat* OR vegetation OR soil OR *biodiversity OR wildlife OR "natural capital" OR "ecosystem service*" OR *forest* OR woodland* OR tree* OR *grass* OR savanna* OR shrub* OR dryland* OR "dry-field*" OR dryfield* OR wetland* OR peatland* OR *marsh* OR bog* OR mountain* OR river OR riparian OR lake* OR stream* OR aquifer* OR catchment* OR watershed* OR floodplain* OR "flood plain*" OR estuar* OR intertidal OR coast* OR mangrove* OR "coral reef*" OR farmland OR pasture OR rangeland* OR livestock OR cropland OR "agro-ecosystem*" OR agroecosystem* OR (infrastructure NEAR/1 (green OR blue OR “green-blue” OR

Category	Terms
	“blue-green” OR natural OR ecological)) OR “sustainable drainage” OR “sustainable urban drainage” OR "natural resource*") AND
Outcomes - Desired social, economic, or environmental outcomes of the interventions.	TS=(adapt* OR vulnerab* OR cope OR coping OR resilie* OR "food securit*" OR agricultur* OR "water securit*" OR (disaster NEAR/1 (mitigat* OR reduction OR protection)) OR (flood* NEAR/2 (prevent* OR control* OR mitigate*)) OR (protect* NEAR/1 (coast* OR shore* OR soil*)) OR (mitigat* NEAR/1 (risk OR climate OR carbon OR CO2 OR greenhouse)) OR "ecosystem service*" OR (biodiversity NEAR/1 services) OR (capital NEAR/1 (social OR human OR natural)) OR "well-being" OR wellbeing OR health* OR alleviat* OR "poverty reduction" OR (income NEAR/1 diversification)) AND
Population - The human group of target for the intervention	TS=(people OR communit* OR "human" OR societ* OR house* OR village* OR rural OR urban OR livelihood* OR sector* OR farm* OR agricultur* OR smallholder* OR "small-holder*" OR "crop* system*" OR “food system*” OR livestock OR camels OR cattle OR sheep OR cows OR goats OR pastoral* OR forestry OR (water NEAR/1 (management OR protect*)) OR aquaculture OR watershed OR fisher* OR fishing OR "policy maker*" OR “decision-maker*” OR authorities OR stakeholder*) AND
Targeted Issue The hazard or societal issue that climate change adaptation seeks to address/build adaptive capacity for	TS=("climat* change" OR (climat* NEAR/5 variability) OR "global warming" OR "climate hazard*" OR "extreme weather" OR "natural hazard*" OR precipitation* OR "rainfall variability" OR temperature* OR "crop failure*" OR "soil" OR "food" OR "water" OR disaster* OR flood* OR drought* OR hurricane* OR storm* OR cyclone* OR mudslide* OR landslide* OR "slope failure" OR desertification OR “land degradation” OR "environmental degradation" OR sedimentation OR siltation OR "wave attenuation" OR (climate AND fire) OR "sea level" OR (sal* NEAR/1 intrusion*) OR salini*)
Article types	Web of Science - Article, Proceedings, Reviews and Book chapters. Scopus – Article, Conference paper, Review, Conference review, Report
Language	ENGLISH
Total # of search results WoS (7.05.2020)	737
Total # of search results SCOPUS (7.05.2020)	929
NbS-like term check (to avoid inadvertently screening out relevant studies due to the complex and specific search terms above)	"Nature-based" OR "Nature based" or "Ecosystem-based" or "Ecosystem based" OR “Community-based adaptation” OR "Green infrastructure" OR "Green-blue infrastructure" OR "Blue-green infrastructure" OR "Natural flood management" OR "Water-sensitive" OR "Sustainable urban drainage" OR "Sustainable drainage" OR “Floating garden*” AND Bangladesh
Total # of search results WoS (7.05.2020)	60
Total # of search results SCOPUS (7.05.2020)	67
TOTAL NUMBER OF RESULTS TO SCREEN	1793 total. 1173 when duplicates removed.

Category	Terms
After title screening	631 rejected leaving 542 for abstract screening. 178 are agriculture, aquaculture or fisheries.
After abstract screening	310 for full text screening.

Figure S1. Stages of the search and screening process



2 Coding template guidance

This coding template has been adapted from a separate study for the International Institute for Environment and Development on NbS for development (Roe, D, Turner, C, Chausson, A, Hemmerle, E and Seddon, N (2021) Investing in nature for development: do nature-based interventions deliver local development outcomes? IIED, London).

We adapted the template by:

1. Including more detail on climate adaptation outcome types, in order to be compatible with the systematic map in Chausson, Turner et al (2020).
2. Including some additional information the role of institutions, from work by Stephen Woroniecki for a separate paper (not yet published), and other enabling factors influencing success or failure of the implementation and governance of NbS.
3. Including a full description of the outcomes including any quantitative data.
4. Restructuring the framework (as for a relational database) with three tables linked via unique IDs for each item:
 - Article – metadata and other information for each article reviewed (academic or grey literature)
 - Intervention – one entry for each intervention, linked to Article ID, because some articles may cover more than one intervention (e.g. case studies in different locations, or multiple interventions at the same location).
 - Outcome evidence – linked to a specific intervention ID. Evidence for each outcome that is assessed will be coded separately so that we can record quality criteria.

Some guidance notes are provided in the tables below but additional guidance is provided in Section 3.

2.1 Article table

The Article sheet of the coding workbook contains one row per article, and captures the information listed in Table S2.

Table S2: Information recorded in the Article table

Article ID	AC-OX-001 for academic articles reviewed at Oxford, AC-B-001 for academic articles reviewed by Bangladesh team, G-001 for grey literature.
Reviewed by	Initials of reviewer
Checked by	Initials of checker (if applicable)
Article type	Journal article, journal review, conference proceedings, book/book chapter, report, other
Peer reviewed?	Yes/No (generally yes for academic, no for grey)
Author(s)	Metadata can be pre-loaded from a reference manager
Date	
Title	
Source	Academic refs: journal, issue, page. Grey literature: publisher/institution.

