Environmental systems and societies
Standard level
Paper 1

Practice Paper (Higher Level)

1 hour

Instructions to candidates

- This booklet contains all the resources to answer paper 1.

Figure 1(a): World map showing the location of Nepal

Figure 1(b): Map showing the location of Nepal

Figure 1(c): Fact file on Nepal

- Nepal has extremely varied terrain, ranging from lowland plains in the Terai in the south to the high Himalayan mountains in the north, including the world's highest peak, Mount Everest (8,848 m).
- Its land is physically divided into three main regions: the flat fertile Terai (about 17 % of land), the forested hilly middle region (about 68 %), and the high Himalaya region with snow and ice (about 15 %).
- The steep and rugged mountains make construction of infrastructure (roads, bridges, rail) costly and challenging, especially in remote valleys.
- Nepal's rivers originate largely in the Himalayas and are fed by glacial melt and monsoon rainfall, creating high flows during wet seasons that are ideal for hydroelectric power.
- The landscape supports rich biodiversity and forests, but forest cover is under pressure from firewood harvesting, clearing for agriculture, and development. Around 39 % of Nepal's land area is forested and nearly 30 % is agricultural land.
- Only about 16 % of Nepal's land is arable (used to grow crops), with much farming concentrated in the Terai and valley regions.
- Nepal has approximately 3,252 glaciers covering about 3.6 % of its area; these glaciers are retreating due to climate change, increasing risks of glacial lake outburst floods and landslides.
- Since the Forest Act (1993), Nepal has expanded community forestry, with government forest parcels handed over to locally managed Community Forest User Groups (CFUGs) under approved management plans.
- Community forestry has been linked to significant forest-cover gains in many hill regions through improved local stewardship and protection.
- Rural out-migration and agricultural land abandonment have contributed to forest regrowth in some areas over recent decades.

Figure 1(d): Climate classification map of Nepal

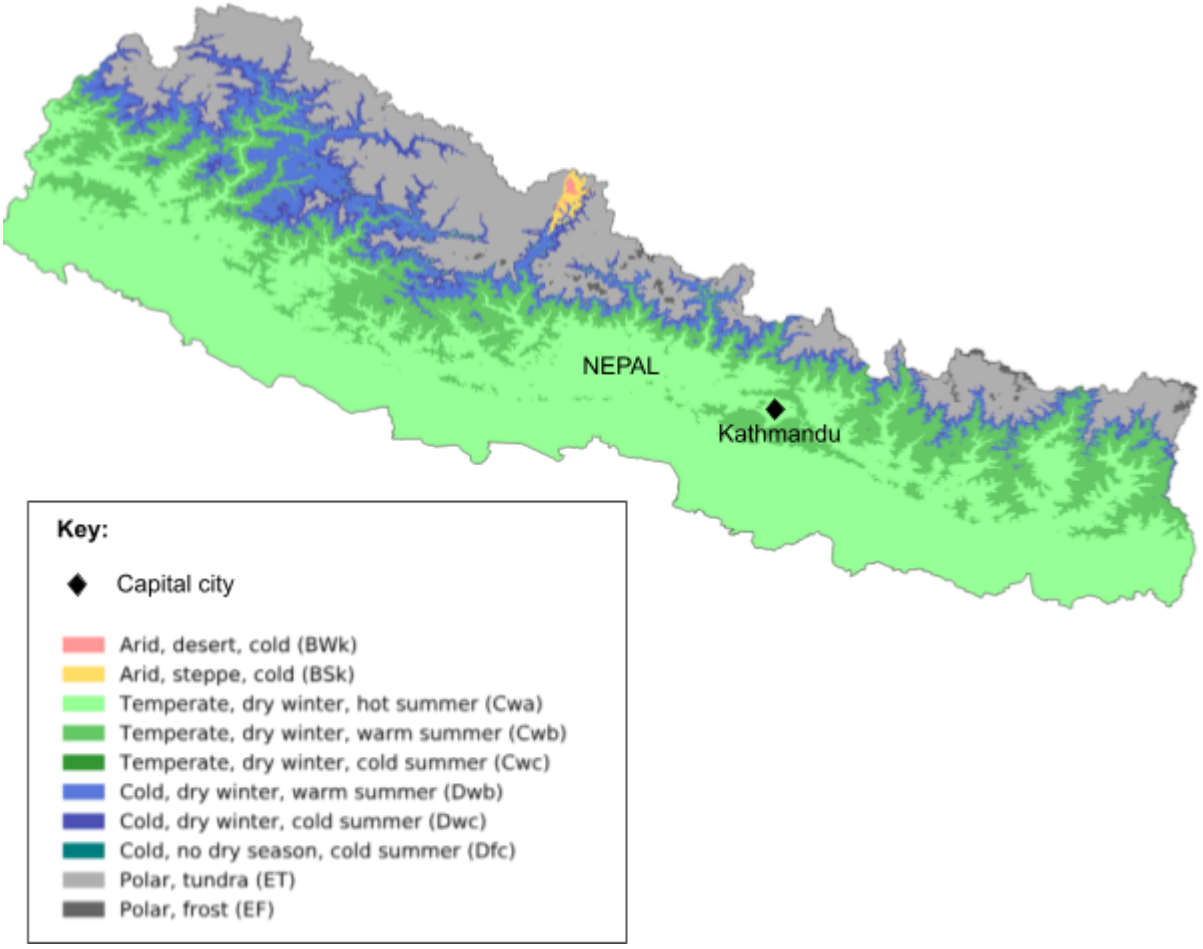


Figure 2(a): Fact file on demography of Nepal, 2024/2025

Total population	~29 620 000
Total population growth rate	~0.74%
Birth rate	~17.3 per 1000 population
Death rate	~5.6 per 1000 population
Total fertility rate	~1.9 children per woman
Life expectancy (total)	~72.7 years
Urban population	~22% of total population
Urban population growth rate	~3.09%

