Project – International Urban Cooperation: Sustainable and Innovative Cities and Region

Sub-project – Baseline study for sustainable tourism in Leh

Deliverable – Final Report

January, 2021

Funded by the European Union

This presentation was produced with the financial support of the European Union. Its contents are the sole responsibility of IUC India and do not necessarily reflect the views of the European Union.

Assignment background

Objectives of the assignment

- To prepare a baseline study for sustainable tourism in Leh, focusing on water supply, solid waste management, mobility and branding
- The project commissioned as part of the Leh-Trikala/ Farkadona/ Meteora strategic collaboration under the IUC – India programme
- Baseline study to provide a set of recommendations to the town of Leh, to integrate sustainable measures into tourism-related activities
- To share with the Greek cities a set of Indian best practices (from Leh) regarding sustainability in tourism

Objective of the IUC programme

- Improved international urban policy diplomacy and increased cooperation on sustainable urban development and climate change
- The IUC programme has two components as follows:

  a) City/ sub-national cooperation on sustainable urban development to strengthen EU-India cooperation at both national and city levels

  b) Cooperation on sustainable energy and climate adaptation and mitigation, access to clean energy, through GCoM initiative

Note: EU- European Union; GCoM- Global Covenant of Mayors; IUC – International Urban Cooperation;

Leh – district profile (1/2)

Leh district

- Leh district is part of the Union Territory (UT) of Ladakh, situated in the northern most part of India
- The district, with an area of 45,100 sq km, is situated at an altitude ranging between 2,300 m and 5,000 m above sea level
- The district's population is estimated to be 152,175 for 2020
- It houses 16 blocks, 116 villages and 93 panchayats as of 2017

Geographical location

- 434 km from Srinagar; 474 km from Manali
- One of highest permanently inhabited towns in the world
- Bounded by Karakoram, Zanskar, Ladakh ranges
- Indus, Shayok and Zanskar rivers flow through district
- Connectivity primarily by either road or air
- Roads remain closed during winters for around 7 months

Leh district map

Source: Google maps, https://leh.nic.in/about-district/map-of-district/

Leh district profile – (2/2)

History

- Until 2019, Ladakh district, comprising Leh and Kargil districts, was part of the Indian state of Jammu & Kashmir
- In August 2019, Indian Parliament passed a reorganisation Act to reconstitute Ladakh as a UT
- In October 2019, Ladakh became a UT, separate from Jammu & Kashmir, retaining the two districts of Leh and Kargil

Climate

- The climate of Ladakh is like that of a cold desert
- November to February are extremely cold
- Temperature often falls below zero in January

Economic activities

- Economy depends mainly on tourism and trade
- Cultivation of fruits and other farm products are also prevalent
- Several small scale industries in 13 sectors as of 2017

Ladakh Autonomous Hill Development Council (LAHDC)

- The autonomous district council that administers Leh district of Ladakh was constituted as per LAHDC Act 1995
- Work in areas such as economic development, healthcare, taxation, land use and local governance etc
- The council has 30 councilors; executive wing of the council consists of a chief executive councilor and four executive councilors