DOI / Web address	Optional
Abstract	Optional
Effectiveness evidence	Does the study provide evidence on the environmental, social or economic outcomes of NbS? (If not, exclude the study from the first round of coding). Yes / No / Maybe (if not yet sure – can be changed after more in depth analysis)
Other evidence	Does the study provide other useful evidence e.g. on the implementation success, governance, costs or acceptability of NbS? If so, it could be included in a later round of coding. Yes / No / Maybe (if not yet sure – can be changed after more in depth analysis)
Do the authors declare a conflict of interest?	Yes / No
Coding questions	Queries on the coding for someone else to check.
Notes	e.g. to explain reasons for coding outcomes that are not straightforward, or to elaborate on a question that does not have a free text box.

2.2 Intervention table

The Intervention sheet of the coding workbook contains one row per article / intervention combination, and captures the information listed in Table S3. Many academic articles will only have one intervention but some may cover more than one case study or intervention type. Multiple interventions are common in the grey literature project reports, as they record landscape level projects with multiple activities.

Table S3: Information recorded in the Intervention table

Article ID	Cross reference to the article this intervention came from.
Intervention ID	AC-OX-001-1 etc. The letters and first three numbers should match the article ID.
Reviewed by	Initials of reviewer
Checked by	Initials of checker (if applicable)
Author-intervention relationship	Yes/No. Yes if the authors work for the organisation which implemented the intervention, or the body funding the study is also funding or otherwise involved in the intervention.
Country	Bangladesh
Region of Bangladesh	Free text
Location	Free text – Use authors own words. If the study is a lab experiment/ex-situ, specify the location matching the habitat they are replicating in the lab.
Habitat or biome	Select all that apply
	Tropical and subtropical forests (dry forest, moist/rainforest, coniferous) – FOR_TR

	Temperate forests (broad leaf, mixed, coniferous) – FOR_TMP
	Boreal forests and taiga – FOR_BOR
	Tropical and subtropical grasslands (including Savanna, shrublands) GR_TR
	Temperate grasslands (including Savanna, shrubland) - GR_TMP
	Arctic & subarctic/subantarctic tundra - TUN
	Deserts and xeric shrublands - DES
	Mediterranean shrublands and forests - MED
	Montane/Alpine (forests, grasslands, steppe, shrublands) – MON
	Wetlands (inland, i.e. swamp marsh bogs fens, except inland peatlands) – WTL
	Ponds and lakes (inland) – LK
	Streams and rivers – RIV
	Peatland (note many peatlands are inland wetlands...) – PTL
	Coastal (includes shoreline, beaches, and dunes, but not mangroves, deltas/estuaries, or saltmarsh) – CST
	Saltmarsh - SLTM
	Mangroves – MGR
	Deltas and Estuaries (including mudflats) - DLT
	Seagrass – SGR
	Coral reefs – COR
	Tropical oceans - OC_TR
	Temperate oceans – OC_TMP
	Polar oceans - OC_POL
	Created forest (plantations) - CRT_FOR
	Created grass (artificial grasslands, grass strips) CRT_GRS
	Created wetland - CRT_WTL
	Created other - CRT_OTH
	Terrestrial production landscapes – AL_TER (cropland, pastures, agroforestry etc)
	Aquatic production landscapes – AL_AQ (aquaculture)
	Other OTH
	Habitat type not specified HNT_SPF
Broad type of nature-based intervention	Select all that apply (see Guidance)
	Restoration (e.g. reforestation, wetland restoration)
	Site Protection (e.g. protected area, community conserved area)
	Habitat creation
	Management (e.g. community-based natural resource management; integrated landscape management)
	Nature-based food production - see separate guidance note
Intervention name	Short name for the intervention (e.g. ‘Conservation agriculture’).

Describe the intervention	Free text. Include a detailed description using (as much as possible) the author(s)' wording. For experimental approaches, copy and paste the treatment.
Terms used to describe the intervention	Select all that apply – could add any local / traditional terms if applicable. This can record terms used in the article but also if an intervention clearly falls into one of these categories but the term is not used it can still be recorded.
	Community-based adaptation
	Community-based management (includes resource and fishery management)
	Ecosystem-based adaptation
	Integrated flood risk management
	Integrated water resource management
	Catchment management
	Integrated coastal zone management
	Disaster risk reduction
	Forest landscape restoration
	Home gardens
	Floating gardens
	Conservation agriculture
	Organic agriculture
	Green/blue infrastructure
	Ecological / natural infrastructure
	Sustainable drainage systems (SuDS)
	Payment for ecosystem services
	REDD+
	Other (specify)
Landscape or seascape scale management?	Yes / No – see guidance
Who is driving/instigating the intervention?	Select all that apply, if reported. Who is driving the action (not the study)? For example is it an externally imposed project, is it a government program, is it an academic model, is it something that local people do as part of their day to day lives (not a “project”)?
	International conservation/environment organization
	International development organization
	International environment and development organization
	National conservation/environment organization
	National development organization
	National environment and development organization
	State/district/local government agency
	National government/agency
	International private sector
	Local private sector
	Community/self driven
	Local NGO or CBO (e.g. indigenous)
	Research institutions
	Other
	Not specified

Partner names	If reported (optional)
Funding source	If reported (optional)
Does the intervention involve participation of local stakeholders/communities?	See guidance
	Yes, Passive
	Yes, Active
	Yes, unclear
	No
	Not reported
Are poor or disadvantaged groups a target of the intervention?	Yes/No/Not reported
What is the reported role of mediating factors (e.g. participation and knowledge integration) in shaping adaptation outcomes?	Free text. Based on unpublished work by Woroniecki et al.
What is the role of institutions to mediate outcomes of adaptation?	Free text. Based on unpublished work by Woroniecki et al.
Any other factors influencing success or failure of the implementation and governance of NbS	Free text
Are any outcomes linked to an effect on poverty?	Select one. Only answer yes when explicitly stated by authors
	Yes - poverty reduced
	Yes – poverty alleviated
	Yes - poverty prevented
	Yes – poverty exacerbated
	Yes – mixed effects on poverty
	Yes – unclear
	Yes – no effect
	Not reported
Beneficiaries	Free text. If the article reports on distribution of costs and benefits as a result of the intervention, describe who were the winners and losers (e.g. evidence of elite capture, evidence of attempts at equitable distribution etc)
Describe any linkages (synergies or trade-offs) between outcomes if reported	Free text. This could include trade-offs between ecosystem services (e.g. food production vs carbon storage) or between beneficiary groups (e.g. farmers vs fishers), or synergies where interventions deliver multiple benefits. See guidance.
Describe timescales of outcome measures if assessed by the study	Free text (use author's words)
Describe spatial scales of outcome measures if assessed by the study	Free text (use author's words)

