Strategic Approach for effectively managing floods in Kashmir Valley: A realistic perspective

Presented By

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Organisation of Presentation

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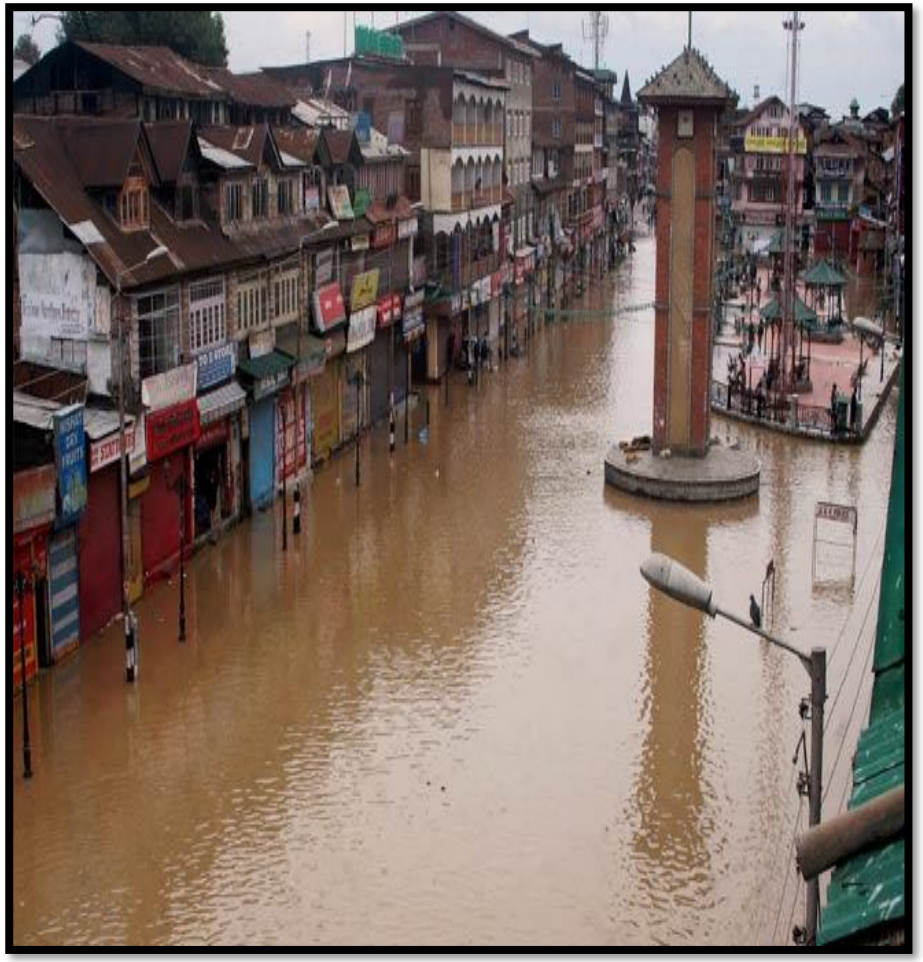
Introduction

1. Numerous studies and projects have been undertaken to gain a better understanding of the severe flooding that occurred in Kashmir Valley in September 2014 and the subsequent consequences.
2. In light of the devastation caused by these floods, there has been increased focus on mitigation efforts in the area.
3. The paper identifies problems right from South to North Kashmir and proposes mitigation measures that are relevant to each region.



Srinagar Lal Chowk Source: I&FC Kashmir

Topography of Kashmir Valley

1. Mountains surrounding on all sides.
2. Relatively flatter portion in the middle of mountains.
3. Only one exit route.
4. One drainage path (Jhelum), flowing from South to North Kashmir (Length = 225 km)