Figure 2(b): Population pyramid for Nepal, 2020

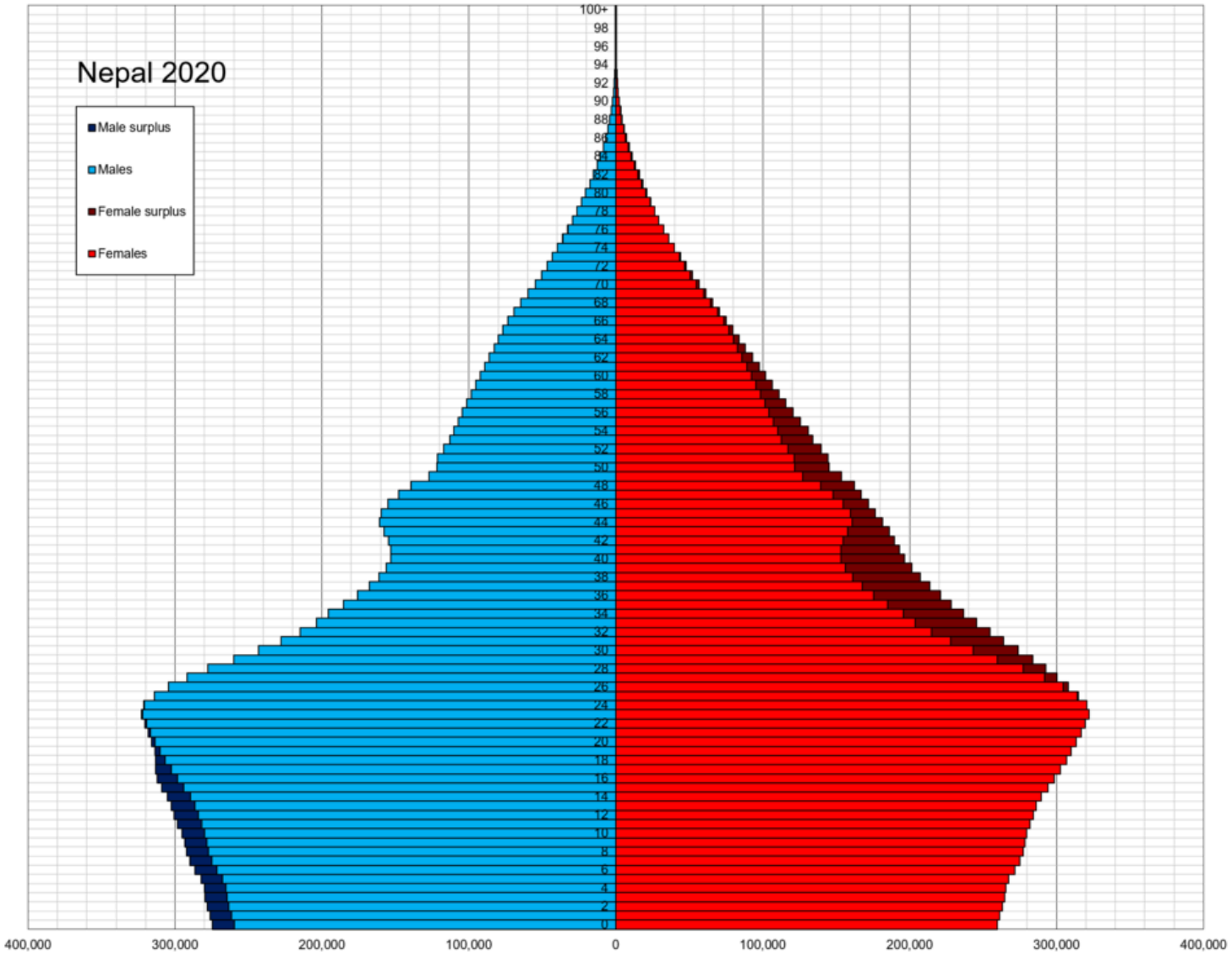


Figure 3(a): Sources of energy used in Nepal, 2023

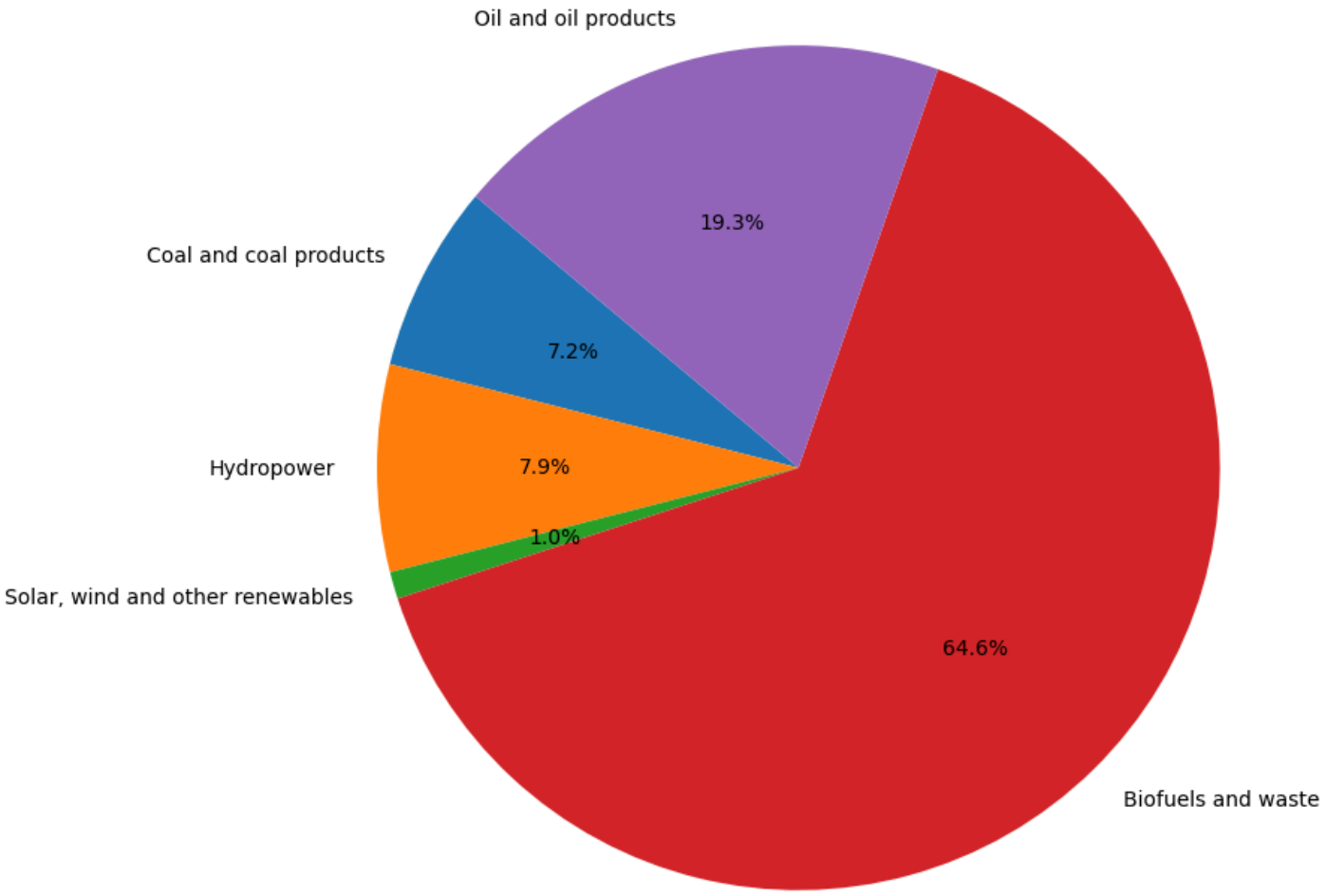


Figure 3(b): Fact file on Nepal's energy

- Almost all of Nepal's electricity generation comes from hydropower, harnessing its mountainous river systems for renewable electricity.
- Electricity access in Nepal has increased dramatically over the last two decades — from around 19% of the population without electricity in 2000 to only about 6% without access today.
- Despite large river potential (~83,000 MW), Nepal has developed only a small fraction of its economically viable hydropower capacity — planned targets aim to expand generation capacity aggressively over the next decade.