Tourism in Leh

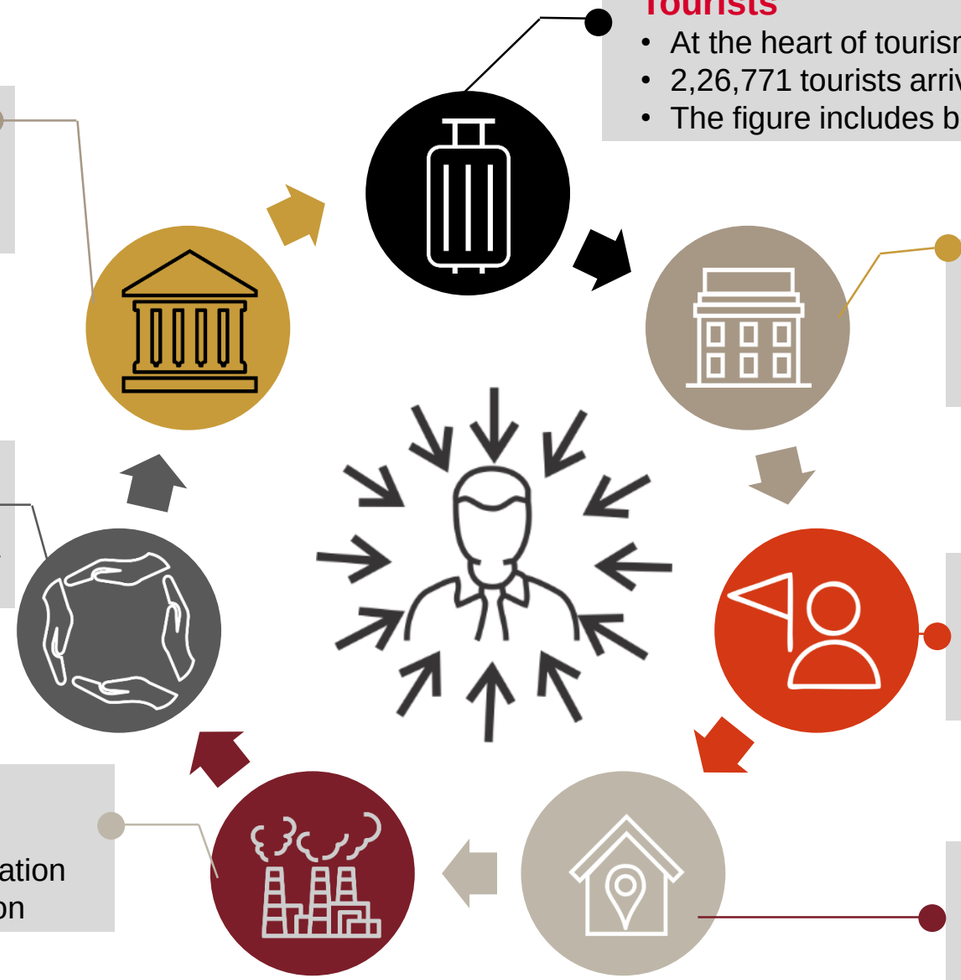
Tourism in Leh

- Leh opened for tourists in 1974; tourist inflow, both international and national, has consistently increased ever since
- It is crucial to Leh as it creates employment opportunities and boosts income generation on a large scale
- Tourism-based jobs are created in sectors such as hotels, transport, catering, restaurants etc
- Tourism has an important role in shaping the socio-economic profile of Leh
- The industry accounts for around 50% Leh district's GDP; however, Leh town and surrounding areas are the key beneficiaries

Note: GDP: Gross domestic product

Major tourism products in Leh

Key stakeholders of tourism industry in Leh



Tourists
- At the heart of tourism industry
- 2,26,771 tourists arrived in Leh in 2019
- The figure includes both domestic & foreign tourists

Local business
- Tour operators, hotels, guest houses, homestays
- Restaurants, handicraft/ souvenirs/ local jewelry
- Suppliers such as farmers and factories

Local community
- Local tour guides, hotel staff
- Cab drivers
- Local residents

Utilities and infrastructure
- Public health engineering department
- Nimoo Bazgo hydroelectric plant
- Solar power plant proposed in Pang, Leh etc

Industry associations
- All Ladakh Tour Operators Association
- All Ladakh Hotels & Guest House Owners Association
- The Ladakh taxi union, Leh restaurants association

Non-governmental organizations
- SECMOL, WAL, The Mountain Institute
- Snow Leopard Conservancy, LeDeg, WWF- India
- Rural Development and You

Government agencies
- The Union Ministry of Tourism
- Administration of Union Territory of Ladakh
- Ladakh Autonomous Hill Development Council

Note: SECMOL – Students Educational and Cultural Movement;
WAL – Women's Alliance of Lakadh;
LeDeg – Ladakh Ecological Development Group; WWF – World Wildlife Fund

About Trikala, Greece

Trikala city

- Capital of Trikala Regional Unit
- Population: 81,355 (2011, Greek National Statistical Service)
- Population density: 130/ sq km
- Area: 608.48 sq km
- Administrative body: Municipality of Trikala

Economy

- The economy of Trikala is primarily based on agriculture
- Main products are wine, feta cheese, sausages and pies
- In recent years, Trikala also became a tourist destination
- It is known as the Christmas City of Greece
- Tourist arrival: Over 1 million per annum
- Famous destination: Mill of the Elves

Figure- City Mobil2 Project

Source: theguardian.com

Figure- Mill of the Elves

Source: https://greece.redblueguide.com/

About Farkadona, Greece

Farkadona city

- A municipality in Trikala Regional Unit
- Population: 13,396 (2011, Greek National Statistical Service)
- Population density: 36/ sq km
- Area: 368.67 sq km
- Administrative body: Municipality of Farkadona

Economy and smart city

- The economy of Farkadona is primarily based on agriculture
- Another major contributor to the economy is stock breeding
- Major smart city solutions deployed are:
  - ✓ Intelligent bus stops
  - ✓ Smart water metering system
  - ✓ Clean means of transport

Figure- Farkadona

Source: https://farkadona.gr

Figure- Map of Farkadona

Source: Google maps

About Meteora, Greece

Meteora

- Municipality encompasses Kalabaka and monastries
- Designated UNESCO World Heritage Site
- Total monastic population: 56
- Number of monks: 15; Number of nuns: 41
- Administrative body: Municipality of Meteora

Tourism

- The economy of Meteora is primarily based on tourism
- Tourist arrival: Over 1 million per annum
- Total number of monasteries: 24
- Number of active monasteries: 6
- Figures among in top 5 tourist destinations in Greece
- Famous destination: Rock formation and monasteries

Figure- Kalampaka-Meteora wastewater treatment plant

Source: http://www.roikos.gr/en/wp-content/uploads/ROIKOS-EN.pdf

Figure- Meteora

Source: https://www.greeka.com/thessaly/meteora/geography/

Tourism in Greek cities

Tourism in Greek cities

- Trikala is know as the national Christmas City of Greece, attracting close to 1 million visitors/ year to the Mill of Elves
- Meteora is a designated UNESCO World Heritage Site and attracts more than a million visitors/ year
- Meteora is famous for its unusual and huge rock formations and multiple monasteries situated atop these formations
- The economy of Farkadona is based on agriculture and stockbreeding, the city is trying to promote agri-tourism in the city
- Tertiary sector in Thessaly (the region housing Trikala, Farkadona and Meteroa) contributes 70% to regional GVA*

Main places of tourist interest

- The Mill of Elves: Largest Christmas theme park in Greece
- Meteora monasteries: Of the 24 monasteries, only 6 are functional
- Caves: 100s of hermit and jail caves accessible in Meteora rock formations
- The Manavika: Area in Trikala famous for eateries and large murals
- Museums: Tritsanis museum dedicated to Vasilis Tsitsanis (music composer)
- Monuments: Famous sites include Kastro, clock tower, Matsopolous Mill, etc

Major tourism products in Greek cities

Note: GVA – Gross value added

Key stakeholders of tourism industry in Greek cities

Tourists
- Heart of tourism industry
- 33 million tourists visited Greece in 2018
- These comprised both domestic and foreign tourists

Government agencies
- Ministry of Tourism, Greece
- Greece National Tourism Organisation
- Municipalities of Trikala, Farkadona and Meteora

