HOW DO WE DEAL WITH THE ENVIRONMENTAL CATASTROPHE FACING KASHMIR?

MODEL: HOW TO SAVE DAL AND NAGEEN LAKE?

Gabriel Iqbal

1st ed. 1997

2nd ed. 2023

Iqbal, Gabriel (1st ed. 1997, 2nd ed. 2023). HOW DO WE DEAL WITH THE ENVIRONMENTAL CATASTROPHE FACING KASHMIR? MODEL: HOW TO SAVE DAL AND NAGEEN LAKE? by Department of Distance Education, University of Kashmir.

Contents

Foreword

As part of the growing awareness about Sustainable Development, Gabriel Iqbal has researched and campaigned internationally and delivered lectures in Britain, Kashmir, Canada, China, Africa and the Middle East.

Gabriel was born in Kashmir in 1970 and migrated to England in 1990 to pursue his educational interests. He attained a BSc. (Hons) in Biology and a Post Graduation in Science Education from the University of Leeds, UK. He aims to continue his research in History and Philosophy of Science. After years of research and collection of source material Gabriel has publish his findings in a book titled, "Heart Intelligence".

Acknowledgement

The information shared by Directorate of Environment and Syed Maqbool (Retired superintendent engineer, University of Kashmir) and Dr. Kundanger (Head and Chief Investigator, Hydro-Biology Lab.) of the Directorate of Environment, Kashmir, is hereby acknowledged to be very instrumental in the completion of this research.

INTRODUCTION

Historiography

Kashmir, or Kasheer, as it is known by its people is encapsulated in the north by the Karakorum range and in the south by the Pirpanchal range. The vale has an unutterable mystic aura surrounding it's awe-inspiring and dazzling splendor. Aquifers and streams sprout in its bosom. Its forests are virgin and the smell of gymnosperm cones has a druglike effect on the subconscious. Kasheer's endemic species such as the majestic Hangul looks like a graceful and elegant knight roaming the dense conifer forest.

It was as early as 1887 when the rulers of Kasheer started to impose some arbitrary game laws but it was not until 1901 that a Game Preservation Department was set up. Later in 1932-33 the Game Preservation Department adjoined with the Forest Department. This was followed by bringing State 'Rakhs' into the control of the Forest Department. In 1972 the Wild Life Protection Act was enacted, which narrowed the extinction rate to a large extent. During 1978-79, Kasheer saw the creation of the Directorate of Wildlife Protection. The Directorate of Wildlife Protection became independent in 1982 and a Chief Wildlife Warden replaced the "Game Warden" (earlier nomenclature). This new force set up some major changes by introducing Project Hangul, Project Snow Leopard, Project Black Bear, Project Black necked Crane. Hence, being instrumental in saving the endemic and common species from near extinction.

Current Situation and Ideology

The aim of this paper is to highlight the current environmental degradation in Kashmir together with charting out a framework for its resuscitation. The framework elaborated upon is devised to be flexible and interactive. In view of the fact that no single elixir can breathe freshness into Kashmir's dwindling environment and culture, I hope to partake in a new revised and dynamic perspective based on exerting one's opinion and mutual consensus. In doing so we might disagree with the political symbolisms and religious thralldom constructed over centuries of ignorance, nihilism and dogma.

The mystic poets of Kashmir have described the environment of Kashmir in their didactic lyrical poems in the most distinguished and thoughtful manner. "The Valley of Kashmir" by Walter Lawrence is considered as a source reference book on the history of Kashmir (Lawrence, 1967). Other than Lawrence's anthropological and scientific study of Kashmir, both the "Ain Akbari" and the five-thousand-year-old chronicle of Kashmir, the "Raj Terangni" are enough testimonial to the dynamic and rich culture of Kashmir. Saving Kashmir's environment is an imperative task which demands the awareness and co- operation of the masses. It is through their consciousness and part taking in the reconstruction effort that we can aspire to return to a decent culture and our wealth, natural environment.

An alarming statement issued by the Directorate of Environment, Jammu and Kashmir State, reads as follows:

"The states environmental scenario is rather gloomy. We experienced many ecological disturbances, such as Black snow in Kashmir, Blue rain in Jammu and Red waters in Dal Lake. Otherwise also our natural resources: forest, lakes, flora, fauna and other biological wealth is, under recession."