- Hydropower capacity has more than doubled in recent years (e.g., from around 1,069 MW to over 2,100 MW within a few years), helping meet rising demand and reduce reliance on imports.
- Nepal exports surplus hydroelectricity to India during wet seasons and has begun negotiating trade with other neighbours for long-term electricity export.
- Most of Nepal's primary energy use still relies on traditional biomass (e.g., wood and agricultural residue) because electricity represents a small share of overall energy consumption.

Figure 3(c): Total energy consumption for Nepal, 1980-2023

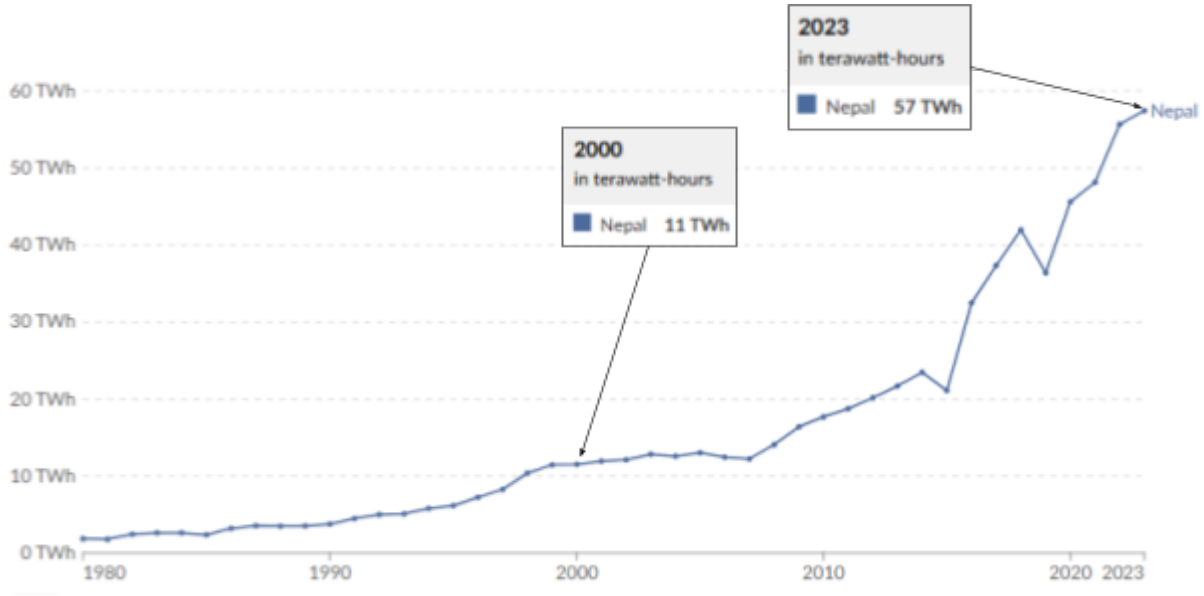


Figure 4(a): The city of Kathmandu is located in the Kathmandu Valley at an altitude of about 1 400 m above sea level and is surrounded by hills and mountains

