ICIMOD Working Paper 2018/7

ICIMOD

FOR MOUNTAINS AND PEOPLE

Mountain Economies in BIMSTEC Countries: An Agenda for Regional Cooperation and Shared Prosperity

About ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD), is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalaya – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu, Nepal. Globalisation and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream-downstream issues. We support regional transboundary programmes through partnership with regional partner institutions, facilitate the exchange of experience, and serve as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop an economically and environmentally sound mountain ecosystem to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now, and for the future.

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ICIMOD gratefully acknowledges the support of its core donors: the Governments of Afghanistan, Australia, Austria, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Norway, Pakistan, Sweden, and Switzerland.

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Mountain Economies in BIMSTEC Countries: An Agenda for Regional Cooperation and Shared Prosperity

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International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, August 2018

Published by
International Centre for Integrated Mountain Development (ICIMOD)
GPO Box 3226, Kathmandu, Nepal

ISBN 978 92 9115 629 0 (print)
978 92 9115 630 6 (electronic)

Production team
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Photos: Kanchan Shrestha - cover; Nabin Baral - p4; Mohd Fahad - p5; Alex Treadway - pp7, 21; Jitendra Bajracharya - pp8, 10, 11, 16, 25; Kabir Uddin - p9, 26; Anu Lama - pp3; Karen Conniff - p18; Nawaraj Pradhan - p24

Printed and bound in Nepal by
Hill Side Press (P) Ltd., Kathmandu, Nepal

This publication is available in electronic form at www.icimod.org/himaldoc

Citation: Rasul, G., Neupane, N. & Hussain, A. (2018). *Mountain economies in BIMSTEC countries: An agenda for regional cooperation and shared prosperity*. ICIMOD Working Paper 2018/7. Kathmandu: ICIMOD.

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Acknowledgements

This paper was prepared by ICIMOD to assist the National Planning Commission of Nepal in submitting a concept note to BIMSTEC Secretariat on mountain economy. We extend our sincere thanks to Swarnim Waglé, former Vice-Chair, National Planning Commission, Nepal, David Molden, Director General, ICIMOD, and Eklabya Sharma, Deputy Director General, ICIMOD for their support and encouragement. This paper has been reviewed by Nakul Chettri and edited by Samuel Thomas and Rachana Chettri. The maps have been prepared by Mohd Abdul Fahad, and layout done by Dharma R Maharjan. Our sincere thanks for their valuable inputs.

This study is part of the Koshi Basin Programme at the International Centre for Integrated Mountain Development (ICIMOD), which is supported by the Australian Government through the Sustainable Development Investment Portfolio for South Asia, as well as core funds of ICIMOD contributed by the governments of Afghanistan, Australia, Austria, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Norway, Pakistan, Sweden, and Switzerland.

The views and interpretations in this paper are those of the authors. They are not attributable to ICIMOD or the Government of Nepal.

Acronyms and Abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BBIN	Bangladesh, Bhutan, India, Nepal Initiative
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
CBD	Convention on Biological Diversity
CIESEN	Center for International Earth Science Information Network
DFAT	Department of Foreign Affairs and Trade
FAO	Food and Agriculture Organization
GBM	Ganga-Brahmaputra and Meghna
GDP	Gross Domestic Product
GW	Gigawatts
HKH	Hindu Kush Himalaya
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and Communication Technologies
IHA	International Hydropower Association
MoU	Memorandum of Understanding
MW	Megawatts
NWs	National Waterways
SAARC	South Asian Association for Regional Cooperation
SASEC	South Asia Sub-regional Economic Cooperation
SDGs	Sustainable Development Goals
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
USD	United States Dollar
WB	World Bank
WTTC	World Travel and Tourism Council

Executive Summary

Mountain and hill areas form a substantial part of The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) region – over 1.1 million square kilometres or 23% of total land area. They are home to 140 million people, and a further 1.5 billion people downstream depend directly or indirectly on the mountains for a range of goods and services, including water, energy, food, and biodiversity. Most of the large rivers in the BIMSTEC region originate in the Himalaya and other mountains and hills. They are important sources of energy for the lowlands, with most of the region's existing and potential hydropower production. Mountains are therefore an important source of vital ecosystem services and play a significant role in economic development, environmental protection, ecological sustainability, and human wellbeing.

Although the BIMSTEC region has seen rapid economic and social development in recent decades, growth is not uniform across or within countries. Hill and mountain areas have generally lagged behind. These areas face challenges of poor physical connectivity, higher climate change vulnerability, inadequate facilities for regional tourism, and low investment to tap existing economic opportunities.

Economic growth and sustainability of both upland and lowland communities is only possible through better integration, improved connectivity, and sustainable natural resource management and use. Regional integration has the potential to contribute to sustained growth, poverty alleviation, and inclusive development. It opens up opportunities for leveraging economic growth and sustainable development within and across the BIMSTEC member countries and to address the challenges of managing the food-water-energy nexus. There is potential for shared benefits may be attained from arising opportunities such regional trade, regional connectivity through waterways, clean energy through hydropower, conserving biodiversity, regional tourism, and mitigation of regional flood risks and damages.

In order to reap the full benefits of inter-regional cooperation, a coordinated response is needed that enhances the connectivity of mountain communities to national and regional markets and seaports and removes the barriers to cross-border movement. It is important to identify concrete implementable projects in which multi-country cooperation would yield tangible benefits for the mountain regions. The immediate priorities could be as follows:

- Improving intra-regional and inter-regional connectivity by rail, road, air, and waterway to accelerate economic growth and alleviate poverty. Priority needs to be given to improving multimodal physical connectivity to landlocked countries and mountain areas. Water transportation offers potential pathways for enhancing connectivity.
- Promoting trade by removal of trade barriers, including removing transit restrictions for landlocked and mountain regions and opening up port facilities for international trade with low transportation and transaction costs.
- Promoting energy trade particularly hydropower for improving regional economies. Cooperation and trade in energy could be mutually beneficial for both hydropower resource surplus and deficit countries. Trade in electricity could open up opportunities for increased use of clean energy and sustainable development.
- Ensuring the long-term sustainability of mountain ecosystems. Benefits derived from mountain regions in terms of water, energy, biodiversity, and other ecosystem services are essential for sustainable development. It is therefore important to prioritize actions to conserve mountain ecosystems and to address the challenges of sustainable development in mountain regions and downstream.
- Investing in infrastructure and human resource development and improving technical know-how including skill development for human mobility and intra-regional labour movement.
- Promoting tourism among BIMSTEC countries through regional cooperation. Infrastructure and transport facilities need to be improved and travel procedures, particularly cross-border movement, simplified – without undermining security concerns.

1. Mountains and BIMSTEC

The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) is a regional group comprising seven countries in South and Southeast Asia – Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand – located in areas adjoining or close to the Bay of Bengal. Established in 1997, the aim of the Initiative is to harness shared and accelerated growth through mutual cooperation. BIMSTEC has identified 14 priority areas of cooperation, namely – trade and investment, technology, energy, transportation and communication, tourism, fisheries, agriculture, cultural cooperation, environment and disaster management, public health, people-to-people contact, poverty alleviation, counter terrorism and transnational crime, and climate change adaptation.

Mountains and hills make up a considerable part of the BIMSTEC region – more than 1.1 million square kilometres or 23% of the total land area – and these areas are home to 140 million people (Box 1). Of the seven countries, five – Bangladesh, Bhutan, India, Myanmar, and Nepal – include parts of the mighty Himalayan mountain range. Some of the world's highest mountains such as Everest (8,848 m, Nepal), Gangkhar Puensum (7,541 m, Bhutan), Kangchenjunga (8,586 m, India and Nepal), Hkakabo Razi (5,881 m, Myanmar) lie in this region. The whole geographical area of Bhutan and Nepal falls within the Himalayan region, while hills or mountains cover 9% of the geographical area of Bangladesh, 14% of India, 47% of Myanmar, 31% of Sri Lanka (the north-south central highlands), and close to 20% of Thailand (called highland or upland) (Box 1).