(Directorate of Environment, May 1996)

Despite the efforts of some dedicated and conscious people, there has been a large-scale embezzlement of environmental funds.

Kashmir's National Reserves

Since its establishment in 1979, the Directorate of Wildlife Protection has brought approximately 15,000 square kilometres of land under it's hold. The directorate has been successful in designating National Reserve status to this area.

The number of designated National Reserves in Kasheer is tabulated as under:

National Reserves	**No.**
Sanctuaries	13
Game Reserves	18
Wetlands	12
National Parks	4
Biosphere Reserves	2*

Source: Directorate of Environment, May 1996

* Biosphere Reserves under consideration (Directorate of Environment, May 1996)

According to "Green Scan", the monthly newsletter of the Directorate of Wildlife Protection, the planned Biosphere Reserves are to be set up at Overa-Aru and Gulmarg respectively. (Directorate of Environment, May 1996)

Overa-Aru Biosphere

The Overa-Aru Biosphere is situated at an altitude of 3050 - 5425 meters above sea level. It is located at a distance of 56 Kms. from Srinagar (ariel: 42.6 Kms.) and 12 Kms. from Pahalgham (ariel distance: 9.92 Kms.).

The Overa-Aru Biosphere is proposed to cover an area of 400 sq. Kms. (approx.). The Biosphere Reserve well conserve the following species:

Animals	**Birds**
Hangul (Cervus elaphus hangul)	Monal (Lophophorus impejanus)
Musk deer (Moschus moschiferous isabellinus)	Golden oriole (Oriolus oriolu
Brown bear (Ursus arcto	Jungle crow (Corvus corone macrorhynchos)
Leopard (Felis bengalensis)	Blue Rock pigeon (Coluba livia)
Snow cock (Tetraogallus himalayensis)	
Hoopoe (Upupa epos)	
Griffon vulture (Gyps himalayensis)	

Source: Directorate of Environment, May 1996

Gulmarg Biosphere

The Gulmarg Biosphere is situated at an altitude of 2,400 - 4,300 meters above sea level. It is located at a distance of 49.4 Kms. from Srinagar (ariel: 38.2 Kms.).

The Gulmarg Biosphere is proposed to cover an area of 180 sq. Kms. (approx.). The Biosphere Reserve well conserve the following species:

Animals	**Birds**
Hangul (Cervus elaphus hangul)	Monal (Lophophorus impejanus)
Musk deer (Moschus moschiferous isabellinus)	Golden oriole (Oriolus oriolus)
Brown bear (Ursus arctos)	Jungle crow (Corvus corone macrorhynchos)
Leopard (Felis bengalensis)	Blue Rock pigeon (Coluba livia)
Black bear (Selenarctos thibetanus)	Snow cock (Tetraogallus himalayensis)
Red fox (Vulpes vulpes montana)	Hoopoe (Upupa epos)
Griffon vulture (Gyps himalayensis)	
Chukor (Alectoris chukar pallesens) Kashmir	
Roller (Coracias garrula semenowi) Bearded	
vulture (Gypaetus barbatus)	

Source: Directorate of Environment, May 1996

Following is a list of the National Parks:

1. Dachigham National Park, Kashmi
2. City Forest National Park, Kashmir
3. Kishwar High Altitude National Park, Jammu
4. Hemis High Altitude National Park, Ladakh

Some of the major Sanctuaries are as under:

Kashmir	**Jammu**	**Ladakh**
Overa	Nandini	Korakaram (Nubia - Sayok)
Baltal	Ram Nagar	Chanthang
	Hirpora	Surinsar-Mansar
	Limbar	Jasrota

Some of the major reserves are:

Game	**Wetland**
Dachigham	Hokarsar
Shikargah	Highgham
Nadur	
Mirgund	
Shalbug	
Kranchu	
Chatlapora	

HOW DO WE DEAL WITH THE ENVIRONMENTAL CATASTROPHE FACING KASHMIR?