Figure 4(b): Climate data for Kathmandu

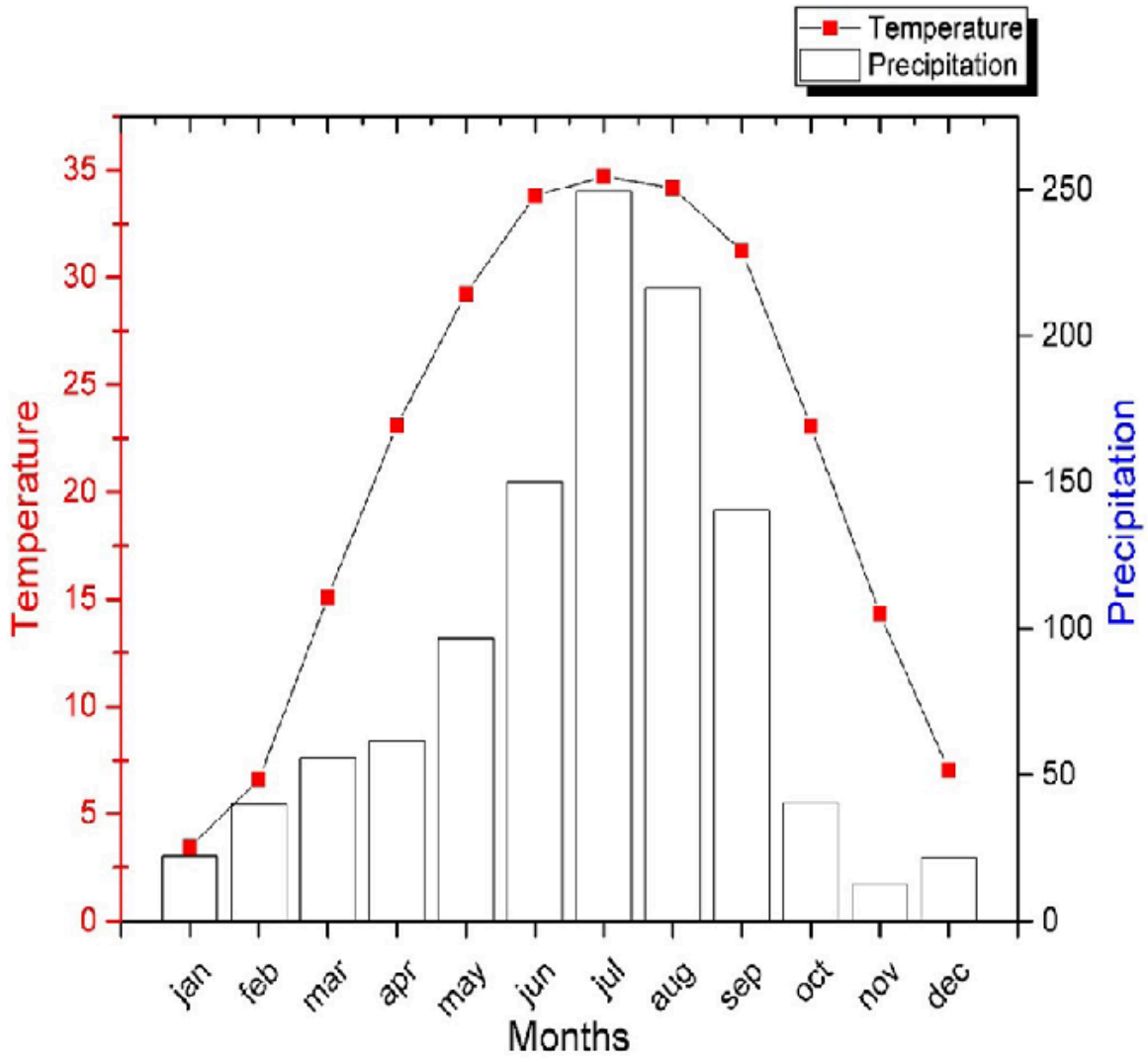


Figure 4(c): Mean measures of PM2.5 in Kathmandu

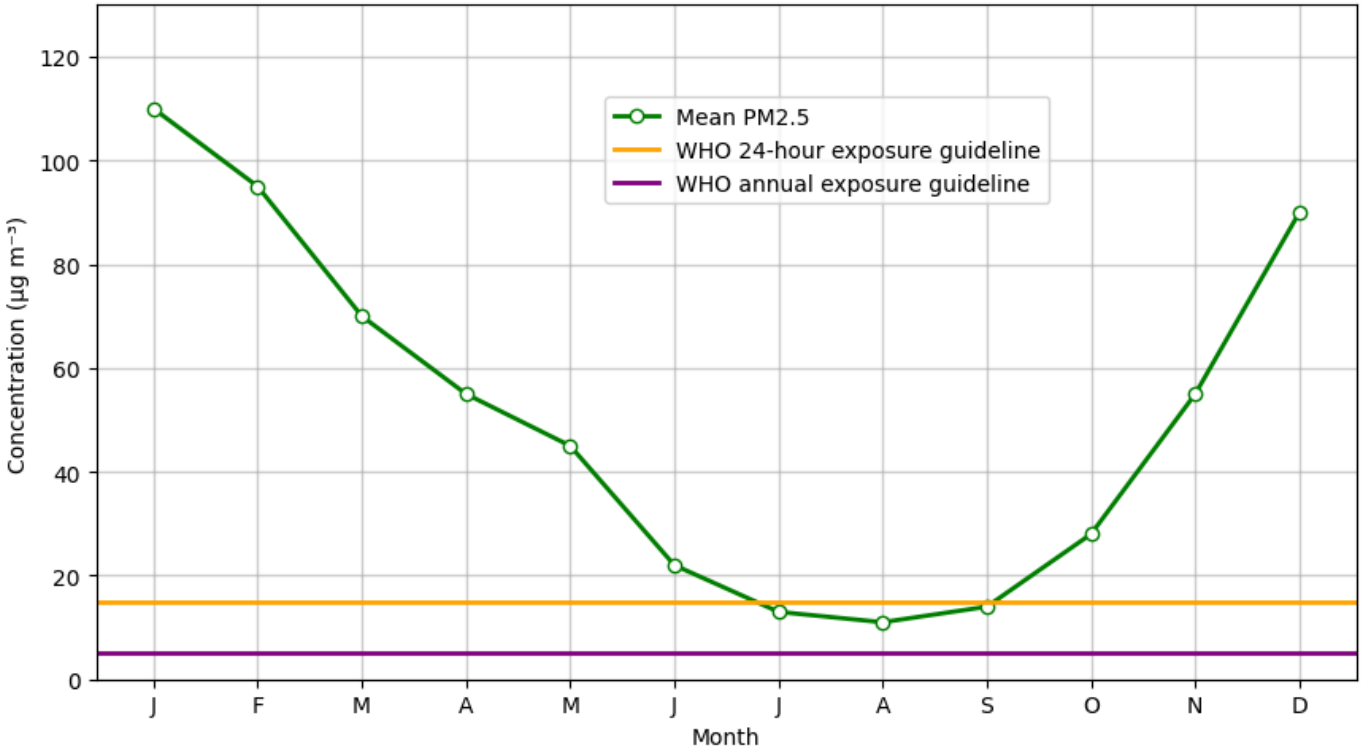


Figure 4(d): Fact file on air quality in Kathmandu

- Sources of air pollution include transport emissions, road/soil dust (from roads and construction), biomass burning, garbage burning, and brick kilns.
- Motor vehicle numbers have increased rapidly (e.g. a reported 34-fold rise in the combined number of cars/taxis/trucks/motorcycles from 1989/90 to 2017/18).
- Temperature inversions occur in winter in the Kathmandu Valley, trapping pollutants close to the ground.
- Pollution from outside Nepal also affects Kathmandu's air quality, with regional transport (including post-monsoon/winter episodes linked to agricultural residue burning in northern India) increasing PM2.5.