Does the intervention exclusively target nature conservation?	Yes/No/Not reported Do we need this?
If the intervention compares the effectiveness of the nature-based intervention to other options for delivering the outcome, is the nature-based intervention:	Select one
	More effective
	Less effective
	Same
	Unclear
	Mixed
Does the study report on economic costs and/or benefits of the intervention?	Not reported
	Yes / No
Does the study evaluate the cost-effectiveness of the intervention?	Select one
	It reports it is cost effective
	It reports it is not cost effective
	It reports mixed outcomes on cost effectiveness
	It is unclear whether it is cost-effective or not
	It does not discuss cost effectiveness
Summarise the economic costs, benefits and cost-effectiveness if described	Free text. Can be pasted from the article.

2.3 Outcome evidence table

The Outcome sheet of the coding workbook contains one row per article / intervention / outcome combination, for outcomes that have evidence, and captures the information listed in Table S4.

Table S4 Information recorded in the Outcome table

Article ID	Cross reference to the article this intervention came from.
Intervention ID	Cross reference to the intervention this outcome came from
Outcome ID	AC-OX-001-1-1 etc. The letters and first three numbers should match the article ID and the next number should match the intervention ID.
Reviewed by	Initials of reviewer
Checked by	Initials of checker (if applicable)
Outcome type	Select an outcome for which there is evidence. See guidance.
Climate change mitigation	GHG reduction
Inland floods and erosion	Inland flooding
	Soil erosion
	Mudslides / landslides / avalanche
Coastal floods, erosion and salinization	Coastal flooding
	Coastal erosion
	Coastal saltwater intrusion (groundwater)

	Salinization (surface)
Wind damage	Wind and storm damage (other than flooding)
Heatwaves	Heatwaves
Wildfire	Wildfire
Desertification	Desertification
Water security	Drought / reduced rainfall
	Water quantity / availability
	Surface water quality
	Groundwater quality
Food security	Food production / security / nutrition
	Fishing
	Aquaculture
	Soil quality
	Pests
Wood, fuel and NTFP	Wood production (forestry)
	Fuelwood supply
	Biofuel production
	Other ecosystem goods (e.g. NTFP)
Air quality	Air quality
Disease risk	Disease incidence and distribution
Cultural outcomes	Aesthetic value
	Recreation (local)
	Cultural heritage, spiritual values and inspiration
Socio-economic outcomes	Tourism
	Employment
	Local economic benefits
	Education and training
	Rights, empowerment and inequality (including gender)
	Social cohesion, governance and engagement
Ecological outcomes	Biodiversity
Effect of the intervention	Select one. See guidance.
	Positive
	Negative
	Mixed
	No effect
	Unclear
Describe the outcome evidence	Free text. Can be pasted from article. Summarise key quantitative or qualitative evidence on the direction and magnitude of the outcomes, costs and benefits. Include values, units and statistical significance (p value) if provided. See guidance.
Which attributes of nature are linked to the measures?	Select all that apply
	Species richness or diversity
	Subspecies richness (e.g. of crop varieties or genetic diversity)
	Abundance or availability of particular species or types of species (e.g. NTFPs)
	Specific functional group (e.g. trees, pollinators)
	Presence of habitat / ecosystem
	Unclear/not reported

	Other (specify)
	Not applicable
Type of evidence	Select all that apply. See guidance.
	Qualitative
	Quantitative
Type of study	Select all that apply
	Experiment (ex-situ, e.g. lab or research station)
	In-situ observations / Case study (including case-study comparisons)
	Modelling
	Interviews
	Literature review
	Comment / opinion
Does the assessment include traditional knowledge?	Yes / No. Includes knowledge from indigenous peoples or local communities. Code yes only when explicitly stated by the authors.
Type of data collection	Select all that apply. See guidance.
	Indigenous research methods
	Participatory approach
	Ethnographic approach
	None of the above
Data strength	Select one
	Primary data used and displayed
	Secondary data with references
	Primary data used but not displayed
	Other
Clear and appropriate methodology	Yes / No
Comparison with counterfactual, threshold or baseline	Yes / No / Not applicable (for some qualitative data)
Attempts to account for confounding factors	Yes / No / Not applicable (for some qualitative data)

3 Guidance

3.1 Broad type of nature-based intervention

Focus on the actions being done on the ground, not what the end goal of the intervention may be. For example, the end goal of the intervention may be species protection but this involves a combination of protected areas and management actions outside protected areas, in which case the intervention types are protection and management

Restoration: An active or passive intervention that involves returning degraded, damaged or destroyed ecosystems to a pre-disturbance natural state, including its structure or function. Also includes the restoration of natural (or wild) resources but excludes agrobiodiversity restoration which fall under the category of agroecology. Can be synonymous with

reclamation, reforestation, rehabilitation, revegetation, and reconstruction. Restoration is variously referred to as ecological, functional, habitat, or structural.

- When intervention is a lab-based experiment mimicking restoration, code as restoration.
- If the strategy involves allowing ecosystem regeneration or rehabilitation through protection (e.g. revegetation/reforestation through set-asides/exclosures or allowing abandoned land to regenerate), code for restoration and protection.
- If the authors describe the approach as ecological engineering; ecosystem engineering; nature engineering; nature-based engineering and it isn't specified that the approach intends to restore or recover a natural habitat or ecosystem then code as created habitats (see below).