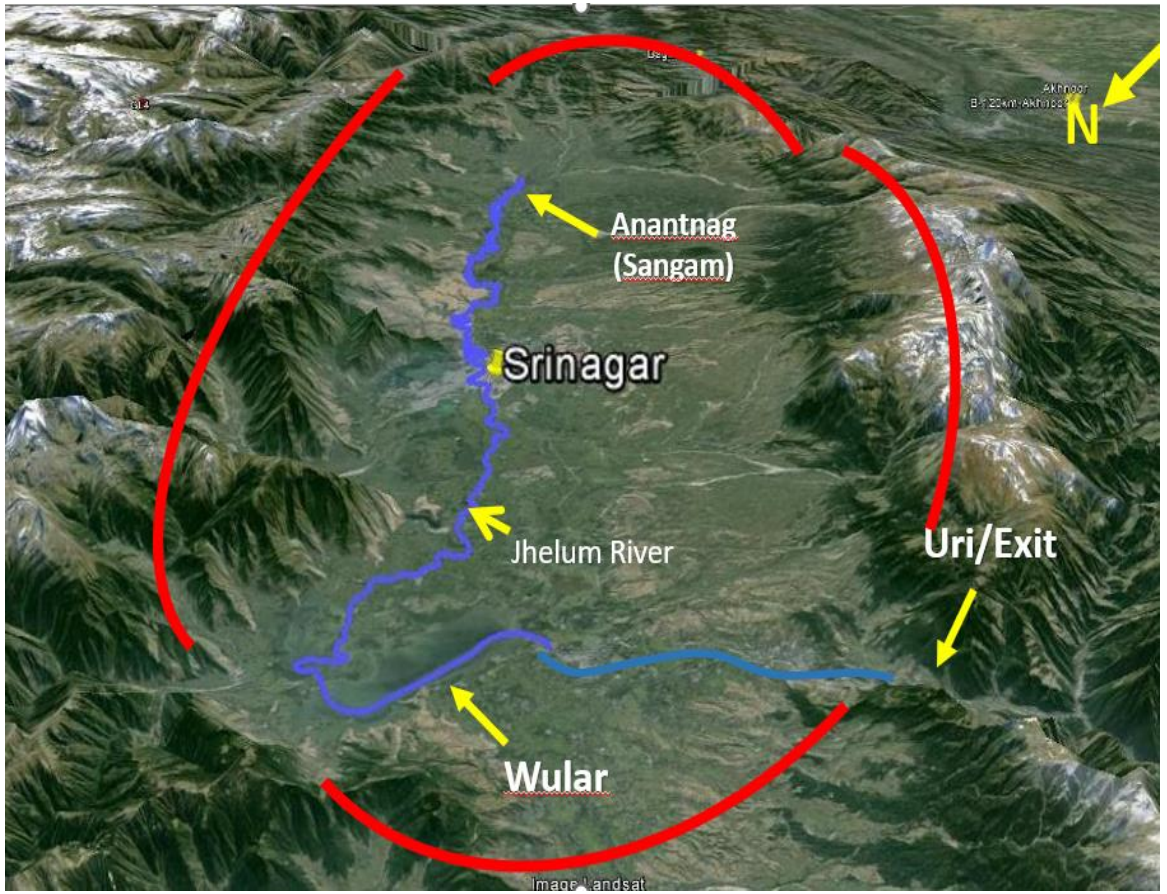
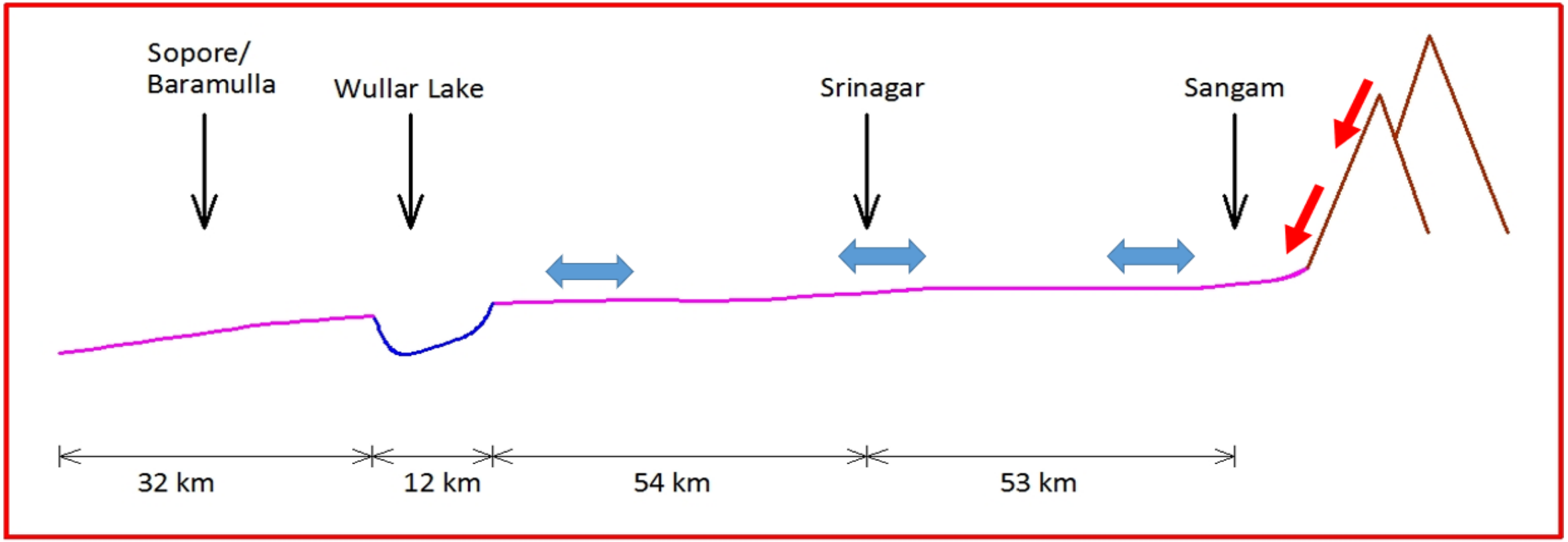


Fig 1 Source : I&FC Department Kashmir

Depiction of mild slope (L-section of Kashmir Valley)



Very mild grade (slope) of about 1 in 10000 gradient

(after every 10 kilometres there is 1 meter drop in elevation).

Flood Dynamics of Kashmir Valley

1. The Valley has a long history of floods.
2. Valley is situated in a region prone to natural calamities.
3. Noteworthy flooding years: 1893, 1902, 1905, 1909, 1928, 1948, 1959 and more.
4. Floods of 1903 and 1959 were exceptionally severe.
5. Historic deluge of 2014 broke all previous records.
6. Flood of 2014 is considered the most catastrophic event in Kashmir's history.
7. The region's vulnerability to floods underscores the need for holistic and integrated approach.
8. Ongoing efforts aim to address and mitigate the impacts of floods.