Figure 5(a): Waste management in Kathmandu

- Composition of municipal solid waste in Kathmandu: 71% organic, 8% paper, 12% plastic and 9% other.
- Historically, open burning and illegal dumping of waste has been a recurring issue in the Kathmandu Valley.
- The Sisdol open-air landfill (Okharpauwa, Nuwakot) began operation in 2005 as a temporary dumping site for Kathmandu Valley waste, but has continued to be used for many years, with ongoing concerns about poor landfill conditions (e.g., odour/leachate) and local opposition.

Figure 5(b): Sisdol open-air landfill in Nepal

Figure 5(c): Reasons for not using waste collection services

- Reasons:
    - Timing (35%)
    - Collection point is too far away (30%)
    - Frequency of pick-up (20%)
    - Other reasons (15%)
- Collection systems in Kathmandu Valley have faced problems with limited collection hours and the need for residents to put waste out at specific times
- Irregular/inefficient collection has been identified as an ongoing issue in Kathmandu Valley waste management.

Figure 5(d): Kathmandu Metropolitan City waste segregation programme launched in 2019

- Aims to reduce the amount of mixed waste sent to landfill by introducing household waste segregation and separate collection in core city areas (pilot in Wards 12, 18 and 21).
- Segregating waste at source into at least biodegradable (organic) and non-biodegradable categories.
- Providing public education and awareness activities (e.g. awareness rally) to encourage households to take part.
- Increasing separate collection of organic waste to support improved treatment (e.g. composting) and reduce what needs transporting for disposal.
- Final disposal for Kathmandu Valley waste relies on large landfill sites (e.g. Banchare Danda/Sisdol), which face environmental management issues such as leachate.
- Community clean-up events also support waste reduction in public spaces (e.g. Bagmati Cleanup Mega Campaign encourages citizens to volunteer time each week to remove waste).

Figure 6: Fact file on water in Kathmandu

- Kathmandu Valley experiences water scarcity, but also urban flooding during the monsoon (heavy rain can overwhelm drainage and low-lying areas).
- The water utility (KUKL) estimates demand at about 370 million litres per day, but supply is much lower (around 144 million litres per day in the wet season and about 86 million litres per day in the dry season).
- Most areas receive piped water intermittently, typically about 1–3 hours every 3–5 days in the wet season, and about 1–2 hours every 5–10 days in the dry season.
- Non-revenue water is high (around 35–40%), meaning a large proportion of water is lost/unaccounted for (often linked to leakage and system inefficiencies).
- Water quality is not always reliable and can be contaminated, increasing reliance on household-level coping strategies (e.g. storing/using alternative sources).
- Many households also purchase water from private tanker suppliers, especially during the dry season when piped supply is most limited.
- Water supply can be disrupted by events outside the city, worsening shortages.

