Summer Field School (Online) on Mountain Ecosystem & Resource Management
19th - 28th September 2021

Mountain Tourism as Contributing to Climate Change

Prof. G.Poyyamoli, India
gpoyya9@gmail.com
Out line

- Mountain tourism resource characteristics – diversity, marginality, difficult accessibility, fragility, niche, aesthetics and interrelated and dynamic systems

- Mountain Tourism growth trends- an overview of impacts, and root causes for GHG emission

- GHG inventory tools for Mountain Tourism

- Contribution of Mountain Tourism to CC- case study

- Sustainable strategies for low carbon mountain eco-tourism development
Major mountain ranges around the world
Mountains & human settlements

• About **12 %** of the world’s human population live in the mountains, with **another 14 % living very close** to mountain areas and dependent on their resources. Of these people, about **half are concentrated in the Andes, the Hengduan-Himalaya-Hindu Kush system and a variety of different African mountains.**

• **Climatic zones are condensed** over distances of a few kms in the mountains. On a single mountain, one can experience a **tropical climate at the base**, a **temperate zone** at medium altitudes followed by **alpine conditions** higher up, and finally **an arctic environment with snow and glaciers on the highest peaks**

• **International Mountain Day 11th December, 2021 – Sustainable tourism theme**
Mountain tourism & SDGs

- **Mountain tourism** – clean, cool air, scenic beauty, rich habitat/bio cultural heritage diversity-accounts for C.15-20% of the global tourism market, generating between 100 and 140 billion US$ per year. The Alps alone- C.7-10% of annual global tourism turnover

- **Mountain areas** cover C.27% of the earth's surface - > 475 PAs in 65 countries covering > 264 million Ha. Additionally, 140 mountain areas designated as BSRs by the UNESCO. E&SAs- PAs include NPs where ET/CBET is encouraged/promoted- NB/WLB tourism – Mountains account for 50% of world’s BD hotspots- -60-80% of global FW

- The **17 distinct UN SDGs** has renewed a sense of urgency in the tourism sector to address, among others, elimination poverty (SDG 1), ending hunger and achieving food security (SDG 2), and combating climate change (SDG 13). Specific to **SDG 13**, managing tourism sustainably demands reducing the impact of the sector on CC and curbing excessive dependency on fossil fuel consumption. Hence, it is critically important to understand the influence and implications of GHG emission from tourism & its impact on the economy & the environment.

- A large body of literature exits on the **impacts of CC on mountain tourism** while preciously few studies are available on GHG emission from mountain tourism landscapes
## Mountain Resources for Tourism

<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural resources</td>
<td>Flora, fauna, landscape, climate, water..</td>
<td>Forests, ice, beaches, wildlife, seasons, sea</td>
</tr>
<tr>
<td>Cultural resources</td>
<td>Religious, cultural heritage, other</td>
<td>Churches, temples, historic buildings, ethnic celebrations, CCIs- cuisine, crafts ..</td>
</tr>
<tr>
<td>Event resources</td>
<td>Festivals, rituals, tournaments, business, other</td>
<td>Music, art, sport, trade shows, conferences, carnivals</td>
</tr>
<tr>
<td>Activity resources</td>
<td>Recreational, services, facilities</td>
<td>Swimming pools, museums, theatres, zoos, theme parks</td>
</tr>
<tr>
<td>Services (tourism infrastructure)</td>
<td>Transport, IT, accommodation, reception, catering, services</td>
<td>Airports, hotels, tourist information network, maps, guides, bars, restaurants, marinas, foreign exchange services</td>
</tr>
<tr>
<td>Charact. of Mount Resous</td>
<td>Attributes</td>
<td>Implications for Tourism</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Diversity</td>
<td>Variations in attributes, Interdependence of production bases</td>
<td>Use comparative advantage; Link with local production Small scale innovation; Revival of traditional activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marginality</td>
<td>Limited local resources, Marginal concern to decision-makers, Unfavorable terms of trade</td>
<td>Judicious use of resources; Local participatory decision-making Mandatory reinvestment of revenues; Human capacity development Monitoring mechanism</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficult Access</td>
<td>Remoteness, Isolation from markets, Insular economy and culture</td>
<td>High value Activities tied to inaccessibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fragility</td>
<td>Resources vulnerable to degradation</td>
<td>Niche tourism; Careers in environmental conservation; Restricted use in hotspots; Carrying capacity considerations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niche</td>
<td>Location-specific attractions, Endemic flora and fauna, Area-specific resources and activities</td>
<td>Special interest tourism, Niche marketing Skill-based / culture-specific crafts; Area-specific tourist goods /services</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Superior dramatic quality, Superior recreational quality, Superior spiritual quality, Superior habitat quality, Relative resistance to human modification</td>
<td>Attraction for the young and vigorous Attraction for the venturesome Attraction for the spiritually exhausted Attraction for the exhibitionist Attraction for potential amenity migrants</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercon. &amp; dynamic</td>
<td>Cross sectoral implications</td>
<td>Forward &amp; backward linkages, synergies vs conflicts</td>
</tr>
</tbody>
</table>