Local business
- Tour operators, hotels, guest houses, homestays
- Restaurants, handicrafts/ souvenirs/ local jewelry
- Suppliers such as farmers and factories

Non-governmental organisations
- Deka Trikalon (enterprise for social development)
- Syn-Eirmos (NGO for social solidarity)
- Ecological movement of environment of Trikala

Local community
- Local tour guides, hotel staff
- Cab drivers
- Local residents

Utilities and infrastructure
- DEYAT, municipal water supply company
- Hellenic Electricity Distribution Network
- Mesochora hydroelectric plant

Main components of sustainable tourism (1/2)

1

Smart systems

Smart city concept is a driving force for a sustainable economy, low carbon environment and footprint, and urban mobility. The advent of IoT, smart sensors, system-on-chip computing devices, etc are facilitating the design and development of smart services and devices

2

Cultural heritage

Sustainable tourism generates income and employment opportunities at the tourist destination, without affecting the cultural heritage of the destination. There are EU guidelines for sustainable culture tourism for tourists, tour operators, policymakers, local and heritage communities

3

Environment

To promote sustainable tourism, the municipality of the tourist destination to conduct cleanliness drives, levy fines on those polluting the environment, conduct audits at hotels to ensure they are operating as per regulations and disposing their waste in a sustainable way

4

Quality food production

Quality food production and usage of good quality products and vegetables in restaurants and hotels are important factors to be considered for sustainable tourism as nearly 1/3rd of tourist expenditure is on food, which is a sizeable revenue for the destination

5

Energy

Adoption and usage of clean energy technologies. Clean energy usage in tourist-related transport is necessary for sustainable tourism development at the regional and local levels

6

Water

Efficient use of water by hotels, guest houses, restaurants, tourists, coupled with safety measures, waste water management, pollution control and technology incorporation can be the key to conserving water as well as promoting the larger objective of sustainable tourism

Main components of sustainable tourism (2/2)

7

Waste

Tourism in tourist destinations generates large amounts of solid waste, particularly during the peak tourist season, which makes its management more complicated. Therefore, various solutions in sustainable solid waste management (SWM) can be implemented to achieve sustainable tourism

8

Mobility

Mobility planning is an integral part of sustainable tourism and territorial planning. Tourist destinations must be integrated with sustainable mobility solutions, as it can add value to the travel and experience of tourists, thereby promoting sustainable tourism

9

Healthcare

Healthcare is an important component for sustainable tourism. The presence of good public/private hospitals and clinics with learned doctors and sufficient equipment/ laboratories at a tourist destination boosts the tourist's confidence while travelling to a particular tourist destination

10

Green spaces

Green spaces are important for all types of sustainable tourism such as leisure, cultural, business, congress, meetings, or other tourism forms. The quality of green spaces helps define the identity of towns and cities that can enhance their attraction for tourists

11

Sewage and sludge management

Proper sewage management is an important aspect of sustainable tourism. It should be ensured that all establishments, including hotels and guest houses, are connected to the central sewage system which ends up at a sewage treatment plant for treatment

12

Commerce

Tourism has several economic benefits and opportunities for local businesses, shops, entrepreneurial start-ups, etc and allows for increased trade of goods and products which might include but not limited to textiles, clothes, shoes, spices, food items, etc

Sectors impacted by tourism in Leh – mobility

Reaching Leh

- There are various ways to reach Leh: (a) By air – Leh Kushok Bakula Rampochee airport is located 5 km from Leh city;
- (b) by road – through Leh-Manali highway and Leh-Srinagar highway; (c) the nearest railway station is Jammu Taxi – approx. 700 km

Mobility in and around Leh

- No dedicated local bus services, but there are a large number of public and private buses for tourist spots in and around Leh
- Apart from buses, there are a large number of private cars and taxis (belonging to tour operators or taxi union) in and around Leh

Mobility issues in Leh

- Due to large influx of tourists every year, the number of traffic jams in Leh has been increasing every year
- There are a large number of construction and development activities in Leh, which create traffic jams
- The two main highways to Leh are closed during winter, leaving flying as the only option
- Diesel freezes in sub-zero temperatures; chances of avalanches and landslides worsen mobility during the winter months

Sectors impacted by tourism in Leh – SWM

Solid waste generation

- Leh generates 0.41 kg waste per capita per day
- 15% of the waste is organic, 15% old items of daily need
- 5% is metal and inert waste, 65% plastic and packaging

Waste prevention and segregation

- Huge influx of tourists make waste prevention challenging
- There are dustbins available for segregating waste at source
- Due to lack of apathy, waste is not segregated properly at source

Waste collection and transportation

- There are three types of waste collection bins in Leh: (a) 15 dumper bins, (b) 7 small dust bins, and (c) 40 open dump sites
- 2-tonne dumper bins are placed near hotels, shopping complexes, etc; while smaller bins are placed along the main roads
- Waste is collected from three types of collection points by municipal trucks that carry waste to dumping ground at Diskit Tsal for disposal

Waste disposal

- Waste treatment plant with a capacity of 30 TPD was commissioned recently, but it is currently not running at full capacity
- Primitive open dumping has been in practice for the past 25 years at a legacy dumpsite in Diksit Tsal, located 1.5 km outside Leh city
- This legacy dumpsite does not have any boundaries and the site was chosen without considering any socio-environmental factors
- Apart from being an eye sore, the dumpsite causes serious environmental issues such as leachate and production of landfill gases

Sectors impacted by tourism in Leh – water supply

Water demand

- Water demand in winters – 2 MLD
- Water demand in summers – 5 MLD
- PHE* current supply – 4.9 MLD
- Ever increasing water demand due to tourism