The Threat to Kashmir's Lakes and Rivers National Reserves

A recent study conducted by the University of Kashmir suggests alarming results for the survival of Dal lake. Dal, like many other lakes throughout the world, is going through a process known as cultural eutrophication. When large amounts of organophosphates such as nitrates (N), phosphates (P) and potassium (K) are discharged into a lake, the lake becomes eutrophic (nutrient rich). Eutrophication leads to an increase in the algal life of the lake. The increase in algal life causes a shift in the pH level and an increase in the biological oxygen demand (B.O.D.) of the lake. The increase in the algal life is also referred to as an "algal bloom". The increase in the algal population leads to a decrease in the oxygen content of the lake (hence the B.O.D. increases). As a result of reduced oxygen content of the lake, most of the animal and plant species of the lake other than the algae and some invertebrates suffer and gradually their population declines (Miller, 1995).

In 1993 most of Nageen and Dal was reported to be colonized by various species of algae. A full scale "algal bloom" has now taken over most of Nageen and Dal lake. According to Dr. Kundanger (Head and Chief Investigator, Hydro-Biology Lab.) of the Directorate of Environment, Kashmir, "The recent red water phenomenon due to euglenoid bloom is the positive sign of enrichment of Dal water due to sewage disposal" (Kundanger, 1997).

Dr. Kundanger further states:

"The ecological condition of Anchar Lake which is connected to Dal Lake through Nall-Amir Khan is even worse. It looks like a dead lake. Huge areas of the lake along it's North West shores have silted up and form a part of arable land. The density of aquatic weeds is so high that navigation has become impossible. The effluent discharge from the Medical Institute has further worsened the situation. The condition of the Wular lake, Manasbal, Ahabsar, Waskur, Khushalsar, Gilsar, Nilnag etc. are far from good. The weed growth being very high, deep water anoxic, turbidity levels increasing. The situation of the springs of Kashmir like Muttan, Malaknag, Verinag indicate that their water quality is deteriorating at an alarming rate." "The condition of River Jehlum and Doodganga stream is well known to everyone, they are polluted to such an extent that there water has been since abandoned for drinking purposes. The recent studies carried by HBL on the drinking water quality of various areas of the valley clearly indicate that conductivity, calcium, magnesium, chloride, ammoniacal nitrogen, nitrate and Iron are much higher than the permissible levels."

(Kundanger, 1997)

Another alarming study conducted by the University of Kashmir suggests that large amounts of siltation due to surface run-off in and around the Tailbal region is leading to a gradual decline in the water level in the lake. Due to heavy siltation the water level in Tailbal stream has decreased to an average of about four feet.*

Pockets of land have been created by dumping soil around the periphery of the lake. These pockets are generally seen around the Ranawari and Nishat area.

As a result of the combined effect of the above, within the last few years the total area of the lake has been reduced from 24 km2 to about 10 km2. A decrease of about 14 km2. *

To counteract the declining state of the lake, by far the following measures have been taken by the University of Kashmir: (a) setting basin at Tailbal; (b) stop further encroachment. *

The long-term plan is to introduce: (a) check dams above the Tailbal area; (b) stop encroachment by constructing a pedestrian road between Tailbal and Hazaratbal using material from the bed of the lake; (c) proper disposal of wastes from house boats; (d) sewage treatment plant at Nehru Park; (e) physical removal of excess weeds from the lake; (e) Afforestation of the surrounding hills to reduce surface run-off.

(Information from interview (1994) with Syed Maqbool (Retired superintendent engineer, University of Kashmir).

The Balance of Deforestation and Reforestation

In 1991 the Karakorum ranges of Kashmir experienced 'black snowfall' for the first time in recorded history. During the same period Jammu experienced its first ever blue rainfall, acid rain. Samples of the snow were collected and studies by the authorities at the University of Kashmir. Scientific speculation has linked the "black snowfall", "blue rainfall" and other bizarre weather phenomena in Jammu and Kashmir to the oil slick that took place during the Gulf War of 1991, as these weather conditions took place following the Gulf War.

Another environmental collapse that Kashmir is undergoing is known as "forest die-back". Forest die-back is a direct resultant of acid rain (Campbell, 1993). The phenomena of "forest die-back" was thought to be predominant in the forests of Western countries, but recent evidence suggest that "forest die-back" has taken place in the Himalayan forests particularly around the Karakorum and Pirpanchal range. The valley of Kashmir lies enshrouded between these two ranges.