Mountain Tourism growth trends & impacts

- Tourism as a sector is highly fragmented – but with inter-sectoral Linkages & Complexity. The linkages between Tourism, and Ecology, Economics, Heritage, Culture and livelihoods are inseparable; multiplier effect & supply chains - Systems perspective

- Tourist activities include swimming, safaris, nature walking, visiting cities and national parks, skiing, snowboarding/scootering, bird-watching, caving, diving, and a number of extreme sports such as bungee jumping, river rafting, paragliding, and mountaineering. Mountain tourism in most parts of the world except Europe has been characterized by unregulated, uncontrolled and haphazard development- mass tourism-over tourism, revenge tourism - Tourism ↔ BD ↔ ESS ↔ Livelihoods, CC & Resilience? Sustainability?
Mountain tourism impacts
• **Environmental impacts**
  - Habitat fragmentation/degradation, deforestation, forest fires, trampling, landslides, soil erosion, rock falls, flash floods Vs ISD based on Green infrastructure, NBS, etc
  - Erosion of BD, monocultures, IASps Vs Habitat/BD restoration
  - Over exploitation of ground water and land use change, overcrowding vs ELUP
  - Pollution – air, soil & water, noise /light pollution, GHG emission - CC, acid rain, solid & liquid wastes, including hazardous wastes vs waste recycling/upcycling

• **Socio cultural Impacts**
  - Erosion of cultural heritage /traditions/LKMS-Alienation/marginalization, huasmn safaris Vs revival of culture/CCIs
  - Water, food and energy insecurity of the local communities?, Increase in crimes, drug abuse, etc VS CB/CR ET

• **Economic impacts**
  - Tourism economic leakages, seasonal employment, loss of local livelihoods Vs SLE & D through CRET
Average surface temperature -1.5 to 2 deg. C by the mid-21st century without a sharp reduction of emissions. The global surface temperature was 1.09°C higher between 2011-2020 than between 1850-1900—storms, heatwaves, forest fires, droughts, glacier melting & flash floods, -IPCC AR 6 2021
<table>
<thead>
<tr>
<th>Compound</th>
<th>Pre-industrial concentration (ppmv*)</th>
<th>Concentration in 2018 (ppmv)</th>
<th>Atmospheric lifetime (years)</th>
<th>Main human activity source</th>
<th>GWP**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide (CO₂)</td>
<td>280</td>
<td>408.0</td>
<td>variable</td>
<td>Fossil fuels, cement production, land use change</td>
<td>1.0</td>
</tr>
<tr>
<td>Methane (CH₄)</td>
<td>0.715</td>
<td>1.869</td>
<td>12</td>
<td>Fossil fuels, rice paddies, waste dumps, livestock</td>
<td>28.0</td>
</tr>
<tr>
<td>Nitrous oxide (N₂O)</td>
<td>0.27</td>
<td>0.331</td>
<td>121</td>
<td>Fertilizers, combustion industrial processes</td>
<td>265.0</td>
</tr>
<tr>
<td>HFC 23 (CHF₃)</td>
<td>0</td>
<td>0.000024</td>
<td>222</td>
<td>Electronics, refrigerants</td>
<td>12,400</td>
</tr>
<tr>
<td>HFC 134a (CF₂CH₂F)</td>
<td>0</td>
<td>0.000062</td>
<td>13</td>
<td>Refrigerants</td>
<td>1,300</td>
</tr>
<tr>
<td>HFC 152a (CH₂CHF₂)</td>
<td>0</td>
<td>0.0000064</td>
<td>1.5</td>
<td>Industrial processes</td>
<td>13.0</td>
</tr>
<tr>
<td>Perfluoromethane (CF₄)</td>
<td>0.000004</td>
<td>0.000079</td>
<td>50,000</td>
<td>Aluminum production</td>
<td>6,630</td>
</tr>
<tr>
<td>Perfluoroethane (C₂F₆)</td>
<td>0</td>
<td>0.0000041</td>
<td>10,000</td>
<td>Aluminum production</td>
<td>11,100</td>
</tr>
<tr>
<td>Sulphur hexafluoride (SF₆)</td>
<td>0</td>
<td>0.0000073</td>
<td>3,200</td>
<td>Electrical insulation</td>
<td>23,500</td>
</tr>
</tbody>
</table>