Stakeholders	Number of units	Average Demand (litre/day/person)
Households	6,000	75
Commercial establishments	3,500	Hotels – 100 Offices/shops - 10
Floating population (labourer)	50,000	30

Water supply

- Sources of water supply in Leh:
  - Public borewell – 31%
  - Private borewell – 29%
  - Borewells on Indus River Basin – 32%
  - Springs/surface water sources – 8%

Water usage by tourists

- Per capita consumption of water by tourists is 100 litres/day
- Tourists prefer water-intensive flush toilets, leading to excessive water demand
- Hotels require 24 hours water supply, 7 days a week
- Big hotels consume 5,000 litres of water/day and many install private borewells

Issues

- High dependence on borewells (public/private), which usually go dry in the absence of adequate rainfall/snowfall in a year
- 25% of water is lost during transportation due to breakage or leakage in the water supply network
- Sub-zero temperatures lead to pipe freezing and bursting, which interrupts the already scarce water supply in the city during winters
- Use of water intensive equipment by hotel owners to please incoming tourists such as flush toilets and showers

Note: PHE – Public health engineering

Branding of tourism in Leh

Tourism branding

- Though tourism is one of the major activities in Leh, it lacks in terms of branding itself as a tourist destination
- Promotional activities are primarily undertaken by private sector operators

Broader initiatives undertaken

- Introduction of tourism incentive policy in 2020. The key highlights of policy include:
  - Provide capital outright investment subsidy of 30% (upto INR 40 lakh) for fixed assets of new tourism assets and expansion of existing
  - Establish Ladakh Tangible Cultural Heritage Conservation Fund for restoration and conservation of historical sites
  - Promote adventure or recreation tourism by providing 20% subsidy (upto INR 5 lakh) for identified equipment
  - Skill development initiatives for training of personnel in the tourism industry
- Mission Organic Development Initiative - Special development project to introduce organic farming into mainstream agriculture
- Ladakh greenhouse project **-** Aims to improve vegetable availability in Ladakh through deep winter greenhouse farming
- Positioning Leh as the solar energy hub, plants with a cumulative capacity of 5,000 MW in the pipeline

Marketing initiatives by the private sector

- Influx of tourists has been largely on account of private operator initiatives and the shooting of movies in and around Leh
- Private operators organise various activities such as bike rides, visits to monasteries, rafting, rock climbing, snow treks, etc

Bioremediation – reclaiming the existing dumpsite

Legacy dumpsite reclamation through bioremediation

- Legacy waste processed to recover valuable recyclable scrap
- Items extracted: Plastic, rubber, metal textile, glass, soil etc.
- Bioremediation is a three part process:
  - Stabilization: Process removes stench, moisture & pathogens
  - Sorting: Trommels used to segregate waste of different types
  - Disposal: Further disposal and co-processing of sorted waste

Bhilswa dumpsite - Delhi

- Total area of legacy dumpsite: 70 acres
- Bioremediation process timeline: October 2019 – in process
- Legacy waste being processed per day: 4,200 tonnes
- Legacy waste processed*: 661,454 tonnes
- Number of trommels being used: 17
- RDF# sent for co-processing and for waste to energy conversion
- 52,700 sqm of area has been cleared of legacy waste

**Till August 18, 2020*
 # Refuse derived fuel

Figure- Trommels being used at Bhilswa legacy dumpsite

Source: https://www.timesnownews.com

Bioremediation – reclaiming the existing dumpsite

Kumbakonam dumpsite – Tamil Nadu

- Total area of legacy dumpsite: 32.5 acres
- Bioremediation process timeline: July 2016 to August 2018
- Contract for bioremediation awarded to: Zigma Global*
- Legacy waste processed: 3,50,000 tonnes
- RDF# mined from site sent to Dalmia Cement for co-processing
- A waste processing and a biogas plant set-up at reclaimed land

Ajith Singh Nagar dumpsite - Vijaywada

- Total area of legacy dumpsite: 45 acres
- Bioremediation process timeline: July 2018 to July 2020
- Contract for bioremediation awarded to: Zigma Global*
- Cost of clearing legacy waste: INR 26 crore (~€ 3 million)
- Legacy waste processed: 3,00,000 tonnes
- Total RDF# sent to cement companies: 47,212 tonnes
- Live feed of project site to authority for maintaining transparency

Figure- Before and after images of Kumbakonam dumpsite

Source: http://www.zigma.in/comp_proj.html

Figure- Before and after images of Ajith Singh Nagar dumpsite

Source: http://www.zigma.in/comp_proj.html

** Zigma Global Environ Solutions Pvt Ltd*
 # Refuse derived fuel

Policy and legal framework

National Tourism Policy, 2015

- The objective of the policy is to increase India's share in world tourist arrivals from 0.68% in 2015 to 1% by 2020 and to 2% by 2025
- This policy is aimed at boosting the tourism sector in the country and key focus areas include:
  - Employment generation and community participation in the development of a sustainable tourism industry in India
  - Developing and positioning India as a must-experience & must-re-visit destination integrating aspects of cleanliness, safety and welcome

National Tourism Policy, 2020

- A new policy is being developed focusing on employment generation, community participation & tourism development in a sustainable manner
- The main focus areas of the new draft National Tourism Policy include:
  - Development of core infrastructure (airways, waterways, railways, etc) as well as further development of tourism infrastructure
  - Position India as a welcoming, safe, clean, hygienic and accessible tourist destination

Eco-tourism policy 2017

- Leh district to be promoted as an eco-tourism destination with the goal of decreasing the negative impact of tourism on the environment
- The policy proposes:
  - Levying an environmental fee on all tourists travelling to Leh, Ladakh
  - Revenue generated to be utilised for development projects: toilets & sanitation, disposal of garbage, protection of water resources, etc

International framework for sustainable tourism (1/2)