Mountains are an important source of vital ecosystem services and play a significant role in economic development, environmental protection, ecological sustainability, and human wellbeing worldwide. Most of the large rivers in the BIMSTEC region originate in the Himalaya and other mountains and hills. Mountains are not only important sources of fresh water but also contain stored water in glaciers, lakes, seasonal snow, and permafrost. Water from mountains is important for hydropower, industry and agriculture; most critically in lowland agriculture, fishery, livestock and food security.

Mountains and hills are important sources of energy for the lowlands, with most of the region's existing and potential hydropower in its mountains and hills. The rivers not only provide water to the lowlands, they also support human settlements, cities and towns, and economic growth centres; serve as transport links; and contribute to trade, commerce, industry and economic growth. Mountain areas are also hotspots for biological diversity, contain highly diverse eco-regions, and are rich in gene pools, species, and ecosystems of global importance. A large proportion of the forests and rangelands in the BIMSTEC region lies in the mountains and hills. They support climate regulation and carbon sequestration, and moderate floods. As a result of their biological and cultural diversity, mountain areas also contain a high proportion of protected areas. The growth potential of mountain areas is limited, but they contribute substantially to the economies of the lowlands.

Although the BIMSTEC region has been growing fast in terms of economic and social development over recent decades, growth is not uniform across or within the countries. Hill and mountain areas, in particular, have lagged behind in most countries. The Sustainable Development Goals (SDGs) represent a transformative agenda that aims to eradicate extreme poverty and hunger by 2030 and to "leave no one behind". It intends to transform economies by making economic growth more inclusive and equitable, achieving decent work for all, decoupling growth from environmental degradation, and investing in climate-resilient development pathways. The agenda is critically important for the hill and mountain areas in the BIMSTEC countries as these areas face multiple challenges and lag behind in socio-economic development, and will require special attention to achieve the SDGs. Although mountain areas are rich in resources, investment is generally low, and resources insufficient to ensure adequate employment or decent living conditions.

The linkages between mountains and lowlands are critical for sustainable development. While lowland people depend on the mountains for many natural resources and ecosystem services, mountain and hill people also depend heavily on lowland areas for many goods and services including connectivity, trade and transit facilities. These interdependencies call for close integration of upland and lowland areas. With globalization, mountain areas

Box 1: **Mountains and Hills in BIMSTEC**

Out of seven BIMSTEC member countries, five – Bangladesh, Bhutan, India, Myanmar, and Nepal – include a significant portion of the Himalaya. Mountains and hills cover about 23% of the total land area of the BIMSTEC region (Table 1). These mountains and hills play a vital role in the economic growth of the BIMSTEC countries. The region's mountains are gradually becoming 'power-houses' as more hydropower projects are built there to meet the region's soaring energy demands. The Ganges, Brahmaputra and Mekong – all originating in the Himalaya – supply freshwater for agriculture, industry and meeting the needs of growing urban populations. Increasingly, the countries are beginning to realize that their rivers provide other benefits, principally inland navigation. The rivers also provide recreational services and support fisheries, augmentation of dry season dry flows, floods moderation and flushing of saline water, among other things.

The mountains of the region host three biodiversity hotspots and harbour diverse flora and fauna – many of them rare, endemic and threatened – that support the livelihoods of its people. Similarly, the region is home to the highest nine of the world's 14 mountains over 8,000 metres. These peaks and their scenic beauty attract thousands of tourists every year. Different religious communities revere some of the mountains in the region. The mountains also provides aesthetic and recreational services to downstream communities, particularly pleasant weather during hot summers. These services generate revenue and provide employment opportunities for communities. Mountains are crucial for many of the most pressing issues facing the BIMSTEC countries today – water, energy, food security, adaptation to climate change, and protection of biodiversity. Similarly, mountain regions also depend on lowland and coastal areas for goods and services, including connectivity, trade and transit facilities. While mountain communities depend on the plains for trade and prosperity, people from the plains depend on mountains for peace, stability and sustainability.

Table 1: **Hill and mountain areas in BIMSTEC member countries**

Countries	Geographical area of countries (sq.km)	Hill and mountain area[a]		Population		
		Sq.km	Percentage of country area	Total population (millions)	Population of mountain areas (millions)	Percentage of population living in mountain areas
Bangladesh	144,000	13,198	09	161	1.78	1
Bhutan	38,394	38,394	100	0.77	0.77	100
India	3,287,263	482,920	14	1,311	86.27	6.5
Myanmar	676,553	317,640	47	53.9	11.77	22
Nepal	147,181	147,181	100	28.5	28.5	100
Sri Lanka	65,000	11,050***	17***	20.35	5.0[b]	24
Thailand	510,890	102,624**	20**	67.95	6.3	9
Overall	4,869,281	1,113,007	23	1,643	140	8.5

[a] Estimated mountain area for Bangladesh, Bhutan, Nepal, India and Myanmar only include the Hindu Kush Himalaya belt
[b] Population of districts Kandy, Matale, Nuwara Eliya, Badulla, Kagalle and Ratnapura

Source: ICIMOD, 2017; Census of Population and Housing (Sri Lanka), 2012; ** Fact and Details Web; *** Breuste and Dissanayake, 2005

are now connected with global market networks and access has increased opportunities. The mountain areas of BIMSTEC are increasingly being integrated into global market systems. Despite several challenges, these areas have huge potential to contribute to economic development in the BIMSTEC countries. However, their landlocked position, poor accessibility, and poor connectivity still pose huge challenges for development.

Achieving the SDGs of ending poverty and hunger, ensuring water and sanitation, providing access to modern energy, and promoting decent employment and inclusive growth by 2030 requires special attention to the mountain areas of the BIMSTEC region. The key challenge is how to overcome the constraints imposed by mountain topography. What role can regional cooperation – particularly cooperation under BIMSTEC – play in conservation and sustainable development in the hills and mountains, and in strengthening linkages to downstream areas in the BIMSTEC region? Intra- and inter-regional cooperation and integration can unleash the potential for sustainable development. This paper examines the role of mountains in the BIMSTEC economy and the issues and challenges in mountains. It identifies future opportunities to enhance the role of mountains, both for national economies and the regional BIMSTEC economy. The aim is to promote cooperation among the BIMSTEC countries for conservation and sustainable development with a view to improving the quality of life and strengthening local economies and communities, especially in mountain and hilly regions, while conserving natural values and cultural heritage.

2. Mountain Topography and Economic Challenges

Mountain ranges vary considerably across countries in the BIMSTEC region in terms of topography and climate – from the mighty Himalaya and high mountains in the west to the lower middle mountains, hills, and uplands in the east; and from cold temperate climate in the west to sub-tropical and tropical climate in the east. These areas have many common characteristics, notwithstanding the variation in topography and climate:

- Physically, the mountain and hill areas are generally more remote, distant from markets and growth centres and with poor connectivity and accessibility. Most are either in landlocked countries (Bhutan and Nepal) or located in border areas of countries far from the coast, sea ports, or growth centres, such as in India, Myanmar, and Thailand.
- Economically, mountain areas generally lag behind, with occasional exceptions as in Himachal Pradesh and Sikkim in India. Much of the population is rural and mostly engaged in low-productivity agriculture, with relatively low per capita income and low human capital. The characteristics of the mountain terrain result in small and scattered production, high transport costs, limited possibilities for economies of scale, poor physical and economic infrastructure, and poorly developed industrial and service sectors. Economic structure is dominated by the primary sector, with people remaining primary producers and collectors who supply raw materials and natural resource products to the lowlands. A large proportion of the mountain population depends on agriculture, forest, pasture, livestock, and collection of non-timber forest products (NTFPs) for their livelihood. Most land is unsuitable for intensive cultivation, although there are a few specialized markets, and mountain farming remains mainly rainfed, low input and low intensity.
- Socially, mountain areas tend to be ethnically and culturally diverse. The mountain and hill areas in the BIMSTEC countries are home to many ethnic and tribal communities with unique cultures, languages and traditions, and the mountain areas are hotspots for cultural and linguistic diversity. Approximately 1,000 languages are spoken in the Himalayan region, a large number of them in the BIMSTEC countries. However, the isolation, remoteness and sparse populations that are the source of this diversity also mean that the voices of these minorities in national decision making is generally weak.