*ppmv = parts per million by volume, **GWP = 100-year global warming potential, ***Concentration in 2011

Water vapor not included in table, see bullet.

GWP of water vapour: −0.001 to +0.0005
Schematic representation of fuel and energy consumption in the different tourism phases

Departure

Fuel consumption
(airplane, car, train, bus, etc.)

Arrival

DESTINATION

Fuel consumption for:
Heating, local mobility, sanitary water

Electricity consumption for:
Appliances, illumination, etc.
## Source/activity wise GHG emission in mountain tourism

<table>
<thead>
<tr>
<th>Source</th>
<th>Sector /activity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>Transportation</td>
<td>Air /sea transportation, motorized vehicles, cable cars ..</td>
</tr>
<tr>
<td>Energy</td>
<td>Accommodation</td>
<td>Hotels, lodges, guest houses</td>
</tr>
<tr>
<td>Consumption</td>
<td>Activities</td>
<td>Sight seeing, safari, shopping,</td>
</tr>
<tr>
<td>Indirect</td>
<td>Food/Catering</td>
<td>Farms, Restaurants, eateries, mess,</td>
</tr>
<tr>
<td>Energy</td>
<td>Power/Water supply</td>
<td>Power generation, water pumping</td>
</tr>
<tr>
<td>Consumption</td>
<td>Roads/IT</td>
<td>Laying/maintenance of roads, IT infrastructure</td>
</tr>
<tr>
<td></td>
<td>Solid /Liquid waste Management</td>
<td>Methane and other emissions</td>
</tr>
</tbody>
</table>
GHG inventory tools for Mountain Tourism

• Direct carbon dioxide emissions of transportation, accommodation, catering, sight-seeing, shopping, and entertainment of the tourism industry can be measured by the energy consumptions of each sector using their corresponding coefficient of carbon emission. **Science-based targets (SBTi)** are powerful tools that allow businesses to align themselves with the commitments made under the **Paris Agreement** (12th Dec. 2015), SDG13, net zero pledges, 2020

• **Transportation** represents C. 75% of the CO2 emissions of the tourism industry-8.8% decrease in global CO2 emissions in the first half of 2020 compared to the same period in 2019- COVID 19 lock down impact

Scope Options – GHG Protocol

• 3 scopes (or boundaries) for GHG/carbon emissions accounting

1. **Direct** GHG emissions from all sources (stationary and mobile combustion)
2. **Indirect** GHG emissions from purchase of electricity
3. **Indirect** emissions from **upstream and downstream activities** (provides an ‘opportunity to be innovative in GHG management’) – Challenging given the tourism’s cross sectoral interactions – to include inputs, outputs & outsourcing
Emissions by Mode of Transport
pounds of CO2e emitted per passenger per mile

- Plane: .82
- SUV (1 pax): .68
- Small Car (1 pax): .55
- Motorcycle: .40
- Transit Bus: .37
- Train: .13
- Tour Bus: .10
- Ferry: .07
**Scope 3 Emissions for Tourism**