UNWTO guidelines

- UNWTO has prepared a guidebook on sustainable tourism, as an engine for development, job creation, poverty reduction, etc
- As per UNWTO, sustainable tourism should:
  - Make optimal use of environmental resources
  - Respect socio-cultural authenticity of host communities, conserve their cultural heritage and values
  - Ensure viable and long-term economic operations, providing socio-economic benefits to stakeholders that are fairly distributed
  - Ensure stable employment and income generating opportunities for host communities, resulting in poverty alleviation

UNESCO guidelines

- Objectives of the UNESCO World Heritage and Sustainable Tourism programme are:
  - Integrate principles of sustainable tourism into mechanisms of the World Heritage Convention
  - Strengthen an enabling environment by advocating strategies, policies, tools and frameworks that support sustainable tourism
  - Promote stakeholder engagement in planning, development and management of sustainable tourism
  - Ensure capacity building of World Heritage stakeholders and provide them the tools to manage tourism efficiently
  - Promote quality tourism products and services that encourage responsible behaviour among all stakeholders

Note: UNWTO – United Nations World Tourism Organization; UNESCO: United Nations, Educational Scientific and Cultural Organization

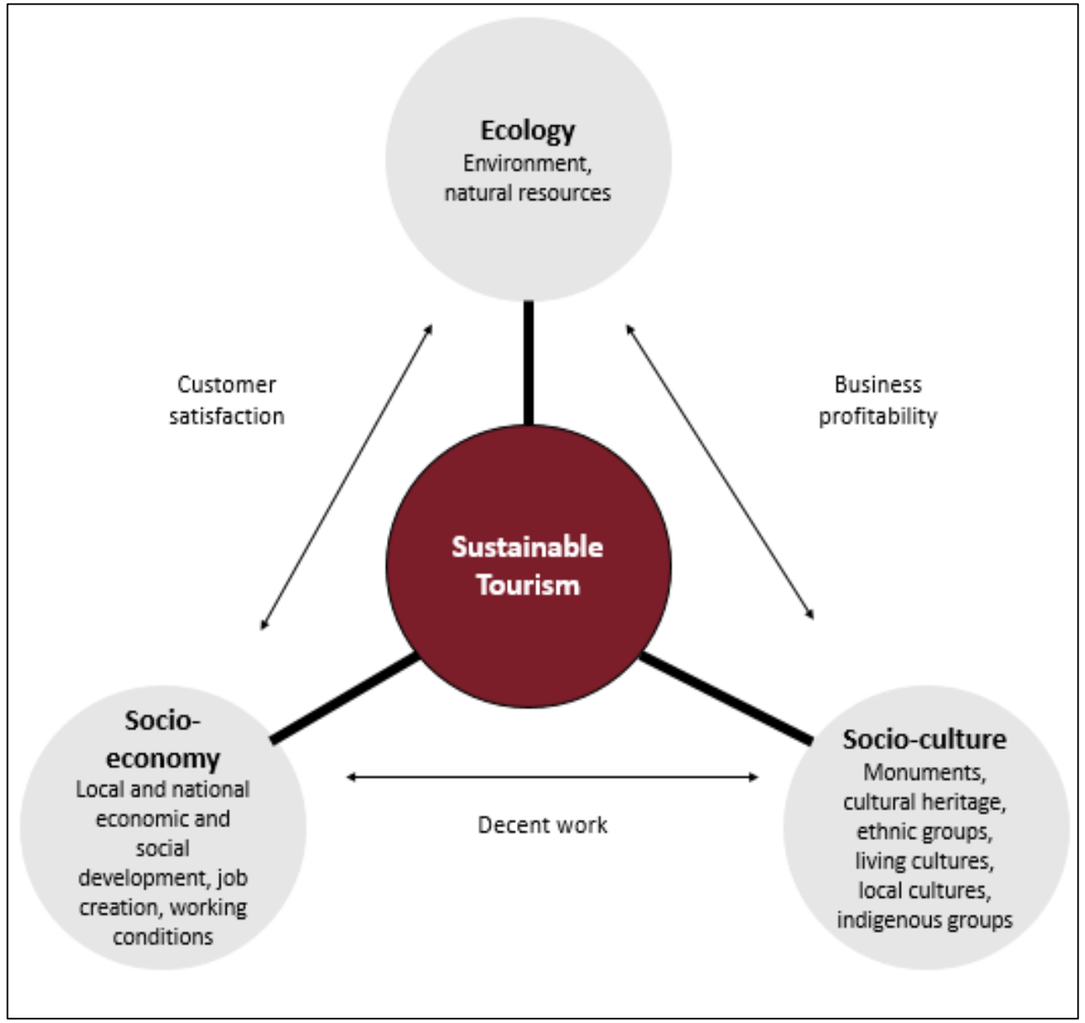
International framework for sustainable tourism (2/2)

ILO guidelines

- ILO's definition of sustainable tourism is composed of three pillars:
  - (a) Social justice (socio-culture)
  - (b) Economic development (socio-economy)
  - (c) Environmental integrity (ecology)

Conclusion

- Sustainability should be inherent part of tourism-related development
- Key takeaways from international frameworks:
  - Maintain ecological process and conserve natural biodiversity
  - Respect socio-cultural authenticity of the host region
  - Ensure equitable distribution of socio-economic benefits



Note: ILO – International Labor Organization

Best practices from Greek cities – Mobility

Robust data center, mobility app and automated vehicles

- Data center to monitor all data from public transport and electronic signs
- Mobility app to facilitate transportation for residents within the city
- Commissioned automated buses, which ply on dedicated driverless bus lanes

Figure- Automated bus project

Source: facebook.com

Smart street lighting and car parking

- Smart street lighting to use wireless sensors employing IoT
- Benefits include savings in energy and salaries, damage detection, etc
- Smart parking management system to identify and monitor parking spaces