Site Protection: An intervention that prevents (or greatly limits) human occupation and use of resources within a “clearly defined geographical area through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values”. Can involve marine, land, or coastal site-specific protection, including protected areas and their management, private land conservation measures, reserves, or conservancies, areas protected by indigenous and local communities (e.g. sacred sites), or locally managed marine areas with specific set-aside ‘conservation zones’. Can involve the protection of a natural or created habitat.

Habitat creation: Interventions involving the establishment of novel ecosystems. This includes the creation of a new habitat type in place of the naturally occurring one (e.g. afforestation of former grasslands or created wetlands) or where the habitat is modified such that it does not resemble its natural ecological state (e.g. rehabilitating degraded land with exotic species or reforesting an area with a single species where it should be a diverse forest). It also includes interventions where it cannot be determined from the authors descriptions whether the established habitat is natural or not (e.g. land rehabilitation without reference to how this was done). In cases where afforestation, using native or non-native species, is conducted to facilitate natural habitat restoration, the intervention should be coded as habitat creation if the outcomes resulted at least in part from the created habitat. It excludes created agro-ecosystems which fall under the category of Nature-based Agriculture.

Management: Natural (or wild) resource management approaches other than restoration, site protection, or habitat creation. Examples include ecosystem-based fire management and actions characterized as forestry or forest management (e.g. for timber production or production of other ecosystem goods and services), species management (for example for hunting, tourism, trade, or conservation). Can involve the management of a natural or created habitat. Excludes agricultural, fisheries, and livestock management approaches which fall under the category of nature-based food production. If the intervention involves management actions occurring inside a protected area to preserve a target ecosystem or species (e.g. weeding or removing exotic species), do not code for management, only protection. However if there are actions for managing the harvest of forest products (e.g. for timber or NTFP) then code both management and protection.

Nature-based Food Production: crop, fisheries, or livestock-based production systems (as well as mixed-production systems) using or taking advantage of biodiversity (including landraces/ traditional crop varieties, see below) or ecosystem services or processes (such as nutrient cycling, soil formation, water infiltration, pollination, natural pest control) either at

the plot, farm or landscape level; includes examples such as agroforestry, conservation agriculture, permaculture activities, “silvopasture”, and ecosystem-based fisheries. Excludes agriculture involving modern varieties (see below) unless there is explicit reference to how diversity or ecosystem services/processes are contributing to production

- Landraces: domesticated, locally adapted, traditional variety of a species of animal or plant that has developed over time, through adaptation to its natural and cultural environment of agriculture and pastoralism, and due to isolation from other populations of the species.
- Modern varieties: bred to meet DUS criteria (Distinctiveness, Uniformity and Stability), and are bred in laboratories or in controlled conditions in agricultural research stations rather than on farm/ in the field (for use as monocultures with chemical inputs). These have been far more substantially modified from their natural form (wild relatives) through intensive scientific breeding than traditional crops/breeds.

3.2 Does the approach involve landscape or seascape scale ecosystem-management?

Interventions falling under this category involve management at a higher governance/spatial scale to ensure the integrity or functionality of ecosystems, landscapes, or seascapes, for the provision of ecosystem services or the conservation of biodiversity through a set of integrated actions. They are closely linked to the science of landscape ecology (and more recently, seascape ecology), or may be ancestral landscapes managed by indigenous peoples or local communities. Landscape or sea-scape ecosystem-based management approaches are often multi-stakeholder and involve several approaches or actions over that given landscape. Examples:

- Interventions characterized as landscape-scale, trans-frontier/boundary, ecosystem-based management, integrated ecosystem-based management, integrated coastal-zone management, infrastructure-related approaches (natural, green, blue); ecological infrastructure, forest landscape restoration or rehabilitation (FLR); large-scale restoration, Integrated Water Resources Management; traditional farming landscapes.
- Drainage basins and catchment areas can be divided into watersheds. Interventions occurring at the scale of a drainage basin, catchment area, watershed should be labeled as landscape scale approaches.
- Marine protected areas, or locally managed marine areas generally fall in this category.

3.3 Does the intervention involve participation of local stakeholders/ communities in decision making about its design and implementation?

Interventions may engage representatives of some local stakeholders, but leave out some ethnic or user groups. Or they may involve participation of all local stakeholders. Participation may be throughout the project cycle – from design to implementation and evaluation, or only at particular stages e.g. implementation.

- Yes, passive: participation is in the form of consultation, i.e. people are consulted but their views are not necessarily taken into account in project design and implementation

- Yes, active: where peoples' views influence decision-making; or may involve self-mobilisation, where interventions support communities to design and implement interventions themselves.
- Yes, unclear: not clear if participation can be considered passive or active
- No: Interventions designed and implemented by scientists or technical experts alone, with no involvement of local people who live in the target area, or who depend on the resources in the target area for livelihoods or cultural/spiritual wellbeing.
- Not reported: the article does not refer to how the intervention was designed/implemented and therefore it is not possible to assess if local stakeholders/communities were involved or not

3.4 Habitat or biome

- Rely on article information and seek a second opinion if the authors aren't explicit about the habitat type associated with the intervention. Code the habitat being protected, restored, managed, or created.
- If the landscape over which the intervention takes place covers multiple habitats, code for all of them. Do not code for other habitats outside of where the intervention takes place, even if they are affected by the intervention.
- In the case of restoration interventions, the habitat coded for will match the habitat that is being restored.
- Habitat categories are mutually exclusive – e.g. if the intervention takes place on coral reefs, code only for coral reef, and not coral reef and tropical oceans or if it takes place in a temperate montane forest, code montane, not montane and temperate forests.
- If the intervention type is 'habitat creation' the only habitat types that should be coded for are created forest/wetland/grass/other – e.g. if occurring in a mountainous region, do not code montane
- If the intervention type is nature-based agriculture, only code for terrestrial/aquatic production
- Consider woodland a synonym of forest