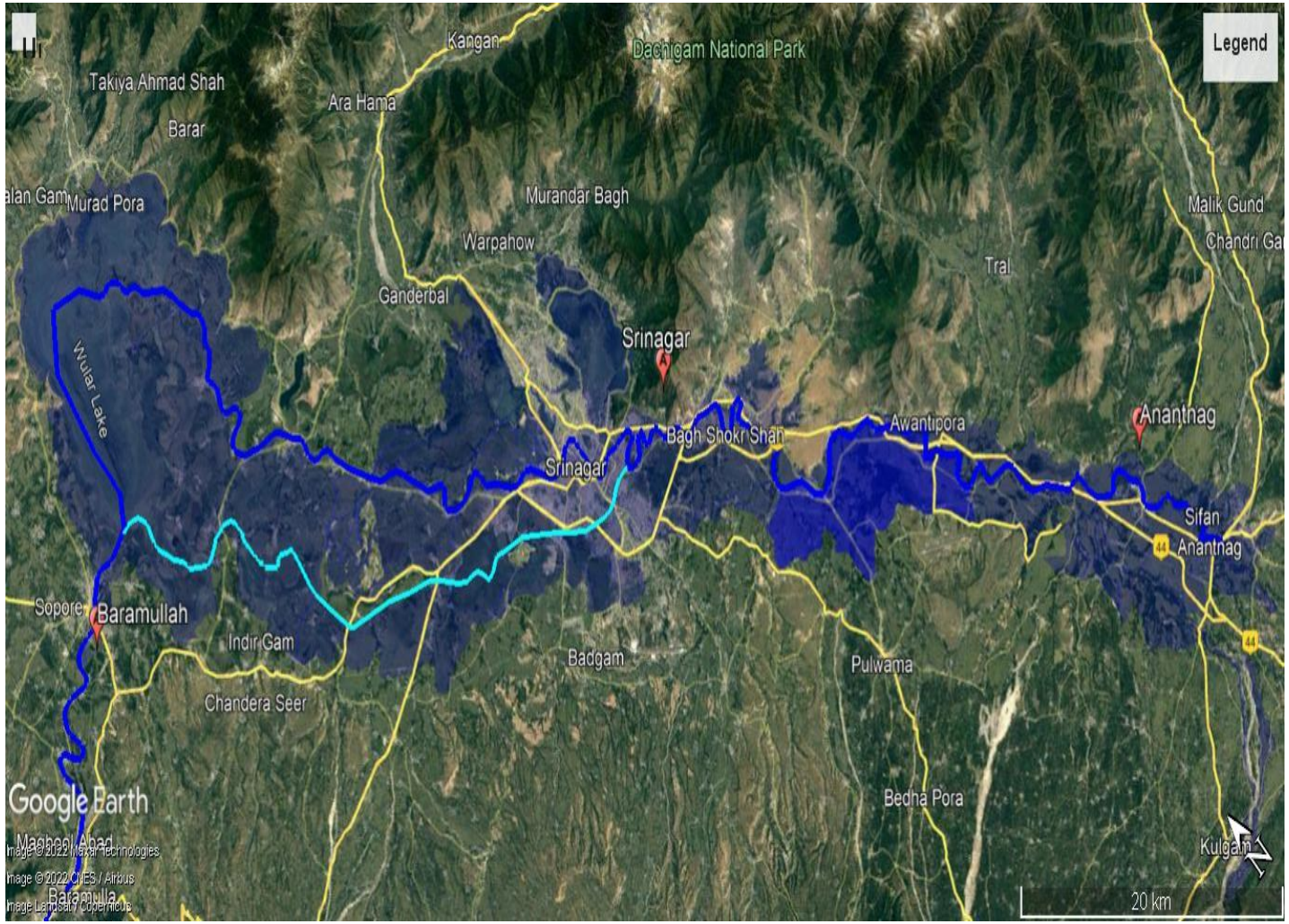


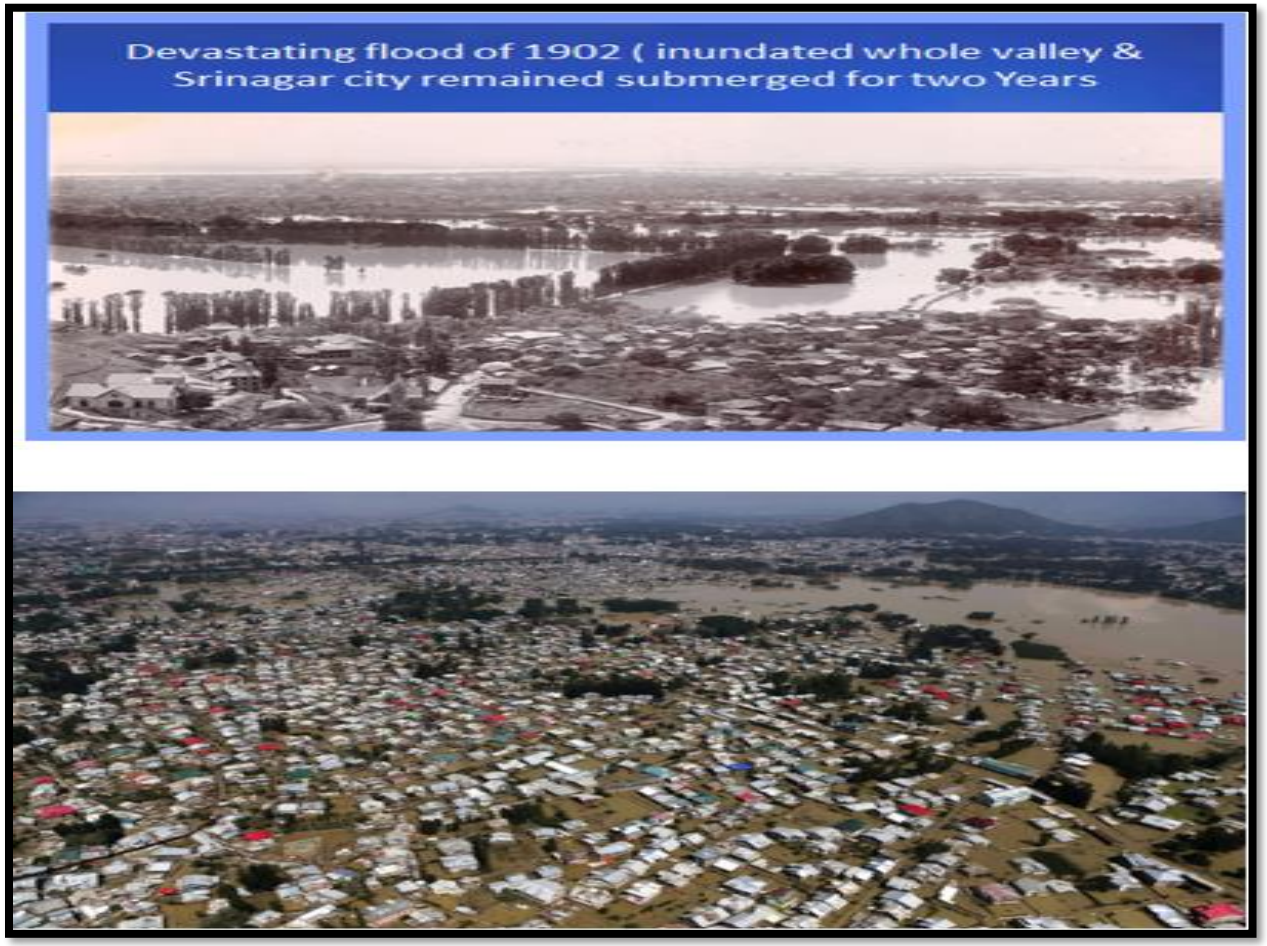
Fig.2 Flood inundation map of Kashmir Valley during September 2014 floods: Source (I&FC Department Kashmir).

- From the integrated satellite analysis of flood layers, it has been observed that about 557 km^2, which constitutes about 3.5% of the Kashmir Valley's geographical area, was inundated due to flooding.