Figure- Dedicated cycling lanes

Source: https://madeintrikala.gr/en/trikala-zoi-podilato/

Cycling, walking and car pooling

- 3.5 km cycling lanes in city center and 5.0-6.0 km outside main city
- Created ideal condition for walking, with dedicated pedestrian lanes and LED lights
- Encourage car-pooling for travel between urban centers

Best practices from Greek cities – Solid waste management

Using technology for waste management

- Waste bins and cans are monitored using sensors at central collection center
- Collection center notified in real time about level of waste in waste bins and cans
- Residents' complaint can be logged via mobile app and web

Submersible waste storage

- Five submersible waste storage systems to be commissioned in Meteora
- Project aims at improving city aesthetics and reduce footprint on environment
- Municipality to approach Green Fund for purchase of submersible waste systems

Recycling

- Recycling of information, communication and technology equipment
- Cooperation agreement signed with company in C&R of ICT consumables
- All proceeds/profits from this activity to go towards SOS Children's Village

Figure- Submersible waste storage

Source: https://www.tameteora.gr/topika/dimos-meteoron/349023/vythizomenoi-kadoi-aporrimmaton-gia-tin-kalampaka/

Note:
ICT: Information, communication and technology
C&R: Collection and recycling

Best practices from Greek cities – Water supply & management

Smart city control center

- Trikala has established a smart city control center to monitor all utilities
- Monitors municipal water and sanitation utility through solenoid valve systems
- Early warning system for breakages or leakages in the system

Figure- Smart city control center

Source: https://egritospress.gr/category/topika-nea/trikala-el/

Smart metering and other technologies

- Smart water meters to ensure complete solution for management and control
- Usage of IoT for collection of data and remotely controlling water valves
- DEYA Farkadona* uses remote control system for efficient water supply

Figure- Dedicated cycling lanes

Source: http://www.roikos.gr/en/wp-content/uploads/ROIKOS-EN.pdf

Wastewater treatment plant in meteora

- Envitech SA built a WWTP in Kalampaka-Meteora region
- WWTP is based on a carrousel system, and is designed to serve 20,000 people
- Technology is a patent of Dutch company, DHV Water

WWTP: Waste water treatment plant
**Water supply company*

Best practices from Greek cities – Branding

Smart city and National Christmas City

- Achieved title of smart city by implementing innovative and sustainable solutions
- ‘Mill of Elves’ is the biggest Christmas theme park in Greece
- Caters to ~1 million visitors during the Christmas week

Branding through participation in seminars/conferences

- EU Green Week: Two online seminars on protection of nature and environment
- European Week of Municipalities: Workshops on planning of development actions
- 16th Panhellenic Conference: Aimed at implementation of 17 SDGs

International branding trips

- Municipality of Meteora organized branding trips
- Participated in Belgrade International Tourism Fair to promote Meteora
- Recorded an interview that was televised to highlight Meteora

SDG: Sustainable development goals

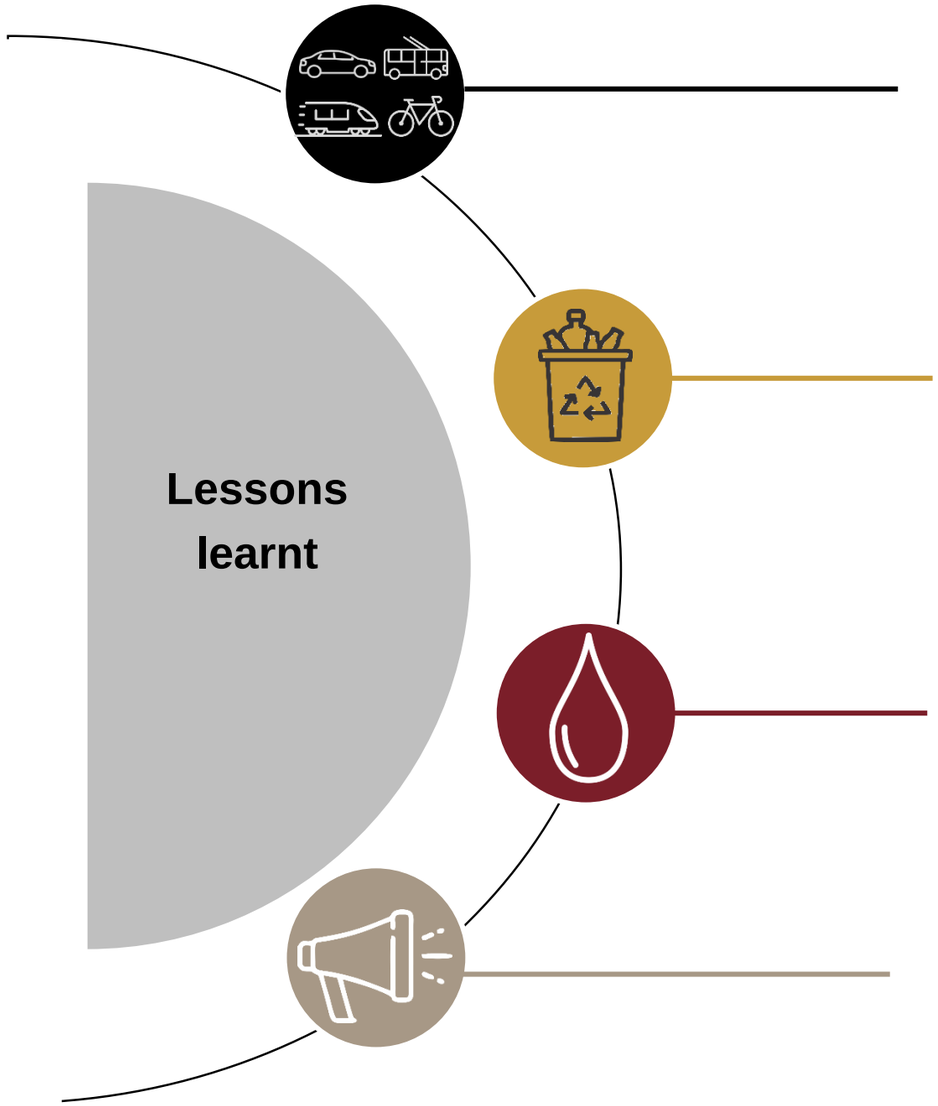
Figure- National Christmas city

Source: https://greekcitytimes.com/2019/12/16/trikalas-mill-of-elves-set-to-welcome-over-1-million-visitors/