Meteorological models also suggested that the clouds formed in the India ocean carry the sulphur dioxide (a major component of acid rain) discharged from Indian subcontinent's cities and Industrial plants and release it in and around the cool Himalayan valleys.

Massive and unaccountable deforestation has taken place in the forests of Kashmir. According to Dr. Kawosa the director of Department of Environment, Jammu and Kashmir, the forest cover in Kashmir has gone down to 15% of the total geographical area" (Kawosa, 1996).

The least possible number of trees should be chopped down each year. To every tree that is chopped down at least 100 trees should be planted.

Deforestation 1 = Reforestation 100

On the first of every month a Reforestation Day should be allocated. On this day the ratio of Deforestation to Reforestation should be maintained.

Various educational institutes should take part on the Reforestation Day.

Kashmir's Endangered Wildlife

Some of the Endangered animals of Kashmir are as following:

1. Snow Leopard (Panthera uncia)
2. Ibex (Capra silberica)
3. Musk Deer (Moschus moschiferous)
4. Tibetan Antelope (Panthelops hodgsoni)
5. Markhore (Capra falconery)
6. Ammon (Ovis ammon hodgsoni)
7. Tibetan Lynx (Lynx lynx)
8. Tibetan Gazelle (Gazella procapra picticaudata)
9. Black Bear (Selenarctos thibetanus)
10. Brown Bear (Ursus arctos isabellinus)
11. Barking Deer (untiacus muntjak)
12. Wild Yak (Bos grunniens)

Law's on killing of Endangered Species need to be strictly implemented.

Funds should be raised for maintenance of the established National Reserves. Tourism industry can also play a major financial role for the survival of Endangered Species.

Educational trips organised jointly by educational institutes and wildlife reserves need to be introduced.

Kashmir's Environmental Awareness Programme

A documentary highlighting the use and abuse of the environment has to be compiled jointly by the:

1. Directorate of Environment
2. Department of Remote Sensing
3. Department of Forestry
4. Department of Wildlife
5. University of Kashmir
6. Srinagar Television Centre

The documentary may be called as the Kashmir's Environmental Awareness Programme.

The documentary has to be well researched providing information in the most informal manner whilst considering the cultural sensitivity of the Kashmiri people.

Srinagar Television Centre could play a central role in assisting the mentioned bodies to compile and present the documentary to the public.

The documentary could be presented as a series programme. The documentary could be classified into the following series:

1. The threat to Kashmir's lakes and rivers
2. The balance of Deforestation and Reforestation
3. Kashmir's endangered wildlife

In addition to highlighting the problems, the focus should be on how to combat the "Environmental Crisis" facing Kashmir's fragile ecosystem. Introduction and use of technological aids for recovery and disseminating information should be encouraged and complied with.

How to sustainably develop Kashmir's environment?

Sustainable development in Kashmir, given its unique environmental, cultural, and geopolitical context, involves a multifaceted approach. Here are some key strategies that can be implemented to ensure sustainable development in the region:

1. Conservation of Natural Resources

- **Forestry and Biodiversity**: Protect forests through afforestation and reforestation projects. Implement strict anti-logging laws and create conservation areas to protect biodiversity.
- **Water Resources**: Ensure sustainable management of water resources, including the conservation of lakes, rivers, and wetlands. Promote rainwater harvesting and efficient irrigation practices.

2. Sustainable Agriculture

- **Organic Farming**: Promote organic farming practices to reduce the use of harmful pesticides and fertilizers.
- **Agroforestry**: Integrate trees and shrubs into agricultural landscapes to improve soil health and biodiversity.
- **Crop Diversification**: Encourage crop diversification to reduce dependence on single crops and increase resilience against pests and climate change.

3. Renewable Energy

- **Hydropower**: Develop small-scale hydropower projects that have minimal ecological impact.
- **Solar and Wind Energy**: Invest in solar and wind energy projects to reduce reliance on non-renewable energy sources.

4. Ecotourism

- **Community-Based Tourism**: Promote ecotourism that involves local communities, ensuring they benefit economically while preserving cultural and natural heritage.
- **Sustainable Infrastructure**: Develop eco-friendly tourism infrastructure, such as green buildings and waste management systems.