Table-1: Table showing extent of inundation from 08-25 September, 2014

S.NO	District	Area (km^2)
1.	Anantnag	43
2.	Bandipora	148
3.	Baramulla	89
4.	Budgam	54
5.	Ganderbal	6
6.	Kulgam	15
7.	Pulwama	102
8.	Srinagar	100

Source : A Satellite based Rapid assessment of Floods in Jammu and Kashmir- September 2014 by DEERS



Source : I&FC KASHMIR

Highest gauges recorded at Gauge and Discharge Monitoring stations

Site	Highest gauge ever recorded (in feet)	Year
Sangam	34.70	2014
	32.60	1992
Ram Munshibagh	29.50	2014
	22.60	1995
Asham	19.35	1996

Srinagar

Objectives

1. Identify the severity of the flooding that occurred in Kashmir Valley in September 2014 and its impact on the region.
2. Propose practical, effective, and result-oriented mitigation measures considering the region's unique topography and the significant discharge of 115000 cusecs recorded during the 2014 floods.
3. Emphasize the importance of a multifaceted strategy that incorporates scientific reasoning, robust planning, and interdisciplinary collaboration with experts in data analysis, geospatial mapping, and AI to mitigate the floods in the Valley.

Proposed strategic approaches to mitigate the effects of floods in Kashmir Valley.

1. Reservoir Development in Upper Jhelum Sub-Basins
2. Determination of limits of flood basins
3. Dredging at Out Fall Channel of River Jhelum from Ningli sopore to Kadanyar Baramulla.
4. Construction of Dogri-pora Wullar Flood Spill Channel (FSC) for enhancing overall flood resilience
5. Interconnecting lakes for prevention of Urban Flooding in Srinagar City and revival thereof.

1. Strategic Reservoir Development in Upper Jhelum Sub-Basins

1. Flood Mitigation Focus

- Intercepting excessive flood discharge in upper subbasins of River Jhelum

2. Construction Locations:

- Lidder, Vishow, and Rambiara sub-basins in South Kashmir

3. Methodology Components:

- Constructing storage reservoirs/dams

4. Optimization Approach :

- Utilizing data and mathematical analyses

5. Protection Context:

- Against flood discharge, as recorded in September 2014

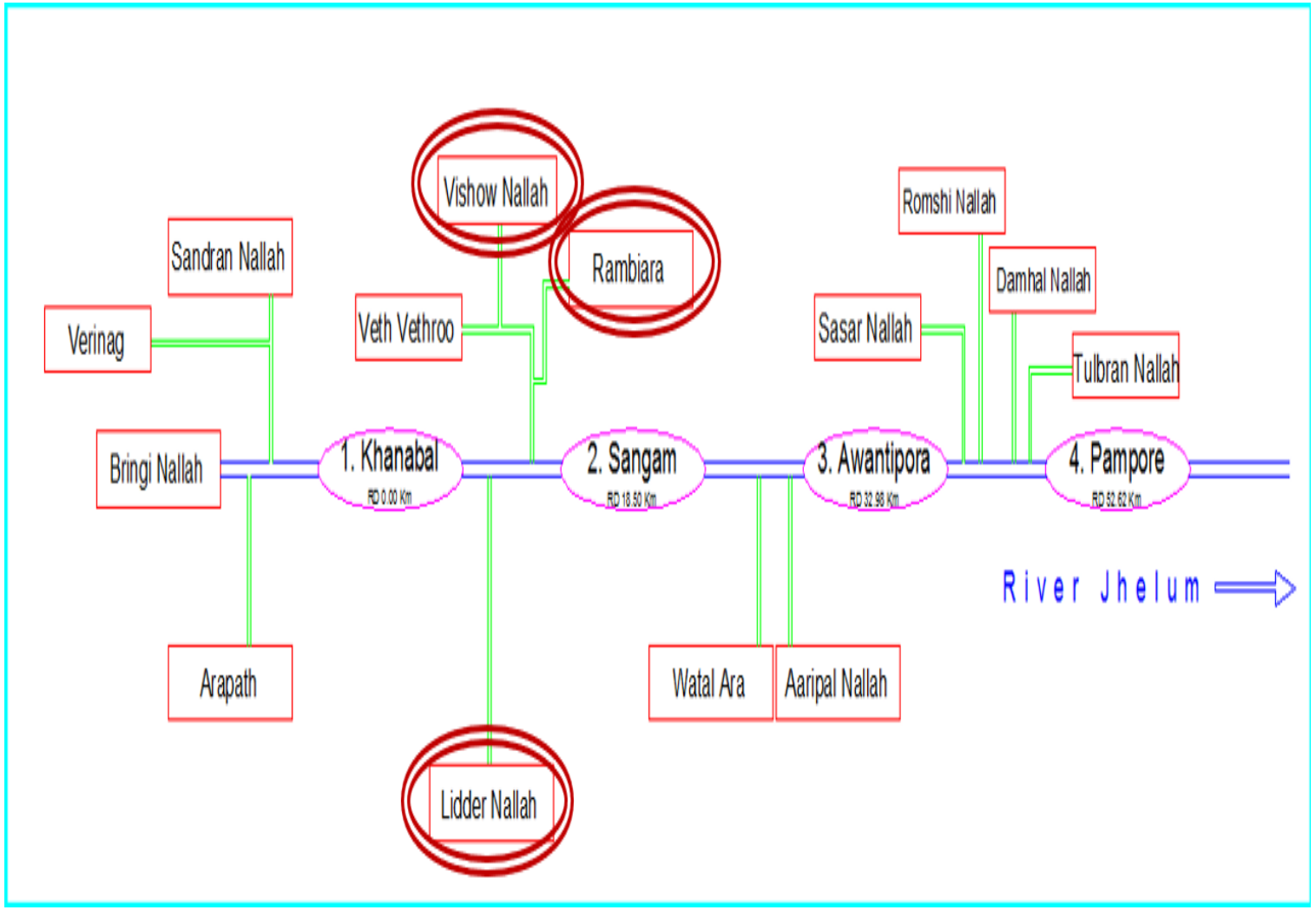


Fig.3 Various tributaries of river Jhelum from South and Central Kashmir Source: (I&FC Kashmir)