Habitat notes

- Lowland temperate grasslands (including Savanna, shrubland) - Grasslands may have been created by deforestation thousands of years ago (e.g. Evans 2003 – curtailment of muddy floods), but we still code for grassland, and not 'created – grassland' unless it's explicit that it was a created grassland system.
- Montane/Alpine is any habitat above 1000m, mountain or plateau. Do not code for MONTANE and forest if it is a cloud forest for example, just code for MONTANE.
- Streams, rivers, riparian zones).
 - riparian zones - the interface between land and a river or stream. Plant habitats and communities along the river margins and banks are called **riparian** vegetation, characterized by hydrophilic plants.
 - Do not code for RIV and FOR if for example, it is a riparian forest. Just code RIV

- Peatland – note many peatlands are inland wetlands, do not code for both
- Created forest - including forests established on lands that lack forests naturally, monoculture plantations that have replaced a diverse forest
- Created grass (artificial grasslands, grass strips) - including grass strips, grasslands planted with exotic grass species or planted in areas that lack grasslands naturally
- Created wetland - established in a site that naturally did not have a wetland.
- Created other - Use this category when the created system cannot be forest, grass, or wetland. (e.g. green infrastructure using vegetation buffers around transport routes or in rural communities)
- Habitat type not specified . Some studies, especially landscape scale studies do not specify habitat type. Do not use this code simply because you are not sure what habitat to code.

3.5 Describe the outcome evidence

Describe in as much detail as possible, using the author's words, the measure(s) used to assess the effectiveness of the intervention from the standpoint of addressing each development category. If a definition is provided by the authors for the measure, copy it. If the authors are not explicit about a specific measure (e.g. qualitative assessments) clarify how they did the assessment (e.g. statements from community members that food security has been improved but do not elaborate what components/measures of food security led them to this conclusion). Proxy measures are accepted, if the authors are explicit about the use of the measure to assess the intervention's effect on the development category (e.g. number of visits to nature reserve as indicator of impact on human health benefits). E.g. for food security, potential outcome measures may be: crop yield, income generation to purchase food, access to harvesting wild foods; for water security: ground water recharge; stream water quality; water supply for irrigation; for DRR: incidence of wildfire, avoided damages from storm surge; area of flooding etc.

3.6 Linkages between outcome measures

Addressing one outcome may be linked to addressing another (either positively or negatively). For example, an intervention provides income (local economic development) which then allows for food purchasing (food security); an intervention improves water quality that then reduces incidence of waterborne illness (health). Alternatively there may be trade-offs e.g. tree planting intervention protects community from flooding (positive effect on DRR) but the trees reduce ground water supplies (negative effect on water security). There may often be links between climate change adaptation/DRR and another development category. For example, food security is threatened by droughts/floods and the intervention is able to maintain crop yields in the face of these hazards; in this case the benefit for food security is linked to adaptation/DRR. Specify any such linkages using the authors own words where possible.

3.7 Are any outcomes linked to an effect on poverty

Only answer yes when explicitly stated by authors.

- Yes - poverty reduced (people changed from poor to non-poor); authors explicitly state that people are no longer poor

- Yes - poverty alleviated (people changed from poor to less poor); authors explicitly state that people are less poor (but have not necessarily crossed the poverty line). Note, if the authors initially state that people were living in poverty and then measure income and jobs that are provided by the intervention, do not assume people have changed to being 'less poor' unless the authors explicitly say so - in this case code as 'not reported'
- Yes - poverty prevented (people prevented from sliding into poverty or becoming more poor) as explicitly stated by the authors
- Yes – poverty exacerbated (poor people became worse off) as explicitly stated by the authors
- Yes – mixed effects on poverty (varied between groups of people or between different dimensions of poverty)
- Yes – unclear, Select this option when the authors explicitly state that the intervention had an effect on poverty but they still do not know the net result it has had on it; do not select this just if the authors initially state that people were living in poverty but then do not follow up on how the intervention has subsequently affected their poverty status – in this case code as 'not reported'; this is when the authors are not clear not the coder
- Yes – no effect on poverty
- Not reported

3.8 Distribution of costs and benefits

Specify who exactly received the costs and/or benefits of the intervention, using authors own words where possible

- E.g. women or marginalized members of communities specifically received costs/benefits
- E.g. evidence of elite capture
- evidence that costs/benefits were equally distributed to all stakeholders

3.9 Timescales of outcome measures

Use authors own words. Do the authors report on the timescales to which outcomes were delivered by the intervention? Must be assessed by the study; inferences made by authors are not relevant. If not reported, write 'NA'.

- Note, this question captures temporal scale of measures linked to development outcomes not measures that are only linked to effects on biodiversity
- e.g. did they report on how long it took after intervention implementation for outcomes to be seen
- e.g. outcomes were only short term

3.10 Spatial scales of outcome measures

Use authors own words. Spatial scale must be assessed by the study; inferences made by authors are not relevant. If not reported, write 'NA'

- e.g. they report outcomes were felt both inside and outside the intervention site
- e.g. report total area impacted by intervention

Note, this question captures spatial scale of measures linked to development outcomes. If the measure of area of ecosystem restored/conserved is only relevant for nature conservation, do not report; instead report under the question on measures used to assess biodiversity outcomes. However, if the area of an ecosystem restored or conserved by the intervention is linked to assessing the impact of the intervention on a development outcome, then report this measure here (E.g. forest supports local livelihoods and the amount of forest restored is reported).

3.11 Which attributes of nature are linked to the measures?

(select all that apply)

Species diversity

- E.g. enhanced resilience against crop losses a function of a more diverse crop base
- Only use when authors explicitly state the link between diversity and the outcome, do not infer

Subspecies richness (including crop varieties or genetic diversity)

- generally applies to agrobiodiversity

Abundance or availability of particular species or types of species (eg NTFPs)

- E.g. ability to make money from collecting a forest product depends on how many there are and how available they are
- E.g. presence of particular wildlife species attracting ecotourism ventures

Specific ecosystem function

- When authors explicitly state a particular ecosystem function underlying the provision of the outcome measures including: nutrient cycling, decomposition, soil formation, pollination, seed dispersal, pest regulation, primary productivity

Presence of entire ecosystem

- E.g. entire forest providing flood protection
- E.g. entire nature conservation area providing recreation opportunities

Not applicable - For those studies that only report outcomes from the process of implementation/maintenance not from the ecosystem.