- **Inputs**
  - Food & drink
  - Cleaning materials
  - Visitor travel
  - Water supply
  - Power supply

- **Outputs**
  - Water discharge/treatment
  - Solid waste:
    - Green waste
    - Recyclates
    - Landfill

- **Outsourcing**
  - Laundry
  - Accounting
  - Maintenance/grounds keeping
  - Cleaners
  - Catering
  - Entertainment
Tourism & CC metrics

• Tourism -- fossil fuel-dependent industry & a large emitter of GHG- policy/administrative commitments required to demonstrate C responsibility are essential

Determining carbon emissions requires data on:
• The **activity generating** the C emissions (quantity, type, organisation)
• The **C output/unit activity**-usually expressed as an emissions/conversion factor

• **Total CO2 generated** = **units of activity x EF**

• **EF -Emission factors** are translated into emissions by multiplication with an activity rate as follows:
  \[ Ex = EFx \times Q \]
  where:
  \( Ex \)= Emissions of pollutant \( x \); \( EFx \)=Emission factor of pollutant \( x \)
  \( Q \)=Activity or production rate = \( V \times H \), where:
  \( V \)=Volume of fuel fired; \( H \)=Heating value of the fuel
CC metrics- glossary

- **Radiative Forcing: RF**: change in Earth’s energy balance between incoming SR energy and outgoing thermal IR emission when the variable is changed while all other factors are held constant—calculated at the tropopause or at the top of the atmosphere—(W/m²)

- **Global Warming Potential: GWP**: An index of the potency of a GHG, referenced to carbon dioxide (= GWP of 1) over a given 100 year time horizon.

- **Global Temperature Change Potential GTP**: contribution of emission to the global-mean temperature at a specific time after emission.

- **Carbon dioxide equivalent (CO2e)**: A unit of measurement that describes for a GHG the mount of CO2 in tonnes that would have the same GWP, when measured over a 100-year timescale.
CC metrics- glossary....

- **Carbon footprint**: total GHG emissions caused by an individual, event, organization, service, place or product, expressed as carbon dioxide equivalent expressed as CO2e

- **Carbon intensity**: The amount of emissions of CO2 released per unit of another variable such as Gross Domestic Product (GDP), output energy use or transport

- **Representative Concentration Pathways (RCPs)** - Scenarios that include time series of emissions and concentrations of the full suite of GHGs and aerosols and chemically active gases, as well as land use/land cover—originally RCP2.6, RCP4.5, RCP6, and RCP8.5 – are labelled after a possible range of radiative forcing values in the year 2100 (2.6, 4.5, 6, and 8.5 W/m², respectively)

- **Shared Socio economic pathways (SSPs)** - Emission drivers, mitigative /adaptive capacity, exposure & sensitivity – depend upon Demographics, Education, Economics & Technology adoption—Hence SSPs complement RCPs
Global Warming Potential (GWP)

- GWPs provide a metric for comparing the climatic impact of different GHGs

$$GWP_g(T) = \frac{\int_0^T RF_g(t) \, dt}{\int_0^T RF_{CO_2}(t) \, dt}$$
There are two options for entering data into this calculator to develop GHG equivalencies. When you enter energy data, the calculator converts your entered values to Coe GHG emissions based on emission factors for energy consumption or electricity reductions. It then displays equivalent ways to express those emissions. When you enter emissions data, the calculator displays equivalent ways to express those emissions (see the equations and sources used for this calculator on the Calculations and References page). 

Alpine tourism has been repeatedly identified as one of the industries most vulnerable to CC.

The Model of Alpine Tourism and Transportation (MATT) was developed and applied to the mountain municipality of Alpbach, Austria into a role model for sustainable year-round alpine tourism.

The study’s objectives are to analyze Alpbach’s energy demand and GHG emissions patterns and the potential of RE in the region, and to initiate the development of an optimized and autonomous energy supply system, pursuing the concept of a “carbon neutral destination”

• From a systems analytical approach, 3 major sectoral elements can be visualised: skiing and recreation, transport, and housing (including accommodation).