Evaluation of the proposed reservoirs/dams in Raimbaira Subbasin of River Jhelum

- Safe discharge carrying capacity of Jhelum = 1000 cumecs (35000 cusecs)
- Discharge observed in 2014 September = 3000 cumecs
- Difference between the two = 2000 cumecs
- Raimbiara sub basin accounts for about 20 % of the overall catchment area of Jhelum at Sangam. In terms of flood discharge, it means that we need to provide a storage of 400 cumecs (= 20 % of 2000 = 400 cumecs)
- Period considered to be reasonable to address a flood peak = 12 hours

Since,

Discharge = 400 m^3/s

- **Volume = 400 m^3/s ×12 hours**
- **Volume = 400 m^3/s ×12 ×60×60 s**
- **Volume = 17280000 m^3**
- **Volume = 17.28 Mm^3**

Results of the proposed flood mitigation method

1. Storage Potential

- 20-meter-high dams based on the topography of tributary.
- Estimated at 42 lakh cubic meters

2. Required Storage:

- 17.28 Mm3

3. Number of Dams/reservoirs

- Four dams needed

4. Approach:

- Rational and results-oriented

5. Problem Addressed:

- Sub-basin level

6. Benefited Areas:

- Khanabal
- Srinagar
- Sumbal

Additionally, this method appears to be practical, cost-effective, and can be completed within a specified time frame, unlike other measures which may require significant government funding and take decades to implement

Fig. 4 Source : *A Satellite based Rapid assessment of Floods in Jammu and Kashmir- September 2014 by DEERS*

Notification of flood basins in accordance with the J&K Water Resources (Regulation & Management) Act, 2010

The traditional method of diverting flood discharge into designated flood plains has been proven effective in reducing the impact of floods.

1. Traditional Method:

- Diverting flood discharge into designated flood plains.

2. Effectiveness:

- Proven effective in reducing flood impact.

3. Mechanism:

- Allowing excess water to spread unrestricted in flood plains.

4. Outcome:

- Subsiding water levels in River Jhelum.

Procedure for notification of flood basins

PREPARATORY STAGE

1.Legal Authority:
- Jammu and Kashmir Water Resources Act, 2010, Section 76.

2.Department in Action:
- Irrigation and Flood Control Department, Kashmir

3.Exercise Conducted:
- Based on sub-sections (1), (2), and (3) of Section 76

1. Reference Year:
- Flood discharge of the year 2014

2. Purpose:
- Setting maximum limits for flood flow

3. Scope :
- Both left and right banks of the river

1.Objective:
- Minimizing loss during floods

2.Areas of Concern:
- Life, livestock, agriculture, and property

APPROVAL STAGE

By virtue of section 75 of the Jammu & Kashmir Water Resources (Regulation & Management) Act, 2010,the Jammu and Kashmir Water Resources Regulatory Authority after seeking public opinion and satisfying itself with the proposal of the Irrigation and Flood Control Department, shall forward the same to the Government in the form of the recommendations for notification of such areas.

Various waterbodies/flood plains which could be considered for notification

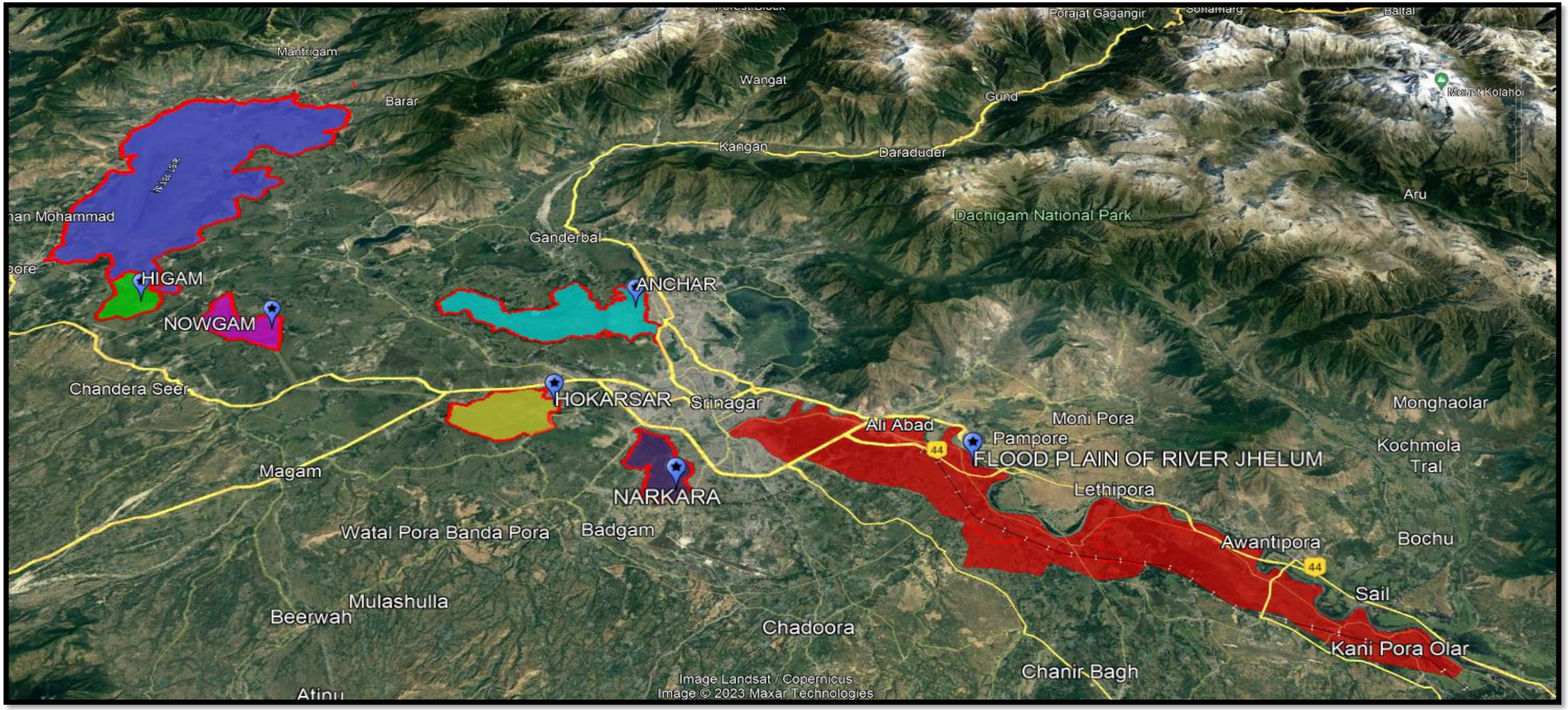


Fig. 5 Waterbodies and floodplains in the vicinity of River Jhelum

Dredging at Out Fall Channel (OFC) of River Jhelum from Nigli Sopore to Khadyar Baramulla