3.12 Alternative options.

If the article compares the effectiveness of the nature-based intervention to alternative options for delivering development outcomes, is the nature-based intervention:

- More effective than the alternative
- Less effective than the alternative
- Same (same effectiveness as alternative)
- Mixed - If the outcome assessment depends on the development outcome (e.g. more effective for food security but less for water), or the implementation context.

- Unclear - when the authors do not derive an explicit conclusion on the effectiveness comparison.
- Not applicable – when no effectiveness comparison is made with other adaptation options.

3.13 Does the study report on economic costs and/or benefits of the intervention?

Costs could include implementation/maintenance costs or opportunity costs (e.g. \$X lost from agricultural production by converting cropland to tree plantation). Benefits could include e.g. \$X generated from NTFP or monetizing ecosystem services provided by the intervention

- Yes – only when a monetary value is applied. E.g. if authors just state ‘the intervention is expensive’ but do not specify a monetary value, this is not valid.
- No

3.14 Effect of the intervention on the outcome

Code for development or other outcomes that are linked to the intervention assessed by the study. The intervention need not be intended/designed to address that outcome (e.g. intervention may be a protected area designed to protect certain habitats/species but the study reports on how this intervention affects food security).

Effectiveness (i.e. Positive, negative, neutral, or mixed) is defined in relation to a no intervention scenario, otherwise if effectiveness is assessed in comparison to an alternative intervention, effectiveness is coded as unclear. To interpret a no intervention scenario, authors may use a control, a baseline, or modelled counterfactual scenario (e.g. projecting what would happen in the future without the intervention). For some social impact studies, formal baselines, controls, or counterfactuals may not exist, but if the authors report/infer what would have happened in the absence of the intervention (counterfactual inference) or what has happened since the intervention has been implemented, use this to code your answer. In a few cases, effectiveness may be assessed by measuring performance against a desired threshold e.g. a threshold of vegetation density needed to prevent a landslide, code for positive if the threshold is met, however, code unclear if not met because it may still reduce the climatic impact.

- Positive, i.e. the outcome improved/increased. Code for positive if both positive and neutral effects are reported for over the spatial scale of the intervention, or between different implementation sites.
- Negative, i.e. the outcome worsened/decreased. Code for negative if both negative and neutral effects are reported over the spatial scale of the intervention, or between different implementation sites.
- No effect – neither positive nor negative
- Mixed - when both positive and negative results are reported. Results can vary over the spatial scale of the intervention. If a study reports varying levels of effectiveness over time (positive/negative to no effect/unclear over time (or vice versa) or positive to negative (or vice versa)) code as ‘mixed.’ If some results are positive (or negative) and others are unclear, code mixed

- Unclear - the authors do not come to a clear conclusion OR if the study looks at effectiveness by comparing to alternative actions.

3.15 Type of data

Qualitative - when the assessment methodology is qualitative; i.e. no quantitative outcome measure. E.g. statements of people's perceptions of change (where responses are not further quantified).

Quantitative - e.g. number of jobs created, water yield measurements, area protected from flooding when the outcome measure is quantitative. It does not relate to the source of the data; perceptions of effectiveness from local communities, if quantified via a survey, are coded as quantitative. Multi-criteria expert ranking approaches are coded as quantitative.

3.16 Type of data collection

- Indigenous research methods: supporting use of indigenous peoples' own concepts and research methods/tools
- Participatory approach
- Ethnographic approach: involves the study of social interactions, behaviors, and perceptions that occur within groups, teams, organizations as well as communities. The method provides rich, holistic insights into people's views on actions including the nature of the location they inhabit.

3.17 Quality of evidence

For each outcome we recorded:

1. Evidence type (qualitative, or quantitative).
2. Evidence strength (all must be met for evidence to be robust):
 - a. Use and display of primary data, or secondary data with references.
 - b. Methodology is reported clearly and judged as appropriate (see below).
 - c. Use of a counterfactual, threshold or baselines, if appropriate.
 - d. Some attempt to account for confounding factors.

Note: the criteria apply differently to qualitative and quantitative evidence, and hence robust qualitative and quantitative evidence are not necessarily comparable in terms of quality.

Further guidance was then developed to inform assessment of these criteria:

- Guidance for methodology being 'appropriate' (for robust evidence) (2.b):
 - The study gives sufficient detail of methods to allow them to be repeated with a high degree of accuracy.
 - Study site(s) are obviously appropriate, or justified.
 - The measure of effectiveness is appropriate.
 - The number of replicates is appropriate. Some types of evidence may not require replicates, e.g. censuses, landscape-scale data collection, or in-depth case studies, particularly those focusing on qualitative analysis where the objective is not to generalize findings.

- Statistical analysis is not necessary for robust evidence, but if a statistical test has been done and was insignificant, then the evidence for a positive or negative outcome is weak.
- For social data:
 - There are details of and justification for the study sample chosen, e.g. who was interviewed and why.
 - An analytical framework is described and appears sound.
 - Questions/themes/discussion points posed in an interview or focus groups are reported or summarized.
- Ways for evidence to sufficiently address confounding factors (for robust evidence):
 - Use of an appropriate control group or statistical method.
 - Or: long-term study with a robust baseline and a modelled counterfactual which takes into account the influence of confounding variables.
 - Or: logic used (in the study's methods or discussion) to show that confounding factors would not alter the outcome direction, even if they may alter the magnitude of the effect. E.g. the social-ecological system cannot be imagined with an alternative state of cause and effect.
- Conclusions as to e.g. direction of an outcome, should be drawn from a study's results, not from the discussion, with the exception of information in the discussion which cites another study's results on the same intervention.
- Obviously incorrect interpretation of the results by study authors does *not* degrade the evidence strength; the critical appraisal judges the quality of evidence, not the quality of the authors' interpretation of this evidence.