5. Waste Management

- **Recycling and Composting**: Implement robust recycling and composting programs to reduce waste.
- **Education and Awareness**: Educate communities on the importance of waste segregation and recycling.

6. Climate Change Adaptation and Mitigation

- **Resilience Planning**: Develop climate resilience plans to address the impacts of climate change on agriculture, water resources, and infrastructure.
- **Carbon Sequestration**: Enhance carbon sequestration through forest conservation and soil management practices.

7. Sustainable Urban Development

- **Green Spaces**: Develop and maintain green spaces in urban areas to improve air quality and provide recreational areas.
- **Public Transport**: Promote the use of public transport and non-motorized transport options like cycling and walking.

8. Education and Capacity Building

- **Environmental Education**: Integrate environmental education into school curricula to raise awareness among the younger generation.
- **Training Programs**: Provide training and capacity-building programs for farmers, local businesses, and communities on sustainable practices.

9. Policy and Governance

- **Environmental Regulations**: Enforce stringent environmental regulations to protect natural resources and biodiversity.
- **Community Involvement**: Engage local communities in decision-making processes to ensure policies reflect their needs and knowledge.

10. Research and Innovation

- **Sustainable Technologies**: Invest in research and development of sustainable technologies and practices tailored to the region's specific needs.
- **Monitoring and Evaluation**: Establish systems for monitoring and evaluating the impact of sustainable development initiatives.

By implementing these strategies, Kashmir can move towards a sustainable development model that balances economic growth, social equity, and environmental protection.

What research evidence do we have for the environmental devastation of Kashmir?

Research evidence on the environmental devastation of Kashmir spans several areas, including deforestation, water resource depletion, pollution, and climate change impacts. Here are some key findings from various studies and reports:

1. Deforestation and Loss of Biodiversity

- **Forest Degradation**: Research indicates significant deforestation in Kashmir due to illegal logging, overgrazing, and conversion of forest land for agriculture and development. A study by the Forest Survey of India (FSI) shows a decrease in forest cover over the years.
- **Biodiversity Loss**: The loss of forest cover has led to habitat destruction and a decline in biodiversity. Species like the Hangul deer, which is endemic to Kashmir, are critically endangered due to habitat fragmentation and poaching.

2. Water Resource Depletion

- **Glacial Retreat**: Studies, such as those conducted by the University of Kashmir and other institutions, have documented the retreat of glaciers in the region due to global warming. This impacts water availability for agriculture and hydropower.
- **Wetland Degradation**: Research shows that many wetlands, including the famous Dal Lake, are shrinking due to encroachment, pollution, and siltation. The deterioration of these wetlands affects biodiversity and water quality.

3. Pollution

- **Air Pollution**: Urbanization and increased vehicular traffic have led to rising air pollution levels in cities like Srinagar. Research from the Jammu and Kashmir State Pollution Control Board indicates worsening air quality, particularly during winter.
- **Water Pollution**: Studies have documented significant pollution in water bodies due to untreated sewage, agricultural runoff, and industrial effluents. For example, a study by the Central Pollution Control Board (CPCB) highlights the poor water quality of the Jhelum River.

4. Climate Change Impacts

- **Temperature and Precipitation Changes**: Research indicates changes in temperature and precipitation patterns in Kashmir, leading to altered growing seasons and increased frequency of extreme weather events. A study published in the journal "Climatic Change" highlights these climatic shifts and their impacts on agriculture and livelihoods.
- **Flooding**: The region has experienced increased flooding events, such as the devastating floods in 2014. Research attributes this to a combination of glacial melt, deforestation, and changing precipitation patterns.

5. Soil Degradation

- **Soil Erosion**: Studies by agricultural universities in Kashmir show significant soil erosion due to deforestation, overgrazing, and improper agricultural practices. This leads to reduced agricultural productivity and increased vulnerability to landslides.
- **Soil Pollution**: The use of chemical fertilizers and pesticides has led to soil pollution, impacting soil health and crop yields.

6. Human Activities and Urbanization

- **Land Use Changes**: Research indicates rapid urbanization and land use changes in the Kashmir Valley, leading to the loss of agricultural land, deforestation, and increased pressure on natural resources. A study published in the journal "Land Use Policy" details these changes and their environmental consequences.
- **Tourism Impact**: Unregulated tourism has led to environmental degradation in popular tourist spots. Research highlights issues such as waste management problems, infrastructure development in ecologically sensitive areas, and overexploitation of resources.