Figure 7(a): Change in forest cover in Nepal, 1992-2016

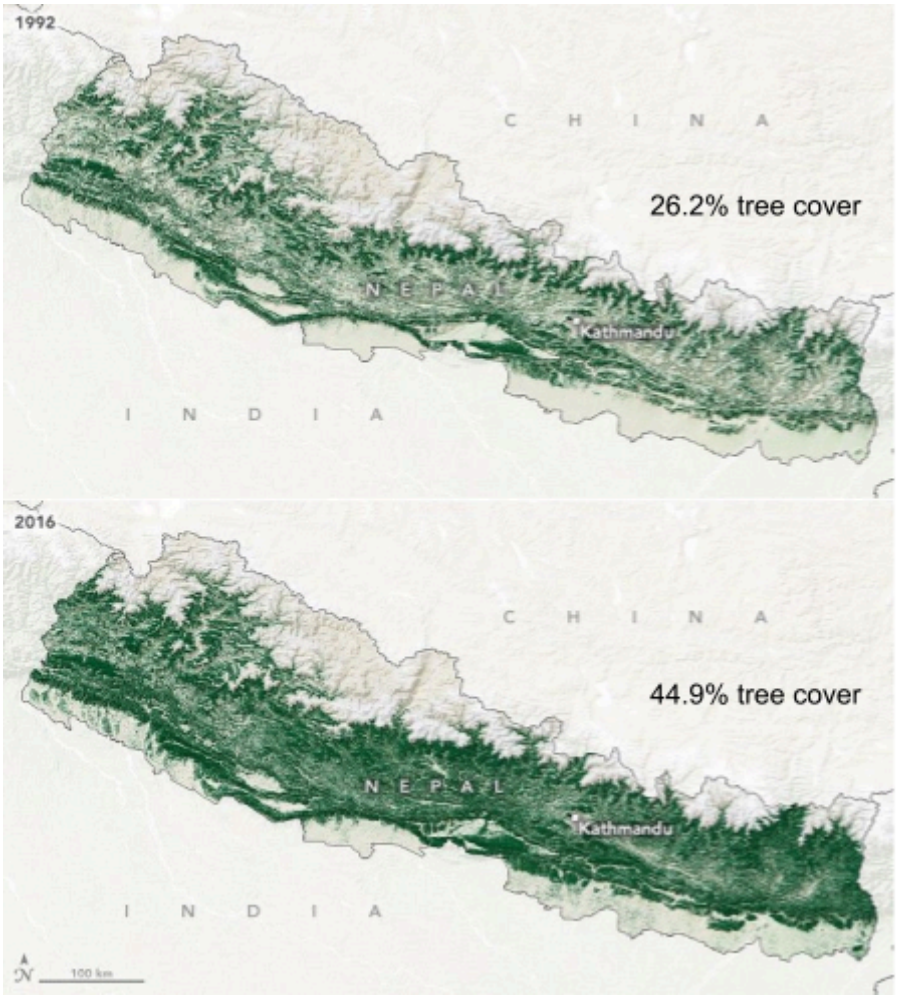


Figure 7(b): Protected areas of Nepal

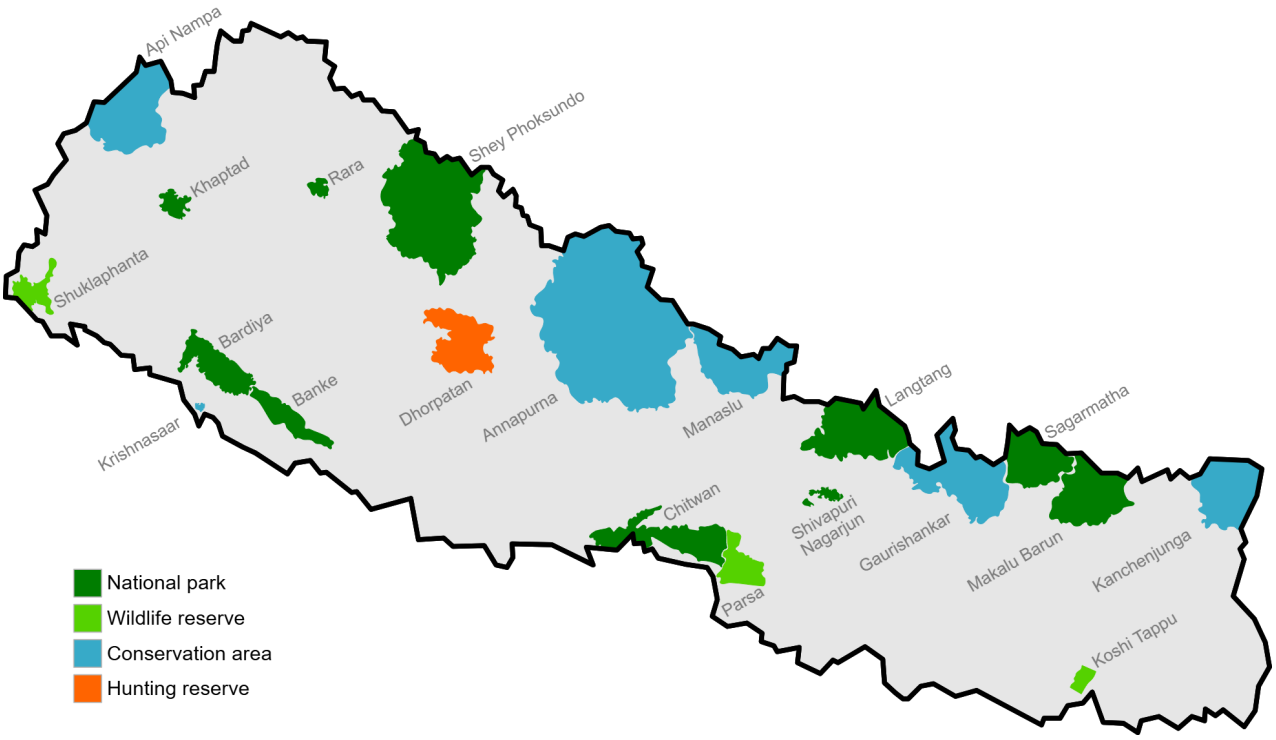


Figure 8(a): A simplified food web from Nepal

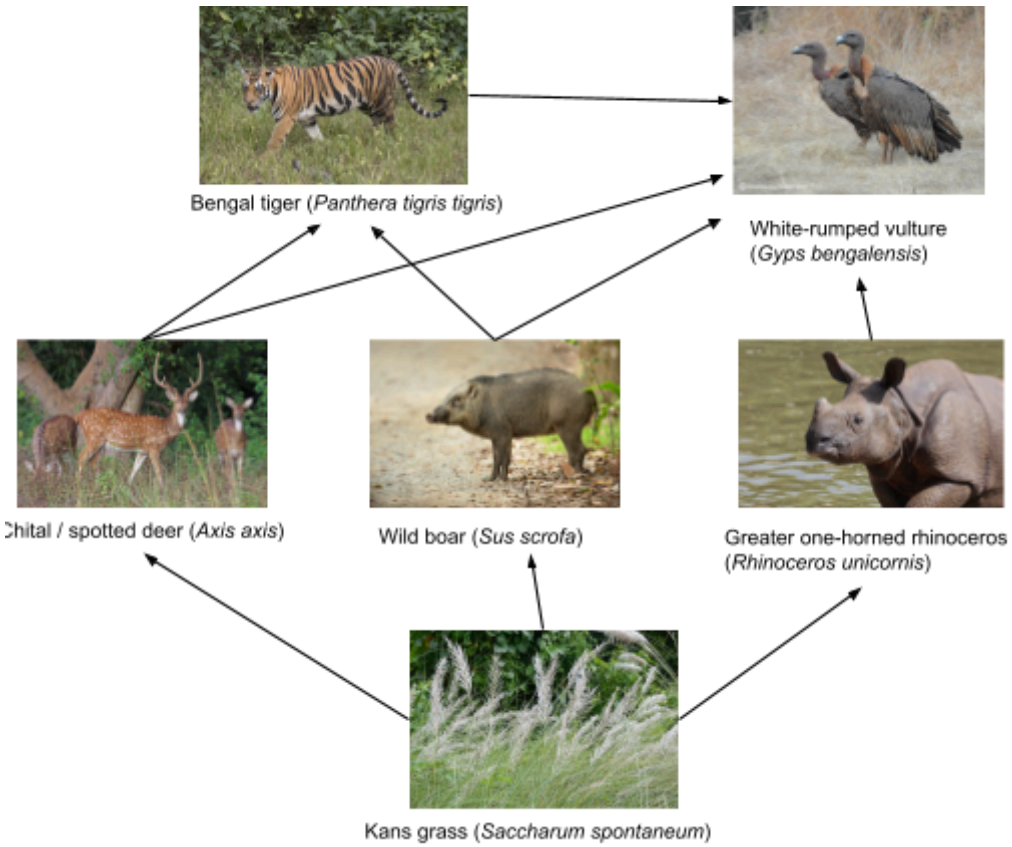


Figure 8(b): White-rumped vulture (*Gyps bengalensis*)