Figure- Smart city project, electric vehicle

Source: https://www.elviten-project.eu/en/trikala/elviten-in-trikala/

Lessons learnt from Greek cities



Mobility

- Robust data center to monitor smart mobility solutions
- Implementation of automated road transport system, with dedicated lanes
- Promotion of cycling as preferred mode of transport, with dedicated lanes
- Smart parking facilitated by sensors and mobile app

Solid waste management

- Waste bins monitored via sensors by central waste collection center
- Residents' complaint registration via mobile app and web
- Submersible waste storage system to improve city aesthetics
- Optimization of waste collection routes using geographical information system

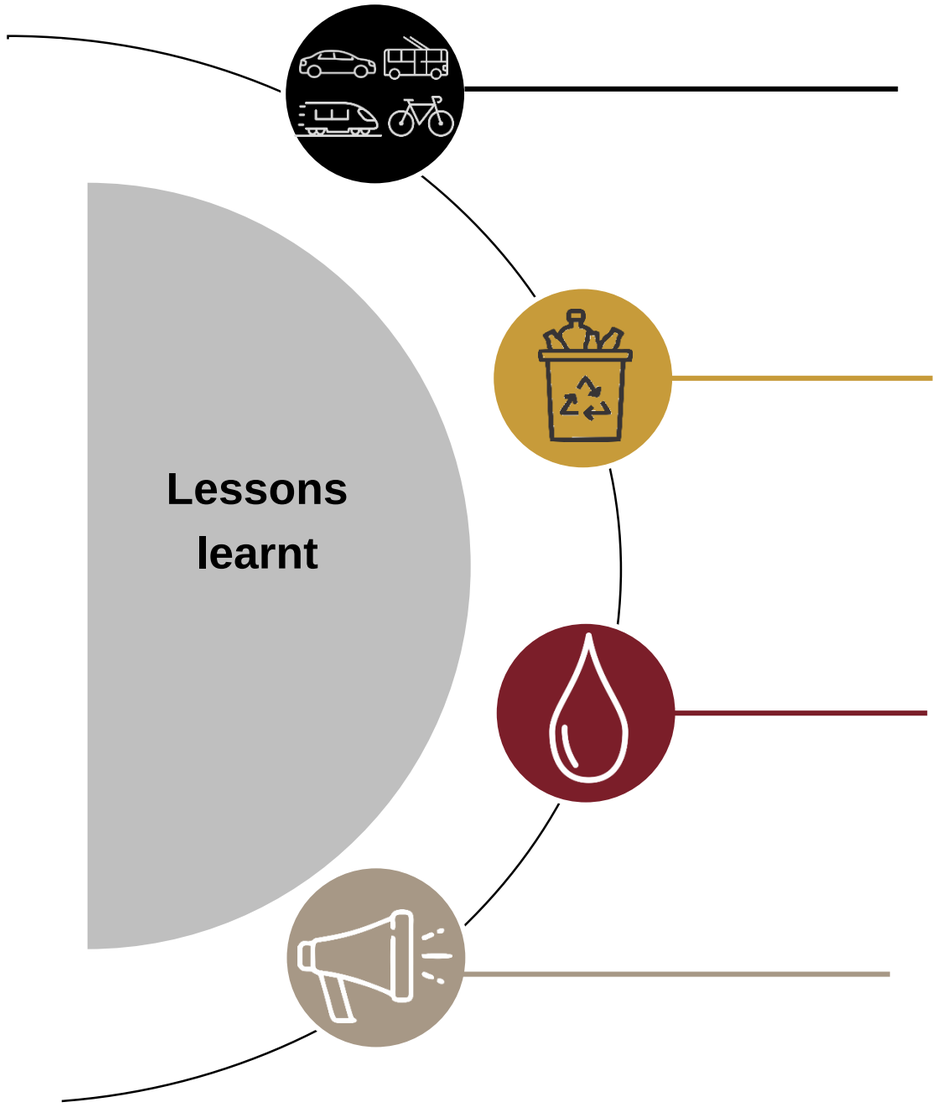
Water supply and management

- Smart city control center monitors water and sanitation utilities
- Automated detection of breakage and leakage in water supply network
- Installation of smart water meter, equipped with IoT technology
- Operational wastewater treatment plant using carrousel system

Branding

- Earned reputation of smart city in Greece
- Trikala branded as National Christmas City owing to 'Mill of Elves' festival
- Participated in seminars and conferences to showcase smart city solutions
- International promotional and branding tours to Serbia and Romania

Lessons learnt from European cities



Mobility (Barcelona, Spain)

- Bike borrowing system – Bicing
- Orthogonal bus network to help reduce interchange points
- Driverless metro system and integrated fare system
- Smart parking systems and bus stops

Solid waste management (Vienna, Austria)

- Manual and/or automatic sorting of plastic waste
- Energy and heat recovery through incineration of plastic waste
- Recycling of lightweight packaging material and PET bottles

