Current Status of Sustainable Water Management in Bhutan

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Bhutan – The Land of Thunder Dragon

Brief Introduction

- Democratic Constitutional Monarchy
- Land area: 38,394 sq. km
- Forest cover: 70.46%
- Population: 746,773
- Districts: 20 Dzongkhags
- Capital: Thimphu

- Highest mountain: Gangkar Punsum 7570 m
- Languages: Dzongkha, English
- Currency: Ngultrum

Background

- Bhutan is endowed with abundant fresh water resources.
- Water bodies and wetlands, glaciers, supra-snow lakes, supra-glacial lakes, glacial lakes, lakes, rivers, streams, springs, peat lands, marshes, peat-bogs, fens and other forms of wetlands are important fresh water sources in Bhutan.

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- According to a study carried out by UWICE in 2010, there are 110 supra-snow lake, 495 supra-glacial lakes and 637 glacial lakes with a total area of 5183.78 Ha. The same study also shows an area of 4,997.33 Ha of lakes.
- Additionally, the National Land Cover Assessment of Bhutan carried out by MoAF, 2011, shows that there are 319.47 Ha of marshes in the country.
- The river systems (22,684.66 Ha) and their hydrological basins (38,39,400 Ha)

Increased water demand

- Water demand in Bhutan is from domestic uses, agriculture, tourism, industrial use and hydropower generation. Small scale cottage industries such as breweries, bottling plants, paper factories, hot stone bath houses and chip board industries also add pressure to the available water resources (NEC, 2016)

Water demand projection for different types (in MCM/Year) for 2015 and 2030

Demand Type	2015	2030	Percentage
Drinking Water	36.09	77.68	53.54
Industry & Others	74.39	218.35	65.93
Irrigation	666.9	9111.8	92.68

Increased waste generation

- Increased waste, particularly untreated wastewater generation, pollute pristine water bodies. In Thimphu City, household connection to the sewerage treatment plant in Babesa remains below 15%. The remaining 85% rely on individual septic tanks and have higher risk of sewerage outflow.

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- Water bodies in urban centers, such as Thimphu and Phuentsholing, are subjected to additional pressure from automobile workshops, which generated waste oil and other effluents. Thimphu alone has more than 47 automobile workshops.

Increased Populations

- Bhutan's annual population growth rate is 1.3%, meaning that Bhutan’s present population will be double in next fifty years.
- Bhutan’s Urban population is growing by 5-7% per year. It is estimated that the present urban population of 130,000 will grow to more than 400,000 by 2020.

Water resources and availability

- Bhutan has one of the highest per capita water resource availability in the world with 94,500 m3/capita/annum, (NEC, 2016).
- Most of the river system is fed by the rainfall, glacial melt (estimated 2 -12%) and snow melt (2%). The total annual water availability stands at 70,576.02 m3 which works out to average flow of 2,238 m3/s in 2015 (NEC, 2016).