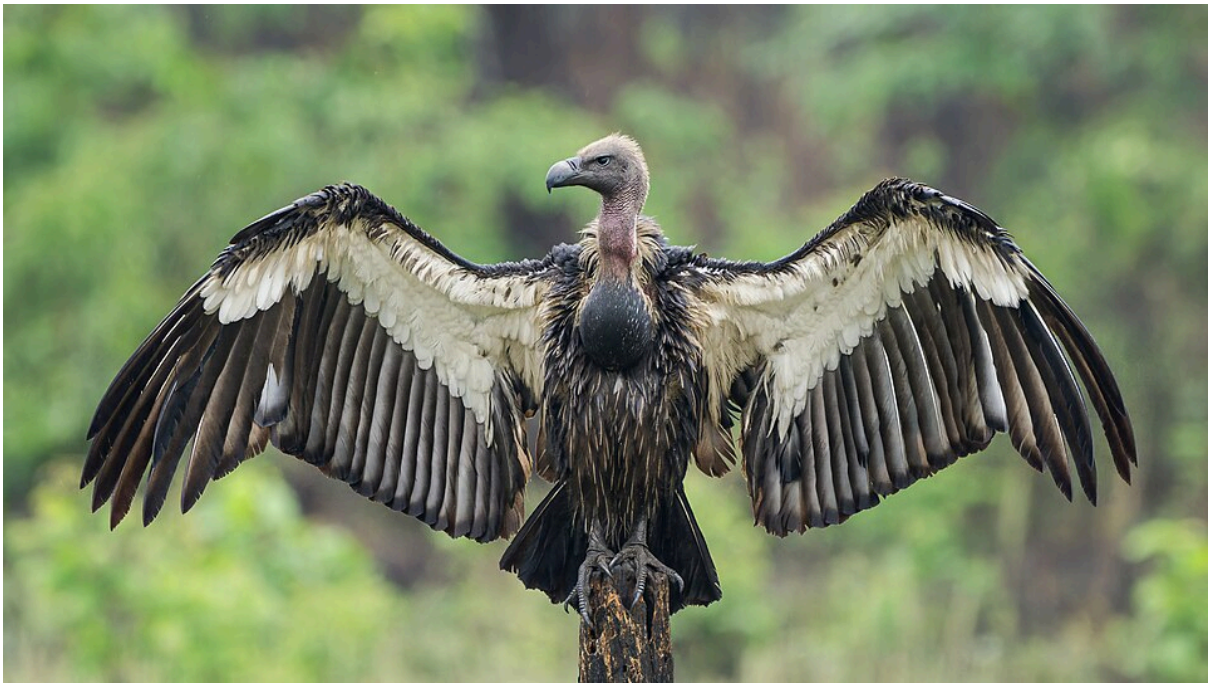


Figure 8(c): Fact file on White-rumped vulture (*Gyps bengalensis*)

- It is listed as Critically Endangered on the IUCN Red List (BirdLife/IUCN assessment).
- The species has suffered an extremely rapid decline of >99% over three generations, primarily due to diclofenac (a veterinary anti-inflammatory drug) in livestock carcasses causing fatal kidney failure in *Gyps* vultures.
- The global population is estimated at about 4,000–6,000 mature individuals, and the overall trend is decreasing.
- In Nepal, veterinary diclofenac was banned in 2006, followed by the rollout of Vulture Safe Zones and promotion of vulture-safe alternatives (e.g., meloxicam).
- Long-term monitoring in Nepal found a rapid decline up to ~2013, followed by partial recovery (≈2013–2018) in some areas, linked to conservation measures reducing diclofenac availability.
- Conservation work in Nepal includes Vulture Safe Zones, community-managed safe feeding sites, and a Vulture Conservation Breeding Centre as part of national recovery efforts.

Figure 9(a): Annual CO_2 emissions per capita for Nepal, 1998–2024

Figure 9(b): Ecological footprints of of five South Asian countries: Pakistan, India, Bangladesh, Nepal, and Sri Lanka, 1990-2022