Realizing the importance of mountains, growing attention has been paid to mountain regions in the global environment and development agenda (FAO, n.d.). Chapter 13 of Agenda 21, the global plan of action adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil in 1992, underscored the role of mountains in global sustainable development. Regional mountain institutes were established in different mountain ranges for sustainable development of mountain regions – for example, the International Centre for Integrated Mountain Development (ICIMOD) for the Himalaya. The Convention on Biological Diversity (CBD), opened for signature at the same conference, has a specific Programme of Work on Mountain Biodiversity. The Rio+20 conference in 2012 emphasised the importance of mountain regions, while the major post 2015 development agenda, the Sustainable Development Goals 2015–2030 (SDGs) explicitly mention mountains several times for its significance (UN, 2015).

3. Role of Mountains in Sustainable Development

Mountains and hills in the BIMSTEC region are home to 140 million people. A further 1.5 billion people downstream depend directly or indirectly on the mountains for a wide range of goods and services, including water, energy, food, and biodiversity. Mountains and hills are the water towers of this region. Mountain products and services form the basis for many economic sectors– agriculture, forestry, pharmaceuticals, rangeland production, hydropower generation, tourism, and others. Indirect contributions include the support and regulation of ecological functions and processes such as carbon sequestration and storage, soil conservation, flood control, climate moderation, and wind and monsoon regulation. The economic growth and sustainability of both upland and lowland communities is only possible through the sustainable management and use of the mountain ecosystems. The benefits derived from mountain regions were recognized as 'essential for sustainable development' by the Rio+20 summit. This section explores the key roles of mountain ecosystems in sustainable development both in the BIMSTEC countries and in the region as a whole.

Water resources

The mountains in the BIMSTEC region contain the headwaters of five of the ten major river basins in the Hindu Kush-Himalayan (HKH) region – the Brahmaputra, Ganges, Irrawaddy, Mekong, and Salween (Table 2). The high mountains, particularly the HKH, are often called 'the water tower of Asia' or 'third pole' because they contain the largest area of glaciers (30% of the world's total) and permafrost and greatest freshwater resources outside the North and South Poles. Thailand is under the influence of the Himalaya as the Mekong River originates in the mountains and Thailand lies downstream. A significant proportion of this lies in the BIMSTEC member countries. A total of 5,082 km^3 of renewable fresh water is generated annually in the BIMSTEC region (AQUASTAT, 2018), which is about 12% of the total renewable fresh water resources in the world (World Bank, 2018). Of the total, 909 km^3 (almost 21%) is withdrawn annually. The rivers play a crucial role in providing various ecosystem services including freshwater for drinking, domestic use, agriculture, energy, and industrial use. More than half of the population in the region relies on freshwater from the mountains.

Table 2: **Principal rivers in the BIMSTEC region**

River	Annual mean discharge (m^3/sec)	Basin area (km^2)	Basin population density (persons/km^2)	Population ('000)	Water availability (m^3/person/year)
Brahmaputra	21,261	528,083	225	118,543	5,656
Ganges	12,037	1,016,124	401	580,000	932
Irrawaddy	8,024	413,710	79	42,870	7,742
Mekong	9,001	805,604	71	77,310	4,963
Salween	1,494	271,914	22	17,880	4,963

Source: ICIMOD, 2009a; CIESIN, 2015

A significant portion of land in the BIMSTEC Region (over 123 million ha, 17% of the world's total) is under cereal production, mostly in the fertile plains downstream. About 30–40% of cropland is irrigated, and irrigated agriculture accounts for more than 50% of food production. The most commonly grown crops are rice and wheat, both of which require huge amounts of water – about 1,000 tonnes to produce 1 tonne of grain (Brown, 2009). Groundwater is vital for irrigation, and the contribution of mountains to downstream groundwater recharge is considerable. The two major canal systems in the Ganges river basin, the Ganges and Yamuna, irrigate almost 60% of India's irrigated area using surface and groundwater received from the Himalayas, and the Brahmaputra river system provides irrigation facilities to a further 0.6 million ha during the dry season (Rasul, 2014). Provision of river water and groundwater recharge means that the mountain ecosystems contribute significantly to agriculture and economic development in the BIMSTEC countries, directly and indirectly.

Energy resources

Mountains are major sources of renewable energy such as hydropower, solar power, and wind power; more than 15% of the world's energy comes from hydropower, mostly from mountains. The Sustainable Development Goal 7 (SDG 7) emphasizes ensuring access to affordable, reliable, sustainable, and modern energy for all. This goal specifically aims to improve the production and use of clean energy, which is needed to maintain economic growth in a sustainable way and to improve the living standards of the vast number of people in the region who still depend on biomass energy. Hills and mountains of the BIMSTEC region have a hydropower potential of about 272 GW of which 23% is being used (Table 3).

Table 3: **Hydropower potential and installed capacity in BIMSTEC member countries**

	BIMSTEC countries							
	Bangladesh	Bhutan	India	Myanmar	Nepal	Sri Lanka	Thailand	Total
Economically feasible (MW)	1,697	23,760	150,000	39,000	43,000	n.d.	15,155	272,612
Installed capacity (MW)	230	1,615	51,494	3,140	753	1,624	4,510	63,366
Electricity access (percent of population)	62.4	100	79.2	52	84.9	92.2	100	
Electricity from oil (% of total)	14.6	0	1.8	0.5	0	35.1	1.0	

Source: World Bank, 2017; International Hydropower Association (IHA), 2016

The hydropower potential of the Ganges-Brahmaputra's tributaries is one of the largest among the world's rivers, estimated to be about 83,000 MW in Nepal, 59,000 MW in Northeast India, and 21,000 MW in Bhutan (Rasul, 2014a). Nepal and Bhutan could harness this hydropower potential at a relatively low cost which could play a vital role in economic development. Streams and rivers in the mountains also offer considerable opportunities for generating hydropower at small and medium scales. Nepal has good experience with micro-hydropower plants (less than 100 kW capacity), especially in relation to community involvement in planning, construction, and operation.

The Ganges and its tributaries also have a huge potential for hydropower development and trade. A recent World Bank study suggests that about 25,000 MW of electricity could be generated in the Ganges basin through upstream storage of water in 23 dams, and that this could provide benefits worth USD 5 billion per year with few trade-offs (World Bank, 2014a & 2014b).

The contribution of hydroelectricity to total commercial energy is about 50% in Bhutan, 17% in Nepal, and 6% in India (ADB, 2011). There is considerable scope to replace non-renewable energy sources through mountain based clean energy in the BIMSTEC countries.

Forests resources

A significant proportion of the mountain and hill areas in the BIMSTEC countries is forested (Table 4), and forests are a major source of livelihood for mountain communities. They provide timber, fuel, medicinal and aromatic plants, food, and fodder; sequester CO_2 emissions; and protect against natural hazards (Agrawal et al., 2013). For example, forests cover more than 72% of the geographical area in Bhutan, directly generate USD 67 million annually (3.8% of national GDP), provide employment to thousands of economically active people, and stock 293 million MT of carbon (Global Forest Watch, 2017).

An ecosystem valuation carried out in Bhutan estimated benefits of USD 4,944 million derived from ecosystem services, of which 53 percent of the ecosystem services created within Bhutan benefit people outside its political boundaries (Kubiszewski et al., 2013). In highly forested mountain countries such as Bhutan, Myanmar and Nepal, or forested regions such as the Indian Himalayas, protecting forest ecosystems has considerable local as well as global environmental benefits. For example, the per hectare ecological value of soil nutrient conservation, flood control, and water recharge is calculated to be USD 860 in Himachal Pradesh and USD 134 in Uttarakhand in India. Moreover, the economic benefits generated by provisioning, regulating, and supporting ecosystem services are calculated to be around USD 4,286 per hectare in Uttarakhand, India (ICIMOD, 2011).