1. Limitations of Dredging:

- Not a long-term solution for flood mitigation
- Unsuitable for flood mitigation in upper Jhelum regions, including Srinagar City

2. Gradient of river Jhelum and Siltation:

- Flat gradient (1 in 10000 to 1 in 12000) from Khanabal to Wullar Lake
- Prone to siltation.
- Siltation exacerbated by persistent precipitation.

3. Wullar Lake Drainage :

- Slow drainability of Wullar Lake.
- Backwater flows.
- Damage in downstream areas (Hajin and Sumbal, North Kashmir)

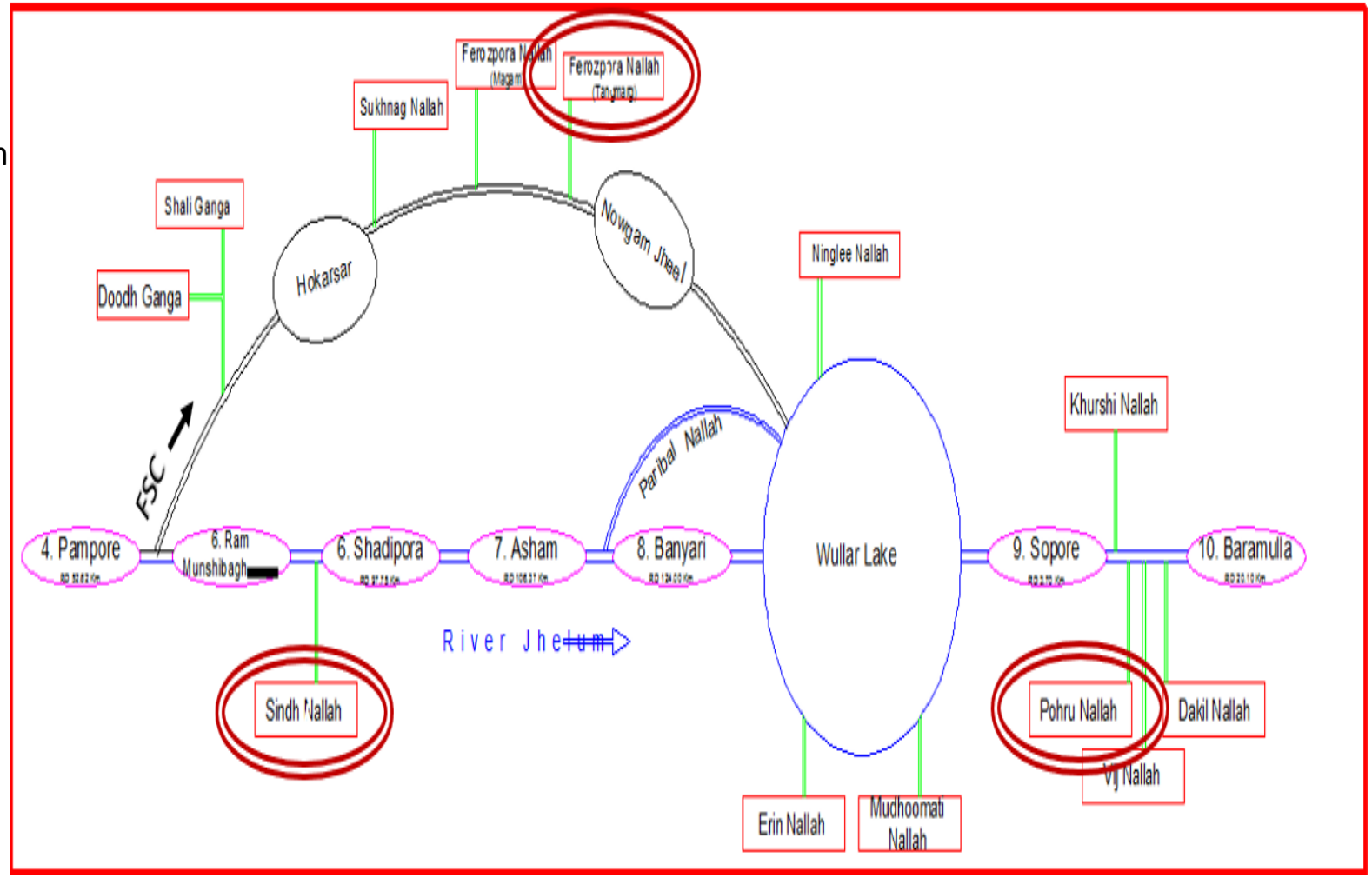


Fig.6 Various tributaries of river Jhelum from central and North Kashmir

Mitigating Flood Risks by way of dredging

1. Issue to be addressed :

- Reduced discharge carrying capacity of Jhelum OFC (Outfall Channel)

2. Location of concern :

- Sopore to Khadanyar-Barmulla

3. Cause of problem:

- Siltation from Pohru Nallah

4. Recommended solution:

- Mechanical dredging of the Jhelum OFC

The success of this approach can be attributed to the dredging conducted in 2011, which was undertaken after a gap of two decades and subsequently was one of the reasons why Sopore and Baramulla were saved from major impacts of the 2014 floods.