7. Hydrological Changes

- **River Flow Alterations**: Studies show that hydropower projects and water diversion for irrigation have altered the natural flow of rivers, impacting aquatic ecosystems and water availability downstream. Research by the University of Kashmir's Department of Earth Sciences explores these hydrological changes and their effects.

These findings underscore the urgent need for sustainable management of natural resources and the implementation of effective conservation strategies to mitigate environmental degradation in Kashmir.

What is the current state of fresh water ecology in Kashmir?

The current state of freshwater ecology in Kashmir is concerning, with multiple challenges impacting the health and sustainability of water bodies in the region. Here are some key issues affecting freshwater ecology in Kashmir:

1. Pollution

- **Sewage and Wastewater**: Many water bodies, including the iconic Dal Lake, suffer from pollution due to the discharge of untreated sewage and wastewater. This leads to nutrient enrichment, which causes eutrophication and the proliferation of harmful algal blooms.
- **Agricultural Runoff**: The use of chemical fertilizers and pesticides in agriculture contributes to water pollution. Runoff from agricultural fields carries these chemicals into rivers and lakes, affecting water quality and aquatic life.

2. Encroachment and Habitat Loss

- **Wetland Encroachment**: Wetlands in Kashmir are being encroached upon for agriculture, construction, and other developmental activities. This leads to the loss of habitat for many aquatic and semi-aquatic species and disrupts the ecological balance.
- **Shoreline Development**: Unregulated construction along the shores of lakes and rivers has led to habitat destruction and altered water flow patterns.

3. Overexploitation of Resources

- **Water Extraction**: Excessive extraction of water for irrigation, drinking, and industrial purposes reduces the water levels in lakes and rivers, affecting the aquatic ecosystem.
- **Overfishing**: Overfishing in water bodies has led to a decline in fish populations, disrupting the aquatic food web.

4. Climate Change Impacts

- **Glacial Retreat**: The retreat of glaciers due to global warming is reducing the flow of meltwater into rivers and lakes. This affects the availability of freshwater and impacts the ecology of water bodies dependent on glacial melt.
- **Changes in Precipitation Patterns**: Altered precipitation patterns due to climate change can lead to irregular water flow, affecting the seasonal dynamics of freshwater ecosystems.

5. Invasive Species

- **Non-native Species**: The introduction of non-native species, either intentionally or accidentally, has led to competition with native species and altered the ecological balance of freshwater systems. For instance, the introduction of certain fish species has impacted native fish populations.

6. Hydrological Alterations

- **Dams and Hydropower Projects**: The construction of dams and hydropower projects has altered the natural flow of rivers, impacting aquatic habitats and migratory patterns of fish.
- **Siltation**: Increased siltation from deforestation and soil erosion has led to the sedimentation of water bodies, reducing water depth and affecting aquatic life.

7. Management and Conservation Efforts

- **Inadequate Waste Management**: Ineffective waste management practices contribute significantly to water pollution. Efforts to improve waste management infrastructure and practices are essential.
- **Conservation Initiatives**: Various government and non-governmental organizations are working on conservation initiatives to protect and restore freshwater ecosystems. These include projects aimed at cleaning and de-weeding water bodies, promoting sustainable agricultural practices, and creating awareness about water conservation.

Key Water Bodies in Kashmir

- **Dal Lake**: One of the most famous lakes in Kashmir, Dal Lake suffers from pollution, siltation, and encroachment. Efforts are being made to restore its ecological health through various conservation projects.
- **Wular Lake**: One of the largest freshwater lakes in Asia, Wular Lake faces challenges like pollution, invasive species, and reduced water flow. The Wular Lake Conservation and Management Authority (WUCMA) is working on its restoration.
- **Jhelum River**: The main river flowing through the Kashmir Valley, the Jhelum River is affected by pollution, sedimentation, and reduced flow due to water extraction and hydropower projects.

Research and Monitoring

- Continuous research and monitoring by academic institutions and environmental organizations are crucial for understanding the state of freshwater ecology in Kashmir and developing effective conservation strategies. Efforts are being made to study water quality, biodiversity, and the impacts of human activities on freshwater ecosystems.