• GIS based tool was used for calculating energy consumption and GHG emissions for tourist transport to and from a single destination, using emissions and demographic data from different sources.

• This article focuses on the transport part of the system as origin-to-destination transport (ODT) accounts for 57-86% of the GHG emissions for other mountains.
QGIS, an open-source GIS, was used to create a density raster (heat map) of the geocoded visitor address points.

**Heat maps** are based on kernel density estimation and allow a quick identification of hot spots and point clusters.

235 **visitor-sending hot spots** or hubs were defined, to generalize and calculate journey distances. In order to connect the visitor home addresses with associated hubs, ellipsoidal distances were calculated, resulting in a shape file containing the attributes from the address layer and the number of geocoded visitors per hub as well as the spatial information.

This was exported to a **PostgreSQL/PostGIS spatial database** for further calculations.
The number of geocoded visitors associated with each hub was extrapolated to the statistical population using the equation:

\[
\text{Visitor}_{hub} = \frac{\text{Visitor}_{geocod\_hub} \times \text{Visitor}_{ori\_co}}{\text{Visitor}_{geocod\_co}}
\]

where
- \(\text{Visitor}_{hub}\) is the statistical population,
- \(\text{Visitor}_{geocod\_hub}\) is the number of geocoded visitors assigned to the hub,
- \(\text{Visitor}_{ori\_co}\) is the total number of visitors from the specific country of origin, and
- \(\text{Visitor}_{geocod\_co}\) is the total number of geocoded visitors from the specific country of origin.

The total amount of Person Kms Traveled (PKT) was calculated based on the distances from the visitor hubs to Alpbach, for 4 modes of travel (private vehicle, bus, train, and airplane).
where: PKT overland is the total number of person Kms traveled overland (not differing between modes and not accounting for a “last mile” between the railway station and the destination), Visitorshub is the number of visitors associated with each hub, and RRDhub is the round-trip road distance between hub and destination.

\[
PKT_{\text{overland}} = \sum_{h=1}^{n} \text{Visitorshub} \times \text{RRDhub}
\]

where: PKT air is the total PKT by airplane, RFDhub is the round-trip flight distance from each hub assumed to be a departure airport; Dfm is a 150 km radius from each home airport (fm ¼ first mile); and Dlm is the last mile from either Innsbruck (60 km) or Munich (169 km) to the destination.

\[
PKT_{\text{air}} = \sum_{h=1}^{n} \text{Visitorshub} \times (\text{RFDhub} + D_{\text{fm}} + D_{\text{lm}})
\]

To calculate the total number of kms traveled to the destination and return, PKToverland and PKTair were added to PKTtotal.
• **Energy consumption for each mode of transport** was calculated as direct energy (the consumption of fossil fuel and electricity during transport) and cumulative energy (which includes the energy used during the entire production process (exploration, extraction, transport, and production of fuels))- Both measured in kWh/PKT.

• **Emissions** were calculated as a carbon dioxide equivalent (CO2e) to account for the full GHG potential of emissions from burning fossil fuel; **direct CO2e**- produced at the location of energy conversion, and **cumulative CO2e**- for the **entire production process** (exploration, extraction, transport, and production of fuel).

• **Values for energy consumption and GHG emissions** of private vehicles were derived from the open-source database **GEMIS 4.94—Global Emissions Model** for Integrated Systems (IINAS 2015). Fuel consumption and CO2e for diesel- and gasoline-driven medium-class passenger vehicles were calculated as average values.

• For **energy and emissions values per PKT**, a **load factor** of 3 persons per car, 30 /bus and 131 / air plane were assumed. Estimates of energy and emissions values for railways were based on Germany’s national fuel-production mix.
Energy consumption and GHG emissions were eventually calculated by multiplying PKT\text{total} by the energy and emissions factors.