4 Major NbS initiatives in Bangladesh

Table S5: Major NbS initiatives in Bangladesh

Name and dates	Lead partners and funders	Locations	Main aims (in bold) and examples of activities
MACH Management of Aquatic Ecosystem through Community Husbandry 1998-2007	Department of Fisheries, funded by USAID. Partners Winrock International, Bangladesh Centre for Advanced Studies (BCAS), Center for Natural Resource Studies (CNRS), CARITAS Bangladesh	Wetlands in Hail Haor, Turag-Bangshi river basin and Kangsha-Malijhee river basin	Restore degraded wetlands to enhance biodiversity and livelihoods of the poor. Resource Management Organizations identified sites that were so silted up that they dried out and could not support fish in the dry season, agreed on the location of the fish sanctuaries in 10% of the wetland and helped plant riparian trees. Branches could be harvested with permission. 57 ha of beels and 32 km of canals excavated to increase dry season water storage. Released 1.19 million native fishes of 15 species.

Name and dates	Lead partners and funders	Locations	Main aims (in bold) and examples of activities
NSP Nishorgo Support Project 2003–2008	Bangladesh Forest Department, supported by USAID	All protected areas	Develop a functional model for formalized co-management of Protected Areas. Created alternative income generation opportunities for key local stakeholders. Strengthened the institutional systems and capacity of the Forest Department and key stakeholders. Implemented a program of habitat management and restoration.
IPAC Integrated Protected Area Co-management 2008–2012	Bangladesh Forest Department and Department of Fisheries supported by USAID	Included Hakaluki Haor and Teknaf Peninsula ECAs	Promote and institutionalize an integrated protected area co-management system for sustainable natural resources management and biodiversity conservation. Reduced dependency of local communities on natural resources and improve biodiversity through conservation
CREL Climate Resilient Ecosystems and Livelihoods 2012-2017	Department of Environment, Ministry of Environment, Forest and Climate Change (MEFCC), Forest Department, Ministry of Fisheries and Livestock, Ministry of Land. Funded by USAID. Partners BCAS, CNRS, CODEC, NACOM, Winrock International, Tetra Tech ARD, WorldFish.	29 protected areas, wetlands and ECAs in Khulna, Cox’s Bazar and Chittagong, Sylhet and Mymensingh	Improve governance of biodiversity and natural resources, capacity building, conservation, and alternative livelihoods for dependent communities. Helped communities better collaborate with local and national governments to balance natural resource management, biodiversity protection and climate resilience with sustainable economic development. Scaled up co-management models to build resilient ecosystems. Activities included swamp plantation, biodiversity conservation and sanctuary management in Hakaluki Haor, and mangrove conservation in Cox’s Bazar.
SEMP Community Based Haor and Floodplain Resource	Ministry of Environment and Forests, IUCN Bangladesh,	Halukaki Haor	Improve wellbeing, sustainable development, poverty alleviation and capacity building of local communities for effective wetland resource management. Established community based organisations, provided alternative

Name and dates	Lead partners and funders	Locations	Main aims (in bold) and examples of activities
Management, Sustainable Environment Management Program 1998-2005	supported by UNDP		income generation and other support to enhance awareness and capacity for wise use of wetland resources. Protected and restored swamp forest, re-excavated wetlands, established fish conservation area.
ECFC Empowerment of Coastal Fishing Communities for Livelihood Security 2000-2006	Department of Fisheries supported by UNDP and FAO	Cox's Bazar-Teknaf Peninsula and St. Martin's Island ECAs.	Improve lives of poor coastal fishing communities. Established 250 village organisations in 117 villages. Empowered local people via collective organisation and knowledge to manage depleted fishery resources. Provided Micro Capital Grants for alternative livelihoods.
CBFM-II Community Based Fisheries Management Project 2001-2007	Supported by USAID	116 water bodies in 22 districts	Community-based wetland management. 130 community based organizations were established to manage 116 water bodies in 22 districts. Training provided in water body management, good governance, leadership and account keeping, and support for alternative income generating options such as duck rearing, vegetable production, livestock rearing, aquaculture.
Tanguar Haor Project Community Based Sustainable Management of Tanguar Haor 2006-2015	Swiss Agency for Development and Co-operation	Tanguar Haor	Establish an effective co-management process for sustainable management of haor resources to develop sustainable livelihoods. Formed 73 Village Community based Committees covering 77 out of 88 villages, and involved 4,774 out of 10,205 households in co-management. Provided capacity and skill training, such as leadership development, organizational and financial management, and community led monitoring. Developed a sustainable fish harvesting system and resource sharing mechanism. Supported alternative income generating activities such as small business, livestock rearing, vegetable

5 Positive outcomes for each type of intervention: robust evidence only

Table S6. Positive outcomes for each type of intervention: robust evidence only

	GHG reduction	Coastal floods, erosion and salinization	Inland floods and erosion	Wind damage	Heatwaves	Water security	Food security	Wood, fuel and NTFP	Cultural benefits	Socio-economic benefits	Biodiversity	Total
Mangrove protection and restoration	3	9	2	2	0	0	3	4	3	3	2	31
Oyster reef	0	0	0	0	0	0	0	0	0	0	0	0
Shoreline conservation	0	0	0	0	0	0	0	0	0	0	0	0
Sand dune revegetation	0	0	0	0	0	0	0	0	0	0	0	0
Shelterbelt	1	2	0	1	0	0	0	1	1	1	1	8
Swamp forest protection and restoration	0	0	0	0	0	0	0	0	0	0	0	0
Wetland protection and restoration	0	0	0	0	0	0	0	0	0	0	0	0
Fishery management	0	0	0	0	0	1	1	0	0	1	0	3
Floating gardens	0	0	0	0	0	0	0	0	0	0	0	0
Bioremediation	0	0	0	0	0	1	0	0	0	0	0	1
Terrestrial forest protection and restoration	1	0	3	0	0	0	2	0	0	0	0	6
Community forestry	0	0	0	0	0	0	0	0	0	1	0	1
Forest plantation	0	0	0	0	0	0	0	0	0	0	0	0
Grass and shrub cover	0	0	0	0	0	0	0	0	0	0	0	0
Agroforestry	2	0	0	1	0	0	0	0	0	1	1	5
Homegardens	0	0	0	0	0	0	1	0	0	4	0	5
Conservation agriculture	3	0	0	0	0	1	10	0	0	3	0	17
Rainwater harvesting	0	0	0	0	0	0	0	0	0	0	0	0
Urban green space	0	0	0	0	0	0	3	2	0	0	0	5
Total	10	11	5	4	0	3	20	7	4	14	4	82