Table 4: **Forest area in the mountains and hills of BIMSTEC countries**

Country	% forest area in mountains and hills
Bangladesh	64
Bhutan	72
India	42
Myanmar	44
Nepal	40
Sri Lanka	22
Thailand	34
Overall	39

Source: UNEP, 1997; ICIMOD, 2009b; ICIMOD, 2011; Government of Sri Lanka 2014; DFRS, 2015; World Bank 2018

Biodiversity

Mountain areas host approximately one quarter of all terrestrial biodiversity and half of the world's total protected areas (Rodríguez-Rodríguez et al., 2011). The extreme altitudinal and climatic variation of the mountains in the BIMSTEC countries has made them rich in regional and global significance. They host a wide range of flora and fauna and locally adapted traditional crops and livestock. The mountain and hill areas in Nepal, for example, contain more than 6,500 species of flowering plants (2.33% of the world's total), of which 600 are edible (ICIMOD, 2002), while the Indian Himalayan region has more than 675 edible plants and nearly 1743 species of medicinal value (Singh, 2007; ICIMOD, 2010). As well as being an important genetic resource, mountain biodiversity provides food, medicine, family income, and recreation, ensures sustained resource productivity, and is significant for environmental restoration and climate change adaptation.

Across the world, protected areas provide a secure home for plant and animal species. The mountains and hills in the BIMSTEC countries have 185 protected areas, 24% of the total protected area in the region. Bhutan, for example, has 10 protected areas covering 51% of the total geographical area of the country and hosting thousands of floral and faunal species. Biodiversity has significance from local to global scales. With increasing threats, mountains are also known as Global Biodiversity Hotspots considering the high proportion of endemic, threatened species and habitat loss (Mittermeir et al., 2004). Species that at present have little human use may have more value in the future. However, mountain people bear a high opportunity cost in their conservation, owing to the restriction of economic activities in protected areas. However, in the long run, biodiversity conservation is important for a green economy and sustainable development.

Recreation and leisure

Mountain areas are increasingly becoming destinations for recreation and leisure. Annually, thousands of domestic and international tourists visit mountain areas for their scenic beauty and for rafting, bird watching, fishing, and hunting, as well as for religious and cultural reasons. The mountain regions of BIMSTEC contain many important tourism attractions and destinations such as Mt. Everest, Mt. Annapurna, and Mt. Kanchenjunga (Nepal), the Chiang Mai and Chiang Rai provinces in the northern hills of Thailand, and Darjeeling, Manali, Shillong, and Ooty in India. Tourism directly contributes USD 121 billion to the GDPs of the BIMSTEC countries and employs more than 30 million people. However, the total contribution of tourism including the indirect contribution is twofold, in terms of GDP as well as providing employment opportunities (Table 5). Regional policies to promote sustainable tourism can benefit mountain regions through livelihood diversification that facilitates a move away from subsistence-based livelihoods.

Table 5: **Contribution of tourism in BIMSTEC member countries in 2016**

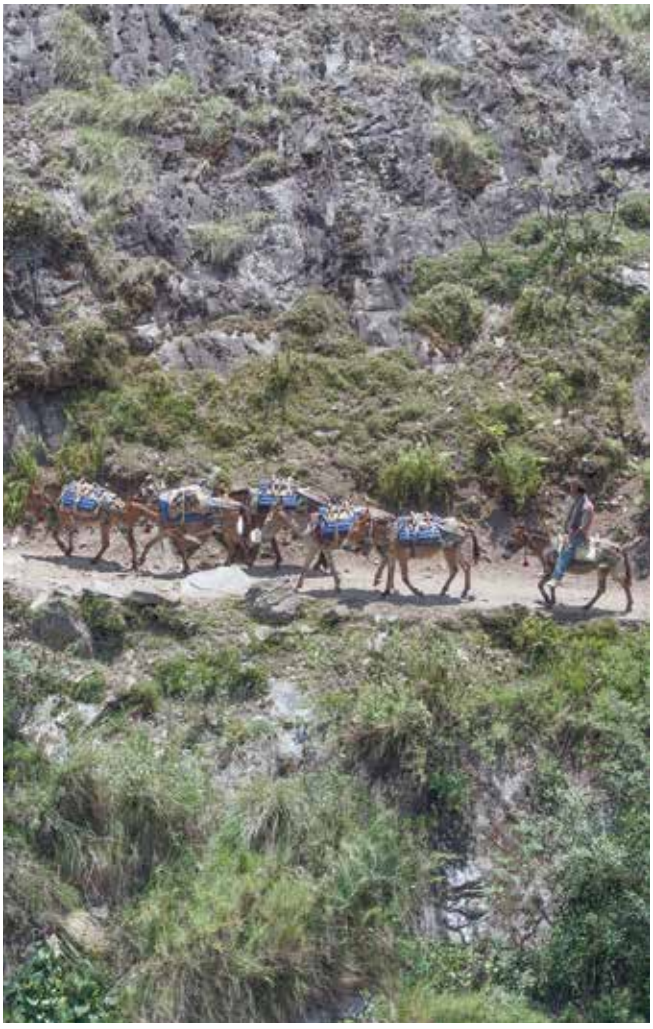
	BIMSTEC Countries							Total
	Bangladesh	Bhutan	India	Myanmar	Nepal	Sri Lanka	Thailand	
Tourism contribution (billion USD)	5.3	0.074	71.7	2.1	0.8	4.4	36.7	121
Share of national GDP (%)	2.2	3.6	3.3	3.0	3.6	5.1	9.2	
Employment ('000 jobs)	1,056 (1.8)	22	25,394 (5.8)	804 (2.7)	426 (2.9)	406 (4.8)	2313 (6.1)	30,421

Note: Figures in parenthesis indicate share of total employment
Sources: WTTC, 2017; World Bank, 2017; Tourism Council of Bhutan, 2016; Nepal, S. & Karst, H. (2017)

4. Challenges and Opportunities for Sustainable Development

Challenges

To support sustainable development in the BIMSTEC region, the strategic importance of the mountains should be realized and current and emerging challenges in the mountains be addressed. These challenges should enter into the policy agenda of the region, and sustainable mountain development made a regional priority. The key mountain issues and challenges related to connectivity in the region include the following.



Poor physical connectivity

The South Asian region is poorly integrated compared to other parts of the world. Intra-regional trade in South Asia accounts for only 5% of total trade, compared to 25% in the ASEAN region (ADB, 2012), and intra-regional investment is less than 1% of overall investment. There is strong evidence that improving connectivity can provide an impetus for economic development, but the poor quality of national and regional infrastructure is a major challenge.

The limited transport connectivity means that it costs more to trade within South Asia than between South Asia and the world's other regions. Table 6 shows the average per unit cost, number of days, and number of documents required to export or import a container from each of the BIMSTEC countries. The unit cost of

Table 6: **Trading time and procedures for exporting or importing a container**

Country	Export			Import		
	Time (days)	Cost (USD per container)	No. of documents	Time to import (days)	Cost (USD per container)	No. of documents
Bangladesh	28	1,281	5	33	1,515	7
Bhutan	38	2,230	9	37	2,330	11
India	17	1,332	3	21	1,462	5
Myanmar	20	620	8	22	610	8
Nepal	40	2,545	11	39	2,650	11
Sri Lanka	21	560	7	13	690	7
Thailand	14	595	5	13	760	5
World average	21.5	1,559	6	24	1,877	7

Source: World Bank, 2018

trading is significantly higher for the landlocked countries of Bhutan and Nepal (3–4 times higher than Thailand), while both countries also require more documents to be submitted.

The transportation costs for mountain products are much higher than the national average because of the fragmented nature of production and rugged terrain. Improved infrastructure and connectivity in mountain areas helps to improve access to basic services as well as facilitating market access and trade. Most importantly it helps integrate the local markets into national, regional, and global markets. Transportation is one of the major impediments to the development of value chains and engagement and expansion of the private sector in the mountain countries. International experience shows that synergies from connectivity will not materialize in a substantial manner until there is some form of regional integration.