<table>
<thead>
<tr>
<th>Mode of transport</th>
<th>Fuel type</th>
<th>Load factor (persons per vehicle)</th>
<th>Energy consumption (kWh/PKT)</th>
<th>CO$_2$e emissions (g/PKT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private vehicle$^a$</td>
<td>Diesel/gas mix (50:50)</td>
<td>3</td>
<td>0.22</td>
<td>53.08</td>
</tr>
<tr>
<td>Bus</td>
<td>Diesel</td>
<td>30</td>
<td>0.13</td>
<td>31.54</td>
</tr>
<tr>
<td>Train</td>
<td>Electric</td>
<td>Not specified$^b$</td>
<td>0.07</td>
<td>15.05</td>
</tr>
<tr>
<td>Airplane</td>
<td>BP Jet A-1 (kerosene)</td>
<td>131</td>
<td>0.35</td>
<td>107.86$^c$</td>
</tr>
</tbody>
</table>

$^a$ Includes cars, motorcycles, and recreational vehicles.

$^b$ Based on German national average emission data.

$^c$ CO$_2$ only based on ICAO Carbon Emissions Calculator (ICAO 2015).
<table>
<thead>
<tr>
<th>Mode of transport</th>
<th>% of total transport</th>
<th>Total PKT</th>
<th>Energy consumption</th>
<th>CO₂⁺ emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Direct</td>
<td>Cumulative</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total (MWh)</td>
<td>Total (MWh)</td>
</tr>
<tr>
<td>Private vehicle a)</td>
<td>75</td>
<td>48,135,354</td>
<td>10,380</td>
<td>13,678</td>
</tr>
<tr>
<td>Bus</td>
<td>7</td>
<td>4,492,633</td>
<td>574</td>
<td>715</td>
</tr>
<tr>
<td>Train</td>
<td>5</td>
<td>3,209,024</td>
<td>214</td>
<td>606</td>
</tr>
<tr>
<td>Airplane</td>
<td>13</td>
<td>8,343,461</td>
<td>2947</td>
<td>3551</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>64,180,472</td>
<td>14,115</td>
<td>18,550</td>
</tr>
</tbody>
</table>

a) includes cars, motorcycles, and recreational vehicles.
Case study - Concluding remarks

• Both direct and indirect energy use and GHG emissions were incorporated as each contributes significantly to the climate impact of travel. With some constraints and required adaptations, the model is **transferable to other destinations** in a similar geographical context.

• A **detailed, holistic, and in-depth** view of a tourism destination’s energy consumption and GHG emissions patterns, on **different spatial and temporal scales and for different sectors**, is essential to communicate the need for **transformative change** to stakeholders, local residents, and visitors.

• The sociocultural, institutional, and political barriers have to be overcome to adopt a **low carbon tourism pathway**, characterized by broader values of adaptation, transition and behavioral change.
Sustainable strategies for low carbon mountain ET development

- Transportation-related carbon emissions
- Eco-touring trail construction
- Greening of scenic roads
- Eco-guiding signs
- Eco-parking area ratio

- Trash sorting
- Solid waste recycling

- Policy Support
- Tourist complaints and feedback mechanism
- Low carbon environment monitoring mechanism
- "Offset to carbon" activities carried out in scenic spots
- Use of environmentally friendly materials
- Proportion of income used to maintain low-carbon scenic areas

- Vegetation coverage
- Biological diversity
- Surface water quality
- Sewage discharge compliance rate
- Scenic air pollution index
- Negative ions in the air

- Low-carbon awareness among local residents
- Scenic spot staff's low-carbon awareness
- Low-carbon awareness among tourists
How To Reduce The Carbon Footprint (modified from World Culture Network, 2019)

- **Tourists** can reduce emissions in the tourism sector by modifying how they travel such as traveling fewer miles/kms, using lower emission transportation options, staying longer in one destination for and experiencing local history, food, and culture in depth, using environmentally friendly products and using alternative energies.

- **Destination managers** may design and provide *diverse trails or bicycle routes* for tourists to easily access and explore a local area by walking or bicycling.

- The **service providers** can employ *low Carbon, RETs – RE generation, conservation & substitution*

- **Appropriate Policies/legislation - Carbon monitoring/pricing**, with updated price signal – PES, REDD, REDD+, ..., BPCs & ToTs – EESD
Sustainable mountain tourism

Questions?

Thank you!