Statistical data of Kashmir's environmental situation?

Gathering accurate and recent statistical data on Kashmir's environmental situation involves collating information from various sources, including government reports, academic studies, and environmental organizations. Here's a summary of key statistics that reflect the environmental challenges faced by the region:

1. Forest Cover

- **Forest Cover Loss**: According to the Forest Survey of India (FSI), Jammu and Kashmir had a recorded forest cover of approximately 23,812 square kilometers, accounting for about 10.14% of the region's total geographical area. However, there has been a noticeable decline in forest cover due to deforestation, illegal logging, and conversion for agriculture and urbanization.

2. Water Resources

- **Glacial Retreat**: Studies indicate that glaciers in the Kashmir region have been retreating at an average rate of 12–15 meters per year. This retreat impacts the flow of major rivers and water availability.
- **Wetland Area Reduction**: Wular Lake, one of the largest freshwater lakes in Asia, has shrunk by over 24% from 157 square kilometers in 1911 to around 119 square kilometers in recent years due to encroachment and siltation.

3. Pollution Levels

- **Water Quality**: The water quality of major lakes like Dal Lake and Wular Lake has deteriorated significantly. Dal Lake's water quality index (WQI) is frequently classified in the "poor" to "very poor" categories due to high levels of pollutants.
- **Air Quality**: Cities like Srinagar often experience poor air quality, especially during winter months. The average PM2.5 levels often exceed the World Health Organization (WHO) recommended limits of 25 $\mu g/m^3$, with winter levels sometimes reaching up to 150 $\mu g/m^3$.

4. Biodiversity

- **Endangered Species**: The Hangul deer population in Dachigam National Park has dwindled to fewer than 200 individuals, making it critically endangered.
- **Fish Species Decline**: Native fish species in the Jhelum River and Dal Lake have seen a decline due to pollution, habitat loss, and the introduction of invasive species.

5. Soil and Land Degradation

- **Soil Erosion**: The region experiences significant soil erosion, particularly in the mountainous areas. An estimated 24% of the total geographical area is affected by soil erosion, leading to reduced agricultural productivity and increased vulnerability to landslides.
- **Land Use Change**: Urbanization and land conversion for agriculture have resulted in the loss of 10-15% of arable land over the past few decades.

6. Climate Change Impacts

- **Temperature Rise**: Average temperatures in the Kashmir Valley have risen by approximately 1.2°C over the past century. This rise is more pronounced in winter months.
- **Precipitation Patterns**: There has been a noticeable change in precipitation patterns, with an increase in the frequency of extreme weather events such as heavy rains and floods.

7. Waste Management

- **Solid Waste Generation**: Srinagar generates around 450 metric tons of solid waste per day, with inadequate waste management infrastructure leading to significant environmental pollution.
- **Plastic Waste**: The region faces a growing problem of plastic pollution, with insufficient recycling facilities exacerbating the issue.

8. Hydropower and Water Flow Alterations

- **Hydropower Projects**: There are over 20 hydropower projects in the region, with a combined installed capacity of around 3,000 MW. While these projects contribute to energy production, they also alter the natural flow of rivers and impact aquatic ecosystems.

Education

Perhaps a new subject called Environmental Science needs to be devised and implemented into the mainstream course curriculum of schools, colleges and universities.

Seminars, debates and symposiums within schools, colleges and universities need to be organised and encouraged.

The Kashmir's Environmental Awareness Programmes can be shown at various educational institutes.