The lack of adequate physical and soft connectivity within and between South and Southeast Asia is a key constraint to increased trade and investment. Good transport infrastructure can have an immense impact on growth, as shown in the European Union. Similarly, ASEAN has accorded high priority to transport infrastructure in its Connectivity Master Plan with the aim of bringing competitiveness and resilience to the region by bringing people, goods, services, ideas, innovation, knowledge, technology, and capital closer together in an efficient way.

As connectivity is one of the main constraints to trade, a major objective of BIMSTEC is to foster economic integration through free trade agreements and improving transport infrastructure and logistics among its member countries. The problem of connectivity is particularly critical in the mountain areas and land-locked regions, where the difficult terrain increases infrastructure costs. Regional cooperation in infrastructure development and trade facilitation will help to reduce costs and time of transit, particularly for the landlocked countries.

High vulnerability to climate change

The mountain and hill areas in the BIMSTEC countries are highly vulnerable to climate change induced hazards. The rise in temperature in the mountain areas, particularly in the HKH region, is higher than the global average. Precipitation patterns have also changed, but not uniformly across the region, and floods and droughts have become more frequent. Overall, climate change induced hazards are hindering economic growth and efforts at poverty reduction (Eriksson et al., 2009; IPCC, 2013).

Inadequate facilities and policy for regional tourism

Tourism is one of the major sources of income and contributes substantially to national GDP of the BIMSTEC countries. It is an important economic sector in the three South Asian countries that are included in the transboundary Kanchenjunga Landscape – Bhutan, India and Nepal. It contributes significantly to the GDP of all three countries (3.3% of India's total GDP, and around 4% of GDP in Bhutan and Nepal), while also supporting employment both directly, as well as indirectly (almost one million jobs in Nepal and more than 37 million jobs in India). While tourism plays a significant role in the economic development of the region, the potential for sustainable tourism is yet to be fully harnessed. SDG 8.9 enjoins nations to "[by 2030] devise and implement sustainable tourism that create jobs and promotes local culture and products". Limited infrastructure, inadequate human resources capacity in the service sector, lack of coordinated marketing, ensuring product quality, limitations in regional mobility and the lack of regional policy and institutional mechanisms have not allowed tourism entrepreneurship to develop in the region.

Low investment in mountain region

Although mountain areas are rich in resources, investment is generally low, and resources insufficient to ensure adequate employment or decent living conditions, with communities often lacking even basic social and economic services. Industries, where established, are mainly extractive, such as mining, hydropower, and timber. Upland-lowland production linkages are generally weak: resources flow from the mountains to the plains, while products flow from the plains to the mountains. Exchange is mostly unequal and the terms of trade are unfavourable. Mountain regions largely remain providers of water, energy, and raw materials, as well as labour for industry and agriculture in the plains.

Opportunities

Regional integration has the potential to contribute to sustained growth, poverty alleviation, and inclusive development in the BIMSTEC area. It opens the door to vast opportunities for leveraging economic growth and sustainable development within and across the BIMSTEC member countries and to address the challenges of managing the food-water-energy nexus in the region (Rasul, 2014a). The commitment of BIMSTEC countries to move forward from a bilateral mode towards regional cooperation is expected to bring immense opportunities at national and regional levels. This section presents some of the most important opportunities which might be tapped through regional cooperation.

Promoting regional trade

The main principle of economic integration is to reduce trade barriers (technical and non-technical) among the member countries. Regional integration offers a single pool of resources to overcome the disadvantages of small scale economies by combining markets. Member countries can enjoy the opportunities offered by a larger market, increased competitiveness, and economies of scale through regional integration. BIMSTEC's objective is to help link Southeast and South Asia through trade and physical and soft connectivity for sustainable development. The economies of member countries have an opportunity to grow as a result of integrating with the emerging economies of India in South Asia and Thailand in Southeast Asia. Competitiveness can be increased and the transaction cost of trade reduced through trade facilitation and use of innovative technologies such as ICTs. Regional integration opens broader markets for landlocked countries like Nepal and Bhutan and improves their negotiating position on access to the coast and trade with their neighbouring countries if all the countries work in a collaborative manner. Apart from direct gains, regional economic integration offers indirect benefits by reducing uncertainty and providing incentives for investment in regional public goods and infrastructures. Considering sustainable tourism as a common and potential link for the BIMSTEC countries, it could contribute to sustainable development through conservation and preservation of the cultural as well as natural Heritage of the Landscape. SDG 12.b specifically requires countries to, "develop and implement tools to monitor development impacts for sustainable tourism that creates jobs and promotes local culture and products".

Improving regional connectivity: access to Bay of Bengal for Bhutan and Nepal

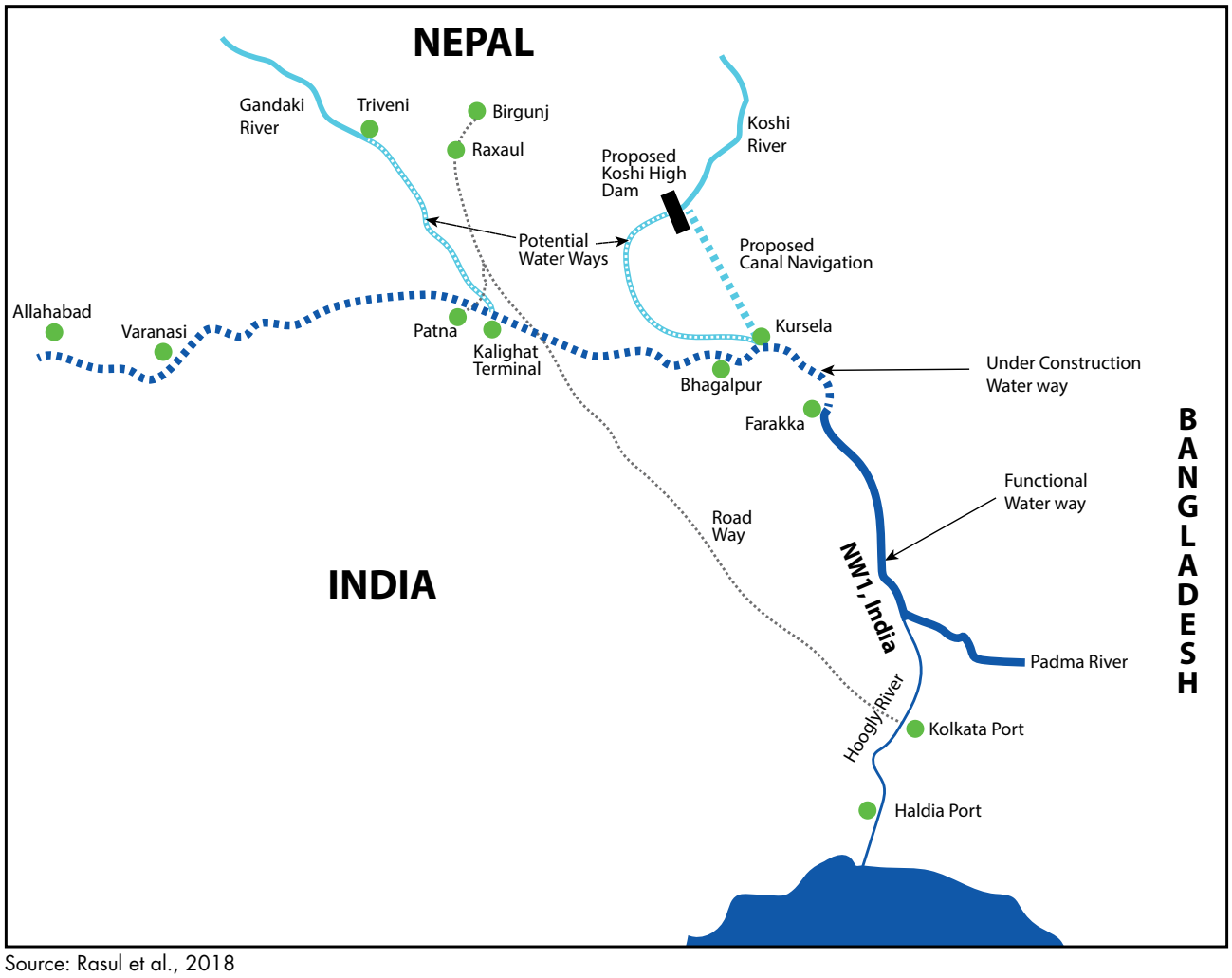
Afghanistan, Bhutan, Nepal and Northeast India lack direct access to the sea and suffer from poor infrastructure and inaccessibility due to difficult topography, which are major obstacles to industrial development and economic growth of this region. The Ganges, Brahmaputra, and Mekong rivers constitute a vast water network and together

offer an opportunity to develop an integrated water transport system. Poor infrastructure and high transportation costs in the mountainous areas make trade more expensive, less competitive and profitable.