Water supply and management (Murcia, Spain)

- Deployment of smart sensors to monitor, log and analyse water flow pressure
- Zoning and microsectorisation of supply network leading to reduction of NRW
- Reuse of 11% treated water and discharge of rest to public waterways
- Savings from efficient water network offsetting Operation & maintenance cost

Branding (Netherlands)

- Use of public private partnerships to develop and organize marketing programs
- Organise national tourist summits to foster sharing of best practices
- Develop yearly thematic marketing programs for development of tourism

Lessons learnt from Leh

Waste segregation

- LAHDC has launched waste segregation project Tsangda on pilot basis
- Blue and green bins have been distributed to 400 households & commercial est.
- 65,000 kg of waste collected in the first year from four areas in Leh
- 27,000 kg sold to scrap dealers and 17,00 kg recycled for making products

Figure- Project Tsangda

Fecal sludge management system

- India's first fecal sludge treatment plant on PPP basis inaugurated in Leh in 2017
- FSTP was built in 44 days & provide end to end fecal management services
- FSTP uses planted drying bed technology which is robust and flexible
- Plant has no direct contact with fecal sludge and produce minimal odor

Figure- Fecal sludge treatment plant in Leh

Green spaces

- Green spaces improve environment quality and attract residents & tourists
- Quality of green spaces define the identity of towns and enhance tourism
- There are several green spaces for leisure and tourism in and around Leh
- Examples-Nubra & Zanskar Valley, Sand Dunes Park, Hemis National Park

Recommendations for sustainable tourism in Leh (1/2)

Mobility

- Use of diesel linked to increased melting of glaciers and ice in and around Leh
- Central government has given renewed push to make Leh carbon neutral
- It is recommended that the city should also push towards clean energy mobility solutions such as e-vehicles and shared mobility
- Some initiatives that can be implemented are:
  - Introduction of Electric Vehicles: EVs are better than diesel vehicles as the former have lower carbon footprint
  - Smart parking initiative: Deploying of smart parking systems to enable monitoring and regulation of parking slots
  - Non-motorized transport: Deploy NMT such as walking, cycling, etc by demarcating vehicle free zones within the city center
  - Standardize public transport services such as fixed bus routes, fee and timings

Solid waste management

- Efficient and exhaustive solid waste management is important for development of a city
- Laws, such as waste segregation and ban on single use plastic, are not being enforced effectively
- Some initiatives that can be undertaken are:
  - Smart central waste collection center: Smart trash cans and bins that can be monitored from a central system
  - Compost toilets: Compost toilets are not water intensive and do not produce waste that has high nitrogen content
  - Biomining: This method helps in processing legacy waste and reclaiming landfill space using stabilization, sorting & disposal techniques
  - Initiatives around 3Rs: Promote reduction and reuse at source to enable waste minimization

Recommendations for sustainable tourism in Leh (2/2)

Water supply

- On account of low rainfall, Leh faces issues related to water supply and high dependence on borewells
- Although the administration is trying new methods to supply water, the efficacy of these are still to be tested
- Leh can explore the following options for solving the issue of water supply:
  - Smart irrigation systems: Installing IoT sensors in irrigation systems for remote monitoring, and detecting of leakage and breakage
  - Regulation of borewells: Strict regulation should be implemented for borewells, controlling their number and usage
  - Water storage techniques: Employ rainwater harvesting, water reservoirs & innovative systems, such as ice stupas and artificial glaciers

Branding

- Leh's several facets can be portrayed to attract tourists:
  - Adventure tourism: Adventure activities, such as mountaineering, trekking, rafting, cycling, motorcycle tours, and camping
  - Cultural tourism: Leh has a strong Buddhist culture, and is home to several monasteries
  - Nature tourism: Region has several species of indigenous wildlife, flora and topography, such as lakes and mountain passes
  - Strategic planning and initiatives: Ensure efficient monitoring and implementation of recently introduced tourism incentive policy

Recent initiatives undertaken in Leh for sustainable tourism

Bioremediation of legacy waste

- The local government has decided to undertake bioremediation of legacy waste to reclaim land at Diksit Tsal
- A Pune based consultant has been hired to undertake a detailed project report and share the most feasible route for bioremediation

Cycle track

- UT administration has sought suggestions of the local authorities for developing a cycling track in Leh under the Smart City mission
- Authorities have already identified a potential area for the development of this track which will also give a boost to tourism

Tunnel to resolve road closure

- Both the access roads to Leh from Manali and Srinagar face closure during winter months due to heavy snowfall and averse climate
- Government has allocated funds for construction of a tunnel through Zoji La pass which will enable connectivity to Leh during winters

Khardung La tunnel proposal

- The local authorities have made a proposal to the UT government to construct a tunnel from Leh to Khardung La pass
- This will allow the water on the other side of the pass to be diverted to Leh and solve the water supply issue

24*7 water supply and diesel

- Pilot project has been initiated for supplying 24*7 water to ward number 1 in Leh which is situated at the highest elevation
- Government has introduced new diesel variant that can be used in temperatures as low as -30 degree celsius without freezing

Way forward

Three-tiered approach

Goal setting

- Divide recommendation in to short, medium and long-term goals
- Short–term goals: 0-3 years
- Medium-term goals: 3-7 years
- Long-term goals: 7+ years

Secure funding

- Adequate funding required for seamless project execution
- Can approach multilaterals, donor agencies, development bank
- Explore central government schemes such as AMRUT, smart city
- Attract private capital through public private partnership mode

Conduct feasibility study

- Administration to undertake feasibility study of priority projects
- Appoint transaction advisors to include best practices and fair evaluation
- Project to be evaluated on technical and financial feasibility
- Feasibility study to define project structure best suited to local needs

Thank you