6 How NbS can contribute to the Sustainable Development Goals (SDGs)

Table S7: How NbS can contribute to the Sustainable Development Goals (SDGs) (for references see main text)

	SDG	How NbS can contribute	Examples from the review
1	No poverty	NbS can provide jobs, incomes and resources for the poor	Community forests provided poor households with BDT 30,000–40,000 per year from the sale of lemons, sun grass, bananas and ginger. They used this income to buy livestock and set up small business and services, and now earn at least BDT 100,000 annually, with only 15% to 24% of their income now coming directly from the forest (Muhammed et al., 2008).
2	Zero hunger	Nbs can make agriculture and fishery systems more resilient to climate change	Conservation agriculture can reduce reliance on inputs of agrochemicals and fuel while maintaining or increasing yields, thus increasing farmers profitability (Alam et al., 2020; Aravindakshan et al., 2015; Bell et al., 2019; Gathala et al., 2016; Islam et al., 2011, Rashid et al., 2018).
3	Good health and well-being	Green infrastructure such as parks, trees and green roofs can help to cool cities and provide a pleasant space for recreation and interaction with nature.	Rooftop gardens in Dhaka provide spaces to grow food, medicinal and ornamental plants (Zinia et al., 2018). However we found no other evidence on green infrastructure in our review; this is an evidence gap.
4	Quality education	NbS can provide opportunities for education and research about nature conservation and sustainable management of natural resources	As part of a community-based management program, 1024 village community group members were trained in natural resource management and conservation agriculture (DoE, 2015).
5	Gender equality	NbS can be designed to empower women	In the CREL project, 73% of livelihood beneficiaries were women, and intensive capacity building for financial and entrepreneurial literacy among 8,000 poor women significantly increased their empowerment (Winrock International, 2018).
6	Clean water and sanitation	Forests, grasslands and mangroves can trap pollution; constructed wetlands can be an affordable option for water treatment; agro-ecology can reduce pollution from eroded soil and agrochemicals.	Coastal mangroves can prevent storm surges that result in salinization of fresh water (Imam et al., 2016). An experimental constructed wetland using bulrush (<i>Typha Latifolia</i>) reduced arsenic concentrations in groundwater to the WHO safe limit (Schwindaman et al., 2014)

	SDG	How NbS can contribute	Examples from the review
7	Affordable and clean energy	NbS can provide a source of sustainable fuelwood, but this cannot generally be classed as a clean energy source. Green roofs can help to improve the efficiency of solar panels by cooling them (biosolar roofs).	No evidence on the use of biosolar roofs in Bangladesh. However, NbS had indirect impacts as solar home technologies were introduced to help reduce the dependence of poor families on unsustainable fuelwood harvesting (DoE, 2015).
8	Decent work and economic growth	NbS can provide jobs for the community, safeguard livelihoods by making farming and fishing more sustainable, and boost eco-tourism.	63 community guards were employed to protect wetland reserves (DoE, 2015). Wetland restoration doubled fish catches over 8 years ((MACH-II, 2007a). Agroforestry increased farmer incomes from around Tk 6000 to Tk 16500 (Nath et al., 2005).
9	Industry, innovation and infrastructure	NbS provide green infrastructure that can protect existing infrastructure and deliver essential services, as well as helping to reduce maintenance costs and prolong the lifetime of infrastructure such as flood defense embankments.	A 50-100m strip of densely planted mangroves can reduce storm surge velocity by 92%, reducing maintenance costs by protecting embankments from breaching, toe-erosion, and other damage (Dasgupta et al., 2019).
10	Reduced inequalities	NbS can be designed to empower vulnerable and marginalized groups such as landless people.	Floating gardens enabled landless people to cultivate vegetables, and 60% of those taking part were women (Irfanullah et al, 2016). Conservation agriculture reduces dependence on expensive fertilizers for poor farmers struggling with low soil fertility (Islam et al., 2011).
11	Sustainable cities and communities	Urban green and blue infrastructure can help to deal with flooding and heatwaves in cities.	Evidence gap; no studies found.
12	Responsible consumption and production	Agro-ecology, agro-forestry and community management of forests and fisheries are more sustainable methods of producing food and other natural resources	Conservation agriculture can reduce use of synthetic fertilizers, irrigation and fossil fuels (Bell et al., 2019). Community-based fishery management helps to boost fish populations, securing sustainable livelihoods into the future (DoE, 2015). In the CREL project, 51,400 households adopted more resilient agricultural practices (Winrock International, 2018).
13	Climate action	NbS help to adapt to the impacts of climate change (cyclones, floods, sea-level rise, drought,	The cost of repairing and reconstructing houses after Cyclone Sidr was lowest for villages protected by mangroves (TK 27,043)

SDG		How NbS can contribute	Examples from the review
		heatwaves) and also store and sequester carbon	compared to TK 82,246 for those with no mangroves (Akber et al., 2018).
14	Life under water	NbS help to protect and enhance biodiversity	Wetland sanctuaries help to protect fish and other aquatic species.
15	Life on land	NbS help to protect and enhance biodiversity	Protecting mangroves, wetlands and forests supports thousands of species of birds, mammals and other taxa.
16	Peace, justice and strong institutions	NbS require strong, transparent and participatory governance	Community groups were trained to build their capacity to manage their own resources and raise funding for conservation (Winrock International, 2018).
17	Partnership for the goals	NbS are usually delivered by partnerships between funders, governments, NGOs and local people	The CREL, CBA-ECA, MACH and Tanguar Haor projects all involved partnerships between government, local communities, international funding agencies and NGOs.