The north-eastern states of India, Bangladesh, Nepal and Bhutan can be connected through National Waterway 1 (NW-1) and National Waterway 2 (NW-2) of India in the Ganges-Brahmaputra-Meghna basin. Navigational development along the Ganges, Brahmaputra, and Mekong rivers could transform the economies of Nepal and Bhutan through increased exports and imports and by triggering industrial development. BIMSTEC initiative provides an opportunity for integrating South Asian and South-East Asian markets through waterways. For example, the Kaladan Multi-modal Transport Network aims to connect Kolkata of India with Myanmar, which can be the gateway for India, including landlocked Northeast Indian states, Nepal and Bhutan to Southeast Asia.

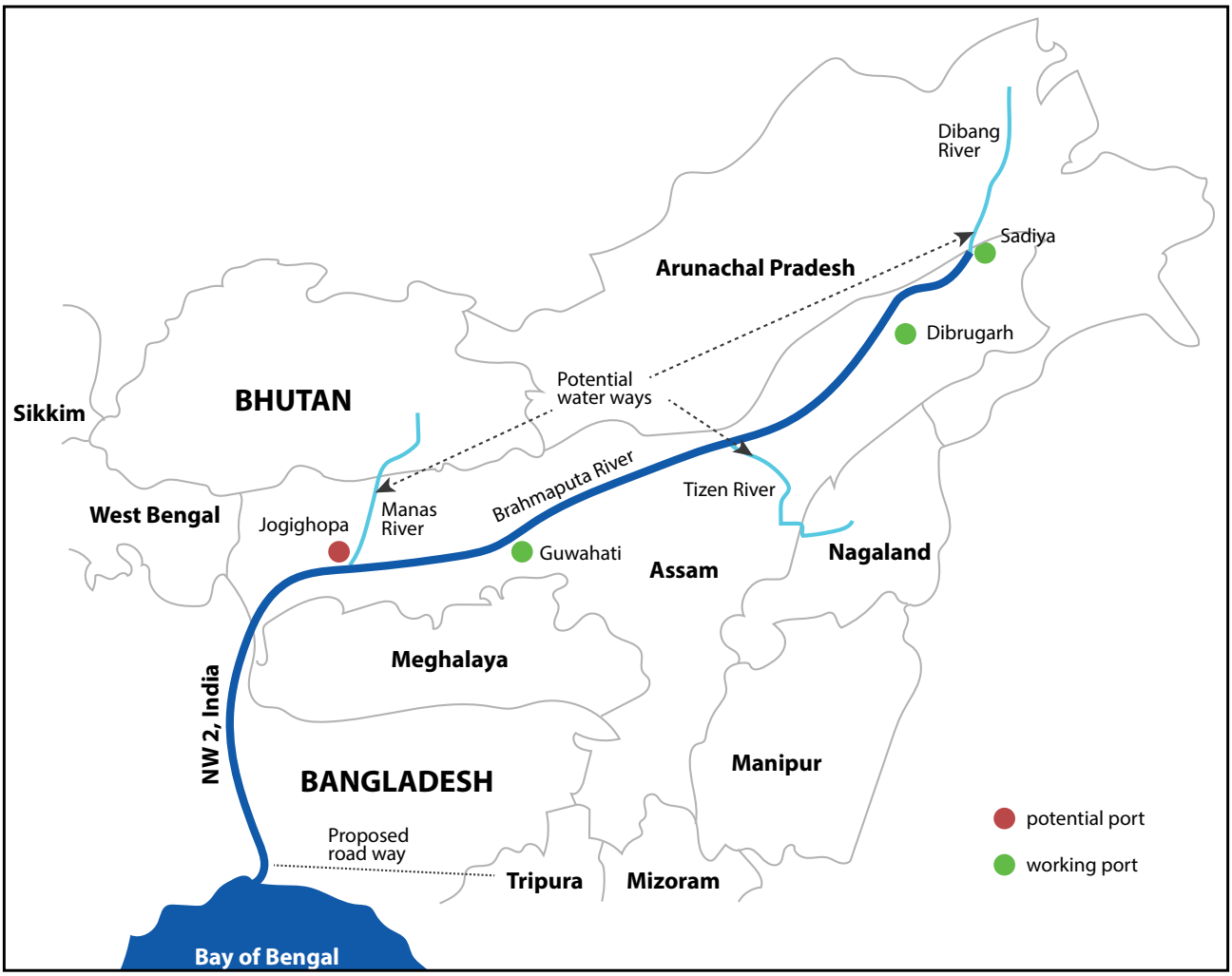
Water transportation is cost-effective compared to other forms of transportation, particularly for bulk commodities as well as environmentally advantageous because of relatively less emissions. For example, it costs around USD 943,000 to transport 100,000 tonnes of freight from Kolkata to Kathmandu by road; whereas transporting by water would cost only USD 96,000 (Rasul, 2014b) and reduce emissions and traffic congestion significantly. Access to the Bay of Bengal via the Brahmaputra could also help Bhutan in expanding regional and international trade. It is technically feasible for Nepal and Bhutan to gain direct access to the Bay of Bengal. NW-1 of India from Hooghly (in India) along the Ganges (in Bangladesh) via Farakka, Kanpur, Kursela, Kalughat and Vanarasi in India can link several points in Nepal, such as Bhardaha on the Koshi River, Trivenidham on the Gandaki, and Chisapani on the Karnali (Figure 1). Similarly, linking Manas River of Bhutan with Brahmaputra can enable Bhutan to have access to the sea (Figure 2). Regional cooperation can facilitate development of a regional water transport network to foster integration of regional economies, better use of resources, and economic growth.

Figure 1: **Potential waterways to connect Nepal with the Bay of Bengal**



Source: Rasul et al., 2018

Figure 2: **Potential waterways to connect Bhutan and Northeast India to Bay of Bengal**



Source: Rasul et al., 2018

Strengthening waterways and regional connectivity

Recently, the development of waterways has gained momentum following the declaration of 106 additional waterways by Indian Government, amendment of bilateral navigation protocol between India and Bangladesh, and ongoing Motor Vehicle Agreement in BBIN and BIMSTEC initiatives. Connecting this region to the Bay of Bengal through development of waterways in Brahmaputra, Ganga and Mekong can be a part of a sub-regional connectivity programme to connect Bangladesh, Bhutan, India and Nepal with Southeast Asia (Rasul, 2015). Realizing the opportunities, prime ministers of India and Nepal took a landmark decision to develop inland waterways for the movement of cargo, within the framework of trade and transit. The new policy development between India and Bangladesh has opened up a new opportunity for Nepal to improve transport and trade. In addition to the Indian ports, Nepal can benefit from using Chittagong and Mongla ports in Bangladesh.

The Manas River is a transboundary river in the Himalayan foothills of Bhutan which connects with Assam in India. Bhutan can benefit immensely through expansion of NW-2 in India. Bhutan has also signed a MoU with Bangladesh in 2017 to use its inland waterways for transportation of goods and services through Chittagong and Mongla ports for imports and exports (Rasul et al., 2018).