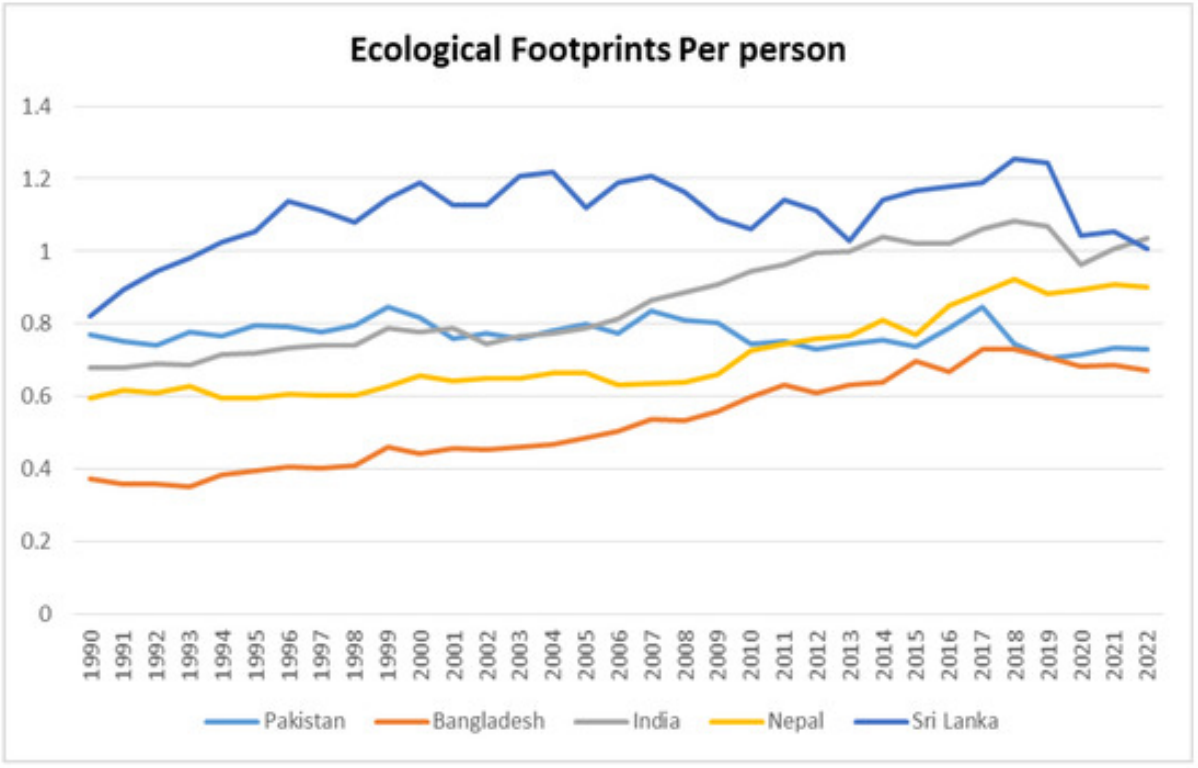
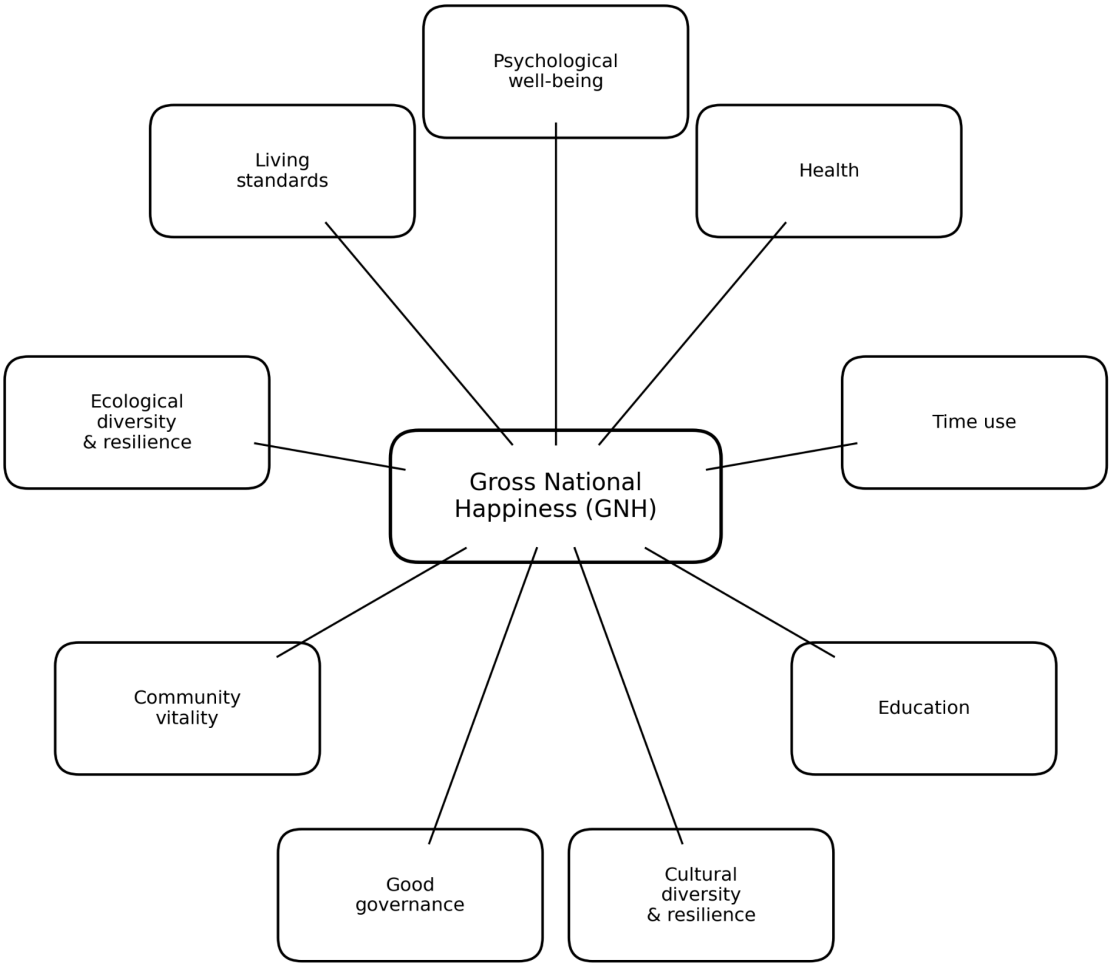


Figure 9(c): Fact file on Nepal's carbon status

- Nepal is not carbon negative, but has committed to reaching net-zero greenhouse gas emissions by 2045.
- Nepal's strategy relies on maintaining forest cover as a carbon sink, with a target to keep 45% of land under forest cover by 2030.
- Nepal aims to expand clean energy (especially hydropower) to reduce future emissions and support low-carbon development.
- At COP26 (2021) Nepal announced its net-zero by 2045 commitment in its high-level statement.
- At COP28 (2023) Nepal again reaffirmed its commitment to net-zero by 2045 and highlighted the importance of mountain ecosystems.

Figure 10: The Gross National Happiness (GNH) Index is determined by measuring nine domains



References:

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Figure 1(d)
By Beck, H.E., Zimmermann, N. E., McVicar, T. R., Vergopolan, N., Berg, A., & Wood, E. F. - "Present and future Köppen-Geiger climate classification maps at 1-km resolution". Nature Scientific Data. DOI:10.1038/sdata.2018.214., CC BY 4.0, https://commons.wikimedia.org/wiki/File:Koppen-Geiger_Map_v2_NPL_1991%E2%80%932020.svg

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Figure 3(a)
Created in ChatGPT using data from: https://www.iea.org/countries/nepal/energy-mix

Figure 3(c)
U.S. Energy Information Administration (2025); Energy Institute - Statistical Review of World Energy (2025) – with major processing by Our World in Data. “Primary energy consumption” [dataset]. U.S. Energy Information Administration, “International Energy Data”; Energy Institute, “Statistical Review of World Energy” [original data].

Figure 4(a)
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Figure 4(b)
Tree-ring climate response of chir-pine (Pinus roxburghii Sarg.) in the sub-tropical forest, western Nepal - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Monthly-average-temperature-and-precipitation-from-meteorological-stations-of-the-study_fig2_381673139 [accessed 30 Jan 2026]

Figure 4(c)
Created in ChatGPT

Figure 5(b)
Leachates' Chemical Characteristic and its impact on society, environment and water resource (Kolpu Khola); A Case Study of Sisdol Landfill Site, Kathmandu, Nepal - Scientific Figure on ResearchGate. Available from:

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Figure 7(a)
https://science.nasa.gov/earth/earth-observatory/how-nepal-regenerated-its-forests-150937/

Figure 7(b)
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Figure 9(a)
Global Carbon Budget (2025); Population based on various sources (2024) – with major processing by Our World in Data. "CO_2 emissions per capita" [dataset]. Global Carbon Project, "Global Carbon Budget v15"; Various sources, "Population" [original data].

Figure 9(b)
Mehmood, U., Aslam, M. U., & Javed, M. A. (2023). Associating Economic Growth and Ecological Footprints through Human Capital and Biocapacity in South Asia. World, 4(3), 598-611. https://doi.org/10.3390/world4030037