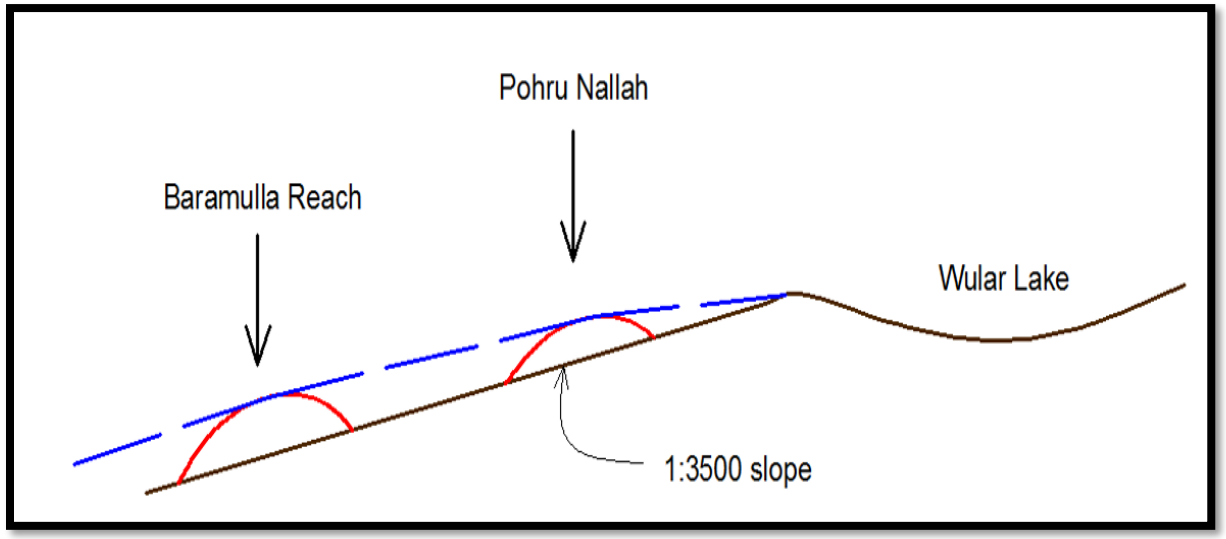


Fig.7 L-Section of North Kashmir (Improvement in bed slope)

Jhelum Out Fall Channel Silted up due to Pohru Nallah.

Construction of Dogri-pora Wullar Flood Spill Channel (FSC) for enhancing overall flood resilience

Proposal Summary:

- **Construction of additional flood spill channel**

Geographical Span:

- **From Dogripora in South Kashmir to Wullar Lake at Bandipora.**

Objective:

- **Alleviate devastating consequences of flooding**

Calculations:

- Total discharge carrying capacity including River Jhelum and existing channels
- River Jhelum + Existing flood spill channel: 50,000 cusecs
- Design discharge carrying capacity of new channel (Dogripora-Wullar): 35,000 cusecs
- Cumulative discharge carrying capacity of all channels: 85,000 cusecs
- Flood discharge recorded in September 2014: 115,000 cusecs
- Highlights a shortfall of 30,000 cusecs

Dual Construction Approach:

- Proposes construction of both new flood spill channel (Dogripora-Wullar) and storage reservoirs on River Jhelum sub-basins

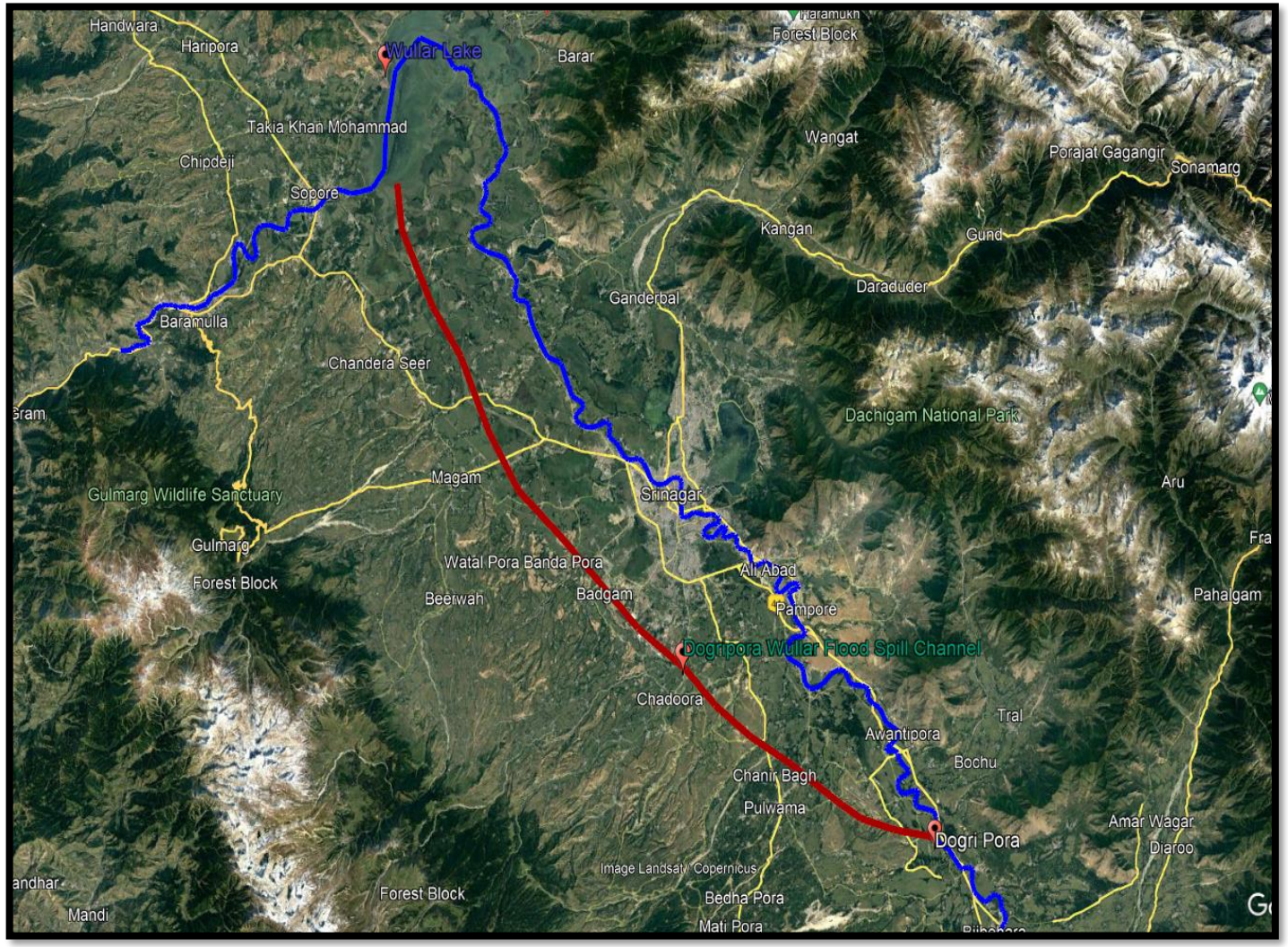


Fig. 8 Proposed Dogripora Wullar Flood Spill channel.

