WATER RISK ASSESSMENT REPORT

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ACKNOWLEDGMENT

Manjushree Technopack Limited acknowledges the efforts and contributions of its internal teams who supported the successful completion of this Water Risk Assessment study. We extend our sincere appreciation to the plant EHS, engineering, and operations teams across all locations for providing the necessary data, insights, and operational inputs.

The leadership team's guidance and commitment to sustainable water management have been instrumental in driving this initiative. This assessment reflects MTL's proactive approach toward responsible water stewardship, regulatory compliance, and long-term sustainability.

Executive Summary:

Manjushree Technopack Limited (MTL) has undertaken a comprehensive Water Risk Assessment to evaluate water-related risks across its operational footprint in India. The objective of this assessment is to ensure sustainable water use, strengthen operational resilience, and proactively manage future water-related challenges.

The assessment covers all **23 MTL manufacturing locations** and evaluates risks under three key dimensions:

1. **Physical Water Risks** – including water scarcity, groundwater depletion, water quality issues, climate variability, floods, and drought risks.
2. **Regulatory Water Risks** – including compliance with applicable water regulations, evolving policy requirements, and licensing conditions.
3. **