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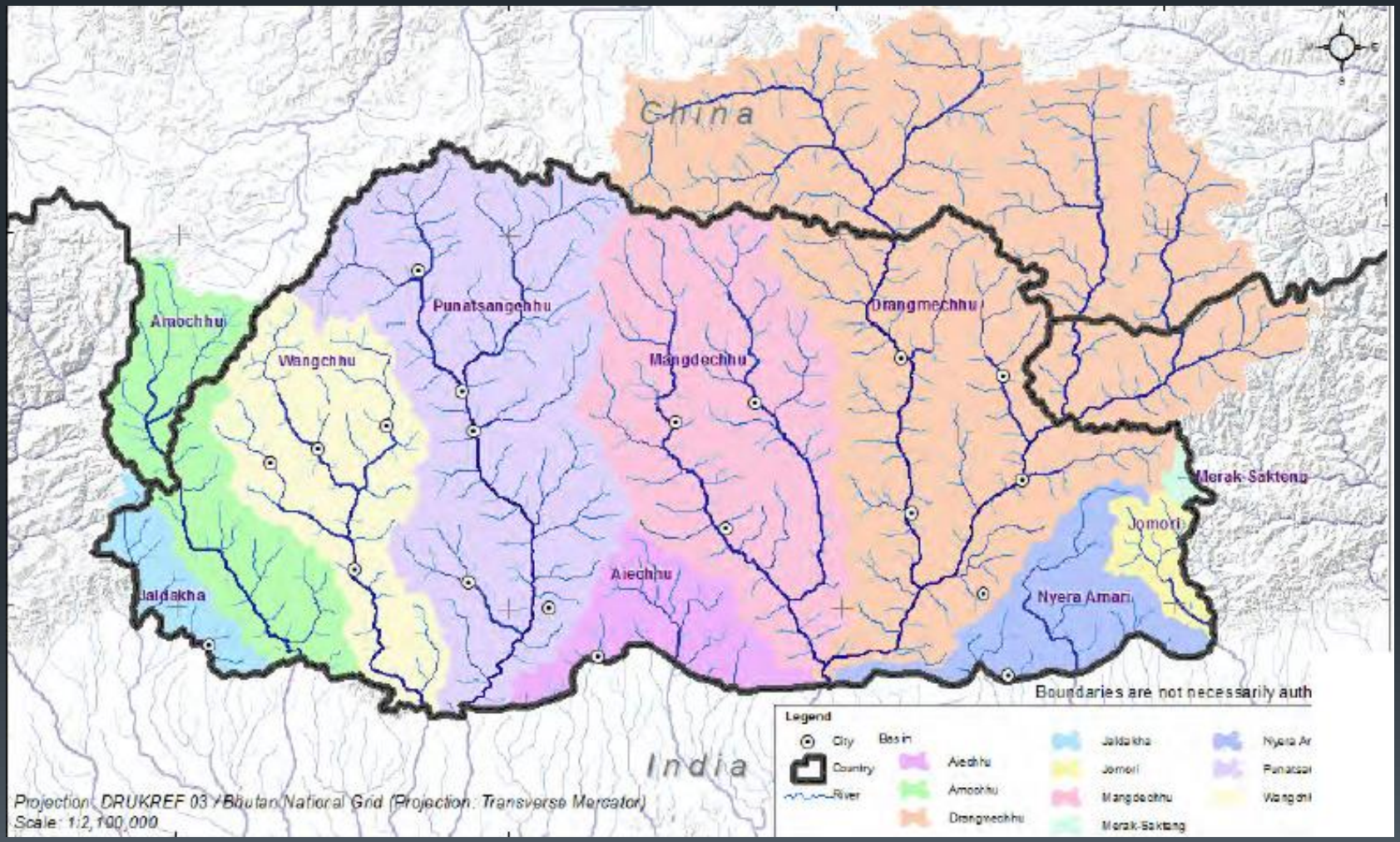
- Although Bhutan water balance does not show any water scarcity at the national, basin, or even *Dzongkhag* level, imbalance geographical and temporal distributions of water leads to experience of shortages in local areas. Water is largely available in the form of major rivers and tributaries flowing in valley bottoms, while most communities depend on smaller streams, springs and lakes for domestic and agricultural use.

Basin and flow calculations (Source NEC - 2016)



Basin and flow calculations (Source NEC - 2016)

Table 6 Basins and Flow Calculations. (Source: NEC, 2016)

Management Basin	Area (km^2)	River Basins	Area (km^2)	Annual flow (MCM)
Amochhu	3252	Jaldakha	942	9,375.07
		Amochhu	2310	
Wangchhu	4596	Wangchhu	4596	5,209.06
Punatsangchhu	11582	Punatshangchhu	9645	19,129.79
		Aiechhu	1937	6,989.14
Mangdechhu	7380	Mangdechhu	7380	11,797.24
Drangmechhu	11584	Drangmechhu	8457	13,569.14
		Nyera amachhu	2348	4,506.57
		Jomori	642	
		Merak - Sakteng	137	
Total	38394	Total	38394	70,576.01
		Population		746,773
		Per Capita Water Available		94,508.04 m^3/Annum
		Flow		2,238.0 m^3 /s

Bhutan Hydro project

Name	Capacity (MW)	Catchment Area (km^2)	Gross Storage (MCM)
CHPC	336	6854	
KHPC	60	9197	9.197
THPA	1020	4028	
PHPA-I	1200		
PHPA-II	1020		
MANGDECHU	720	3102	2.128
INDO BHUTAN ENERGY (AUGUST 24, 2016)			

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Name	Capacity (MW)	Catchment Area (km^2)	Gross Storage (MCM)
Basochu I	24		
Basochu II	40		
Dagachu	126		

- There are upcoming project Sunkosh Reservoir, Wangchuk, Ngeramari, Amochu in pipeline.
- PHPA – I, PHPA – II, MANGDECHU, are targeted to be completed in 2020.

Water Sustainability at Local Level

- Education and advocacy
- Government Subsidies
- Civil Society Organization
- Small scale research

National Level

- High Level Advocacy on Importance of water e.g. Shared water Shared Responsibilities.
- Cascaded Hydropower Constructions
- Maintaining forest covers of 60% at all time.

To meet Water Vision for Bhutan

"Water is the most important natural, economic and life sustaining resource and we must ensure that it is available in abundance to meet the increasing demands, present and future generation will have assured access to adequate, safe and affordable water to maintain and enhance the quality of their lives and the integrity of natural ecosystems".

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Thank You

.....Questions/Answers.....