Interconnecting Lakes for Prevention of Urban Flooding in Srinagar city and revival thereof

1. **Flood Diversion System**:
- Interconnected waterways and canals.
- Plan to allow gradual floodwater entry

2. **Encroachment Impact:**
- Reduction in water bodies carrying capacity.

3. Decline in Valley Wetlands :
- Research by J&K Remote Sensing Centre reveals Loss of nearly 50% of wetlands over a period of 100 years.

4. Historical Perspective:
- Proactive flood management in urban planning
- Past rulers foreknowledge for defending against floods

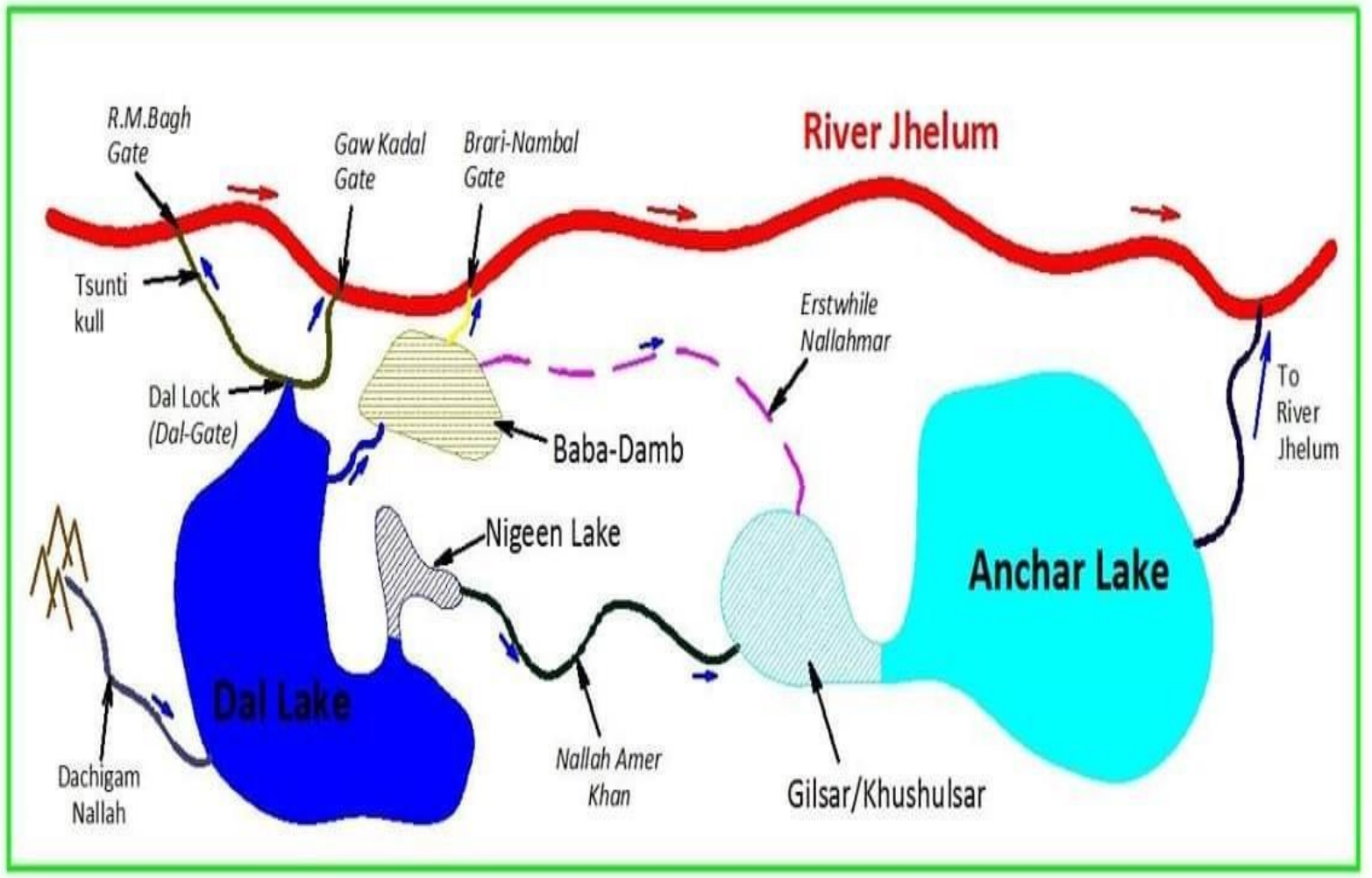


Fig. 9 Interconnected water bodies of Srinagar city: Source (I&FC Department, Kashmir)

Steps to be taken for revival of old waterways

➢ **Preventing Encroachment:**

- Anti-encroachment drives crucial
- Severe consequences for illegal encroachers

➢ **Collaborative Efforts:**

- Technocrats and authorities collaboration
- Rebuilding and reviving water bodies.

➢ **Inspiring Success Stories:**

- National Institute of Hydrology's achievement
- Revival in Uttarakhand's Ibrahimpur Village

➢ **Hopeful Outlook:**

- Demonstrates possibilities
- Restoration to original pristine state

Stakeholders in Flood Mitigation Eco-system

Conclusion

The proposed measures aim to significantly improve flood resilience if implemented effectively.

By collaborating with policymakers, urban planners, and environmental agencies, stakeholders can ensure the safety and resilience of communities, infrastructure, and the environment.

Further Research Scope

The emphasis need to be laid on environmental and socio-economic impacts, advanced modeling techniques, adaptability to extreme events, and real-time data integration so as to guide further research and development, ensuring that the proposed remedial measures are effective, sustainable, and adaptable to changing conditions.

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