Promoting clean energy through hydropower development

The mountain and hill areas of the BIMSTEC countries have substantial hydropower potential (Table 3). Myanmar, Nepal and Bhutan have high potential, whereas India, Bangladesh, and Sri Lanka have high demand. Harnessing the vast hydropower resources in countries like Nepal and Bhutan will be critical for meeting the energy demands of the region. The available hydropower resources could provide a large surplus if developed strategically with a view to fostering regional energy trade. Such regional cooperation agreements can provide assured markets and help attract investment from regional member countries.

Establishment of an inter-country power grid is a prerequisite for energy trade. Such a grid could facilitate the integration of different power systems and the export of excess hydropower from Nepal and Bhutan to India, Bangladesh, and other member countries. A grid link with Bangladesh could substantially shorten the transmission distance between Northeast India and West Bengal, compared to the current route via Siliguri. Cross-border grid interconnections are increasing all over the world, and already work smoothly in North America, Europe, and southern Africa.

Conserving biodiversity: Mountains as a regional seed vault and centre of biodiversity

The mountains and hills of the BIMSTEC region are global biodiversity hotspots. Twenty of the world's principal biome types are found in the HKH region, which hosts a vast array of plants, mammals, birds, reptiles, and other taxa. Around 25,000 plant species have been identified across the HKH region (Singh, 2011), with more than 5,000 in North East India alone (Singh, 2011). While plant species diversity decreases with elevation, genetic diversity increases. The hills and mountains of the BIMSTEC region are also a treasury of medicinal plants. The biodiversity of these hills and mountains have regional and global significance. However, the degradation and loss of biodiversity is very common, as elsewhere in South and Southeast Asia. Many edible plant species and NTFPs, which in previous times were a source of food and income, are now rare or non-existent. The governments of the member countries are making a considerable effort to conserve the biological resources in their own areas and a number of protected areas have been created in the mountain ranges. However, conservation also means agreements across transboundary areas, and can be made much more effective through regional cooperation and policies.

The economy and livelihoods in most of the BIMSTEC countries are still based on agriculture, and millions of people are still food insecure and poor. Various drivers of change including climate change may ruin crop species and affect crop growth. The concept of a regional seed bank is crucial, as it can both help to ensure that the unique species of the region are conserved and provide genetic resources for crop adaptation under changed conditions in the future. There are already some initiatives in the mountain countries of BIMSTEC. Navdanya in Uttarakhand, India, hosts one of the five global seed banks, while Nepal has 11,051 accessions of mountain crops in its National Genebank (Paudel et al, 2016). The conservation of genetic resources is expensive and sometimes difficult for downstream and coastal countries. There are many permafrost areas in the Himalayas that could be used as natural seed banks. With proper infrastructure, the mountain regions could function under regional cooperation as a seed bank for the whole region.

Promoting regional tourism

The rich and unique cultural and biological diversity, diverse geography, beautiful landscapes, sites of historic and religious significance, and hospitable people in the mountains and hills of the BIMSTEC region are all a draw for tourists. Notwithstanding this enormous potential, the total revenue generated is low; in the South Asian (SAARC) countries mountains generate only 1% of total revenue from tourism (SAARC, 2011). The most promising approach is to develop a regional sustainable tourism strategy focusing on mountains.

The BIMSTEC region presents a major opportunity for joint promotion of a tourist circuit. For example, Sri Lanka, India, Thailand, Myanmar, and Nepal all have famous Buddhist sites, which could be developed as a joint package targeting Buddhist pilgrims. Similarly, Hindu circuit can be developed linking major sites to attract Hindu Pilgrims. Most of the Hindu sites are located on the banks of holy rivers such as Ganges and Brahmaputra and inland waterways could be an alternative option for connecting the circuit. Such potential regional tourism linkages need to be identified; further effort is needed to take transform this concept into reality (ADB, 2004). Similar packages could be developed for mountain trekkers. A regional strategy could promote travel to the cooler areas in the hills and mountains in summer, and to the warmer coastal areas in winter.

There are several successful international examples of improved tourism through a regional tourism policy. For example, in Latin America, improvements in infrastructure and communication and a reduction in formalities for tourist entry have significantly improved tourist flows and income in Brazil and Chile. As a result of regional integration, tourist numbers increased from 20 million in 1991 to 81.2 million in 2011 in Brazil, where 54% of total tourists are from within the region (Ghimire, 2001).

Mitigating regional flood risks and damage

The high precipitation in the monsoon season (June to October) renders the Eastern Himalayan countries and the areas downstream vulnerable to natural hazards such as floods and landslides. The Ganges-Brahmaputra basin is one of the most flood-prone regions in the world, with flooding a recurring phenomenon in Bangladesh, India, and Nepal. The loss of human life is highest in Bangladesh (on average around 6,000 people per year), while the number of people affected by floods is highest in India (more than 22 million per year). About one-tenth of the population of Bangladesh is affected by floods or drought annually. Bihar, Assam, and other North Indian states are particularly vulnerable to floods, with estimated annual average economic damage of INR 458 million in Bihar alone. The frequency and severity of floods, and the number of people affected, are increasing and pose a serious constraint to the development potential of these countries (Rasul, 2014b; Rasul, 2015).

> "While floods cannot be completely avoided, the damage can be reduced through the joint efforts of governments and those living in the major river basins. The lead time for flood forecasting can be increased substantially through exchange of real-time data on river flow from upstream areas of the basins. Downstream states also depend on the upstream neighbours for data and warnings about below average precipitation or drought. Flood warnings can provide a grace period – 2 to 14 days depending on the size of the river – between upstream rainfall and the augmentation in river flow downstream. But all of this is only possible with regional cooperation (Zawahri, 2008 cited in Rasul, 2014b: p. 24)."

5. Agenda for Regional Cooperation: A Way Forward

Although the BIMSTEC region has been growing fast in recent decades, it is still home to millions of the world's poor. The people living in the hills and mountains are relatively poorer than their plains counterparts, and social and economic development in these areas has remained a major concern. Poor connectivity is a major impediment to economic growth and social development in the mountains. Recent development of technologies and information and communication facilities, together with globalization, has gradually been connecting the mountain areas to the national, regional and global market systems. This has raised the aspirations of the mountain people; they aspire to better quality of life and integrating with the global community. BIMSTEC provides an opportunity to connect the Himalayan region to the Bay of Bengal and beyond.

Economic and social development in the mountain regions is hindered by poor physical and economic infrastructure and limited facilities for cross-border movement. Development of infrastructure is critical for improving connectivity and enhancing the prospects for growth. There are considerable upland-lowland linkages, and both mountains and lowlands can gain from intra and inter-regional regional cooperation and integration under BIMSTEC.

Mountain ecosystems are essential building blocks for long-term sustainable development, poverty alleviation, and green economy of the BIMSTEC region. Mountain ecosystems are complex and fragile and closely linked to the downstream; thus, any activity in mountain areas is likely to have environmental and socio-economic consequences that not only affect the mountains but also the plains. If the mountain region is healthy, rich, and prosperous, it will have a positive impact on the whole BIMSTEC region. However, in the past, most policies and decisions on the management of mountain ecosystems and resources have been made in isolation, with little attention to the mountain communities and the shared and contiguous ecosystems across the political boundaries.

In order to reap the full benefits of inter-regional cooperation, a coordinated response is needed that enhances the connectivity of mountain communities to national and regional markets and seaports and removes the barriers to cross-border movement. It is important to identify concrete implementable projects in which multi-country cooperation would yield tangible benefits for the mountain regions. Such investments may be considered as responses to the inherent 'needs' of the mountain and hilly areas, to ameliorate the geographical challenges that they face by improving transport and other infrastructure. The immediate priorities could be as follows:

- Improving intra-regional and inter-regional connectivity. Mountain and hill areas suffer from a deficit in infrastructure and poor connectivity. To accelerate economic growth and alleviate poverty, it is important to improve regional transport connectivity by rail, road, air, and waterway. Priority needs to be given to improving multimodal physical connectivity to landlocked countries and mountain areas. However, while the economic benefits of multi-sectoral infrastructure are high, infrastructure development can lead to environmental and social risks if not designed well. The infrastructure needs to be well planned, technologically sound, and socially acceptable to avoid negative impacts on the environment and society. Detailed feasibility studies need to be conducted to identify possible infrastructure development opportunities.
- Promoting trade facilitation by removal of trade barriers, including removing transit restrictions for landlocked and mountain regions and opening up port facilities for international trade with low transportation and transaction costs.
- Promoting energy trade particularly hydropower. Given the uneven distribution of hydropower resources and market production capabilities across the different countries in the region, cooperation and trade in energy could be mutually beneficial for both hydropower resource surplus and deficit countries. The electricity sector is mostly capital intensive, requiring transmission through grids and with problems of storage. Trade in electricity could open up opportunities for increased use of clean energy and sustainable development.