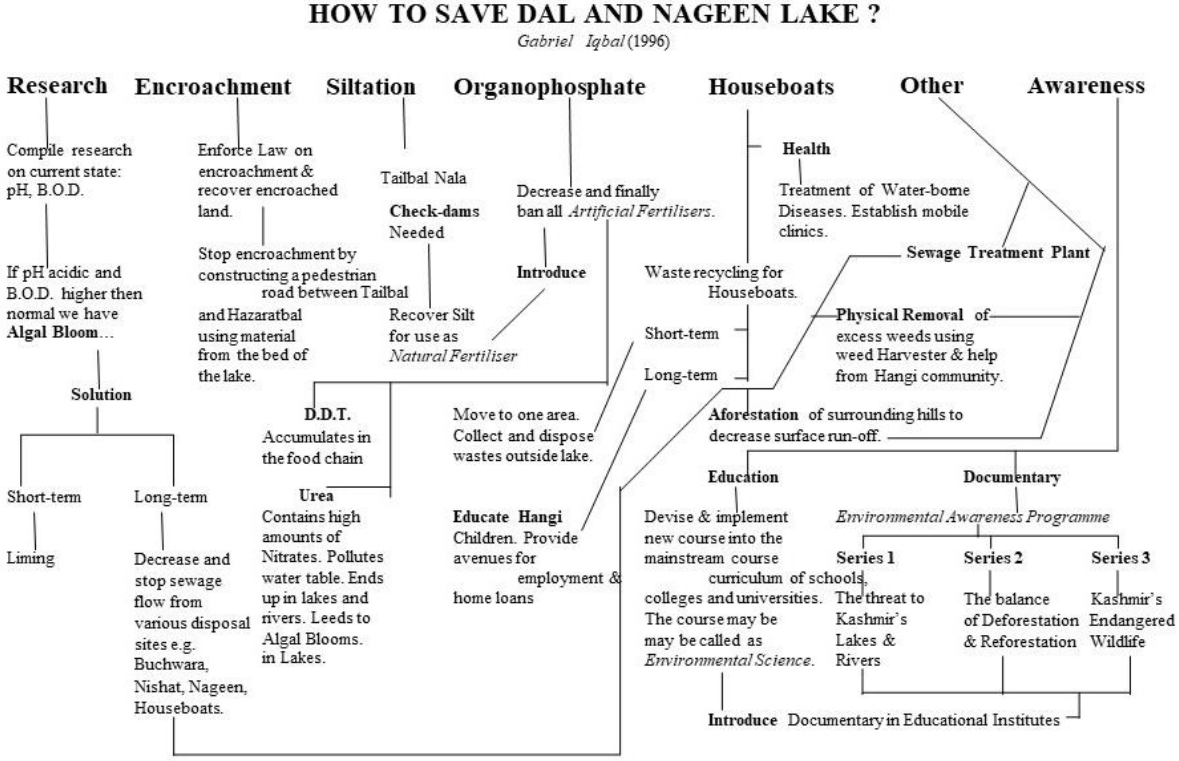
For additional details please refer to Model on How to save Dal and Nageen Lake?

Conclusion

These statistics highlight the critical environmental challenges faced by Kashmir, including deforestation, water pollution, habitat loss, and climate change impacts. Addressing these issues requires a coordinated effort involving sustainable practices, effective policies, and active community participation.

In conclusion, while Kashmir's freshwater ecology faces significant challenges, ongoing conservation efforts and increased awareness can help mitigate these issues and promote the sustainable management of water resources in the region.

Model on How to save Dal and Nageen Lake?



References

Campbell, N. A. (1993). Biology. Third edition. Chap. 3. p. 50. Benjamin/Cummings publication company, Readwood city, California.

Central Pollution Control Board (CPCB)

Directorate of Environment (May, 1996). Green Scan. Monthly Newsletter on the Environment. Directorate of Environment and Remote Sensing, Government of Jammu and Kashmir State.

Forest Survey of India (FSI)

Jammu and Kashmir State Pollution Control Board

Kawoosa, M. A. Dr. (May, 1996). Glimpses of the Wildlife of Kashmir. Green Scan, Monthly Newsletter on the Environment. Directorate of Environment and Remote Sensing, Government of Jammu and Kashmir State.

Kundanger, M. R. D. Dr.(May, 1996). Water Pollution in J & K State. Green Scan, Monthly Newsletter on the Environment. Directorate of Environment and Remote Sensing, Government of Jammu and Kashmir State.

Lawrence, R. Walter (1967). The Valley of Kashmir. Kesar publishers, Residency Road Srinagar, Kashmir.

Miller, G. T. JR. (1995). Environmental Science, Working with the earth. Fifth edition. Chapter 11. p. 284. Wadsworth Publishing Company, Belmount, California.

University of Kashmir

Wular Lake Conservation and Management Authority (WUCMA)