- Managing long-term sustainability of mountain ecosystems. The benefits derived from mountain regions in terms of water, energy, biodiversity, and other ecosystem services are essential for sustainable development. It is therefore important to prioritize actions to conserve mountain ecosystems and to address the challenges of sustainable development in mountain regions and downstream. As the mountains are regional public goods, sufficient investment is needed to ensure sustainable management of the mountain resources and use of these resources within ecological limits, without degrading the natural environment or jeopardising future resource availability. Investing in infrastructure and human resource development and improving technical know-how including skill development for human mobility and intra-regional labour movement.
- Promoting tourism among the BIMSTEC countries through regional cooperation. To promote tourism among the BIMSTEC countries, infrastructure and transport facilities need to be improved and travel procedures, particularly cross-border movement, simplified – without undermining security concerns. Networks should be strengthened among tour operators in the region and regional tourism planning developed. Efforts should be made to promote regional tourism clusters involving several countries.

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Annexures

Table A1: **Economic indicators of BIMSTEC member countries**

Economic indicators (2015)	Bangladesh	Bhutan	India	Myanmar	Nepal	Sri Lanka	Thailand
Labour force (million)	60.7*	0.353	345.9	21.9	10.0***	8.8****	38.5
Labour force employed in agriculture, forestry and fishing (million) (% of total labour force)	45.1* (74%)	0.200 (57%)	201.8 (58%)	no data	6.4*** (64%)	2.4**** (27%)	12.3 (32%)
Unemployment rate (%)	4.3*	2.5	2.5**	0.8	3.6	4.7	0.9
GDP growth rate (%)	6.6	5.5****	7.6	7.3	2.7	4.8	2.8
Share of agriculture in GDP (at current producer prices)	15.5	17.7	17	26.7	31.8	8.7	9.1
Share of services in GDP (at current producer prices)	56.4	39.4	53.2	38.7	53.3	60.6	55.1
Agriculture production index (2004-2006 = 100) For Myanmar only (2010-11 = 100)	136*	97.2*	139.8*	102.1	130.4*	136.1*	128.2*
Trade balance (billion USD)	-9.4	-0.393	-116.4	-5.4	-6.5	-7.9	+8.9

Data Year: *2013; **2009; ***2011; ****2014

Source: ADB, 2016

Table A2: **Economy of Indian hill and mountain states**

Economic Indicators	Jammu & Kashmir	Himachal Pradesh	Uttarakhand	Sikkim	West Bengal	Meghalaya	Assam	Tripura	Mizoram	Manipur	Nagaland	Arunachal Pradesh	National
Electricity availability in the state (GWh) (2008-09)	9,603	6,363	8,137	453	33,384	1,512	4,483	702	350	538	463	511	707,886
Installed capacity (MW) (2010-11)	1.093.3	769.1	1386.3	52.1	6013	189.1	446.8	169.4	88.3	50.9	30.7	94.7	82453
Average tariff per unit electricity in agriculture (INR/ Kwh) (2011-12)	1.42	0.00	2.01	0.00	2.70	1.77	4.79	3.33	0.00	2.04	0.00	0.00	1.53
Ultimate irrigation potential (000 ha) (2008)	1358	353	864	70	6918	168	2870	281	70	604	85	168	139893
Identified hydropower potential (MW) (2008)	14,146	18,820	18,175	4,286	2,841	2,394	680	15	2,196	1,784	1574	50328	148701
Real growth rate percent at constant prices (average from 2005-06 to 2013-14)	5.81	7.78	12.80	17.05	6.85	8.12	5.79	8.43	9.17	5.57	7.61	6.58	7.61
Per capita net state domestic product at constant prices (INR) (2012-13)	30,335	51,730	56,251	75,137	35,132	38,627	23,448	42,315	40,930	23,996	46,889	37,051	38,856
Growth rate- GSDP percent constant prices (average growth from 2005-06 to 2013-14)	5.81	7.78	12.80	17.05	6.85	8.12	5.79	8.43	9.17	5.57	7.61	6.58	7.61
Fiscal deficit as percent of GSDP (2013-14)	-2.85	-5.76	-2.66	-2.35	-1.90	-2.53	-1.98	-3.28	-6.56	-4.47	-2.57	-1.11	-2.50
Public debt-state governments (as percent of GSDP) (2013-14)	50.4	37.7	21.4	23.1	34.9	26.9	20.8	29.7	48.9	51.7	43.8	29.9	22.5
Literacy rate percent (2001)	55.5	76.5	71.6	50.6	68.6	62.6	63.2	73.2	88.8	70.5	66.6	54.3	64.8
Infant mortality rate (2012)	39	36	34	24	32	49	55	28	35	10	18	33	42

Source: Central Statistical Organization of India, 2014

Table A3: **Annual value of various forest ecosystem services: Uttarakhand, India**

Ecosystem Service	US$/ha/yr	Percent of total
Climatic regulation	167.6	14.6
Disturbance regulation	2.3	0.2
Water regulation and water supply	5.2	0.5
Erosion control	114.6	10.0
Soil formation	11.6	1.0
Nutrient cycling	429.6	37.4
Waste treatment	102.7	8.9
Biological control	2.3	0.2
Food production	50.7	4.4
Raw material	164	14.3
Genetic resource	18.5	1.6
Recreation	78.6	6.8
Cultural	2.3	0.2
Total	**1,150**	**100**

Source: Singh, 2007; Singh, 2011

Table A4: **Connectivity indicators of the BIMSTEC Countries**

Indicators	Bangladesh	India	Nepal	Sri Lanka	Bhutan
Length of paved road (KM)	81,170	1,604,000	5,273	74,444	2,460
Percent of paved road	30	47.3	31	81	56
Access to all season road (percent of rural population)	39	61	43		47
Road density (road km/square km of land)	2,079	1115	121	1505	93
Average road tariff/freight ($/ton-km)		0.015	0.1	0.05	
Average road tariff/passenger- km)			0.20	0.006	
Annual road expenditure (share of the GDP)	2%				
Rail-way density (rail route-km/1,000 people)	0.02	0.06	0.002	0.06	
Average rail tariff/freight ($/ton-km)	0.018	0.021	0.140	0.019	
Average rail tariff/passenger/km)	0.006	0.006		0.006	

Source: World Bank, 2018

Table A5: **Transport indicators of the BIMSTEC member countries**

Indicators	World Average	Bangladesh	India	Nepal	Sri Lanka	Thailand
Quality of road infrastructures	3.8	2.8	2.9	1.9	3.6	5.0
Quality of railroad infrastructures	3.0	2.3	4.4	1.3	3.2	3.1
Quality of port infrastructures	4.1	2.6	3.3	2.9	4.5	4.4
Quality of air transport	4.7	3.4	3.5	3.5	4.8	5.8

Source: ADB, 2012

Table A6: **National Infrastructure Needs in the selected BIMSTEC countries (2010-2020)**

Countries	Estimated Investment needs (US$ millions)	Investment as a percent of estimated GDP
Bangladesh	144,903	11.56
Bhutan	886	4.07
India	2172469	11.12
Myanmar	21698	6.04
Nepal	14,330	8.48
Sri Lanka	37908	6.85
Thailand	172907	4.91
Source: Bhattacharyay, 2010		

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ISBN 978 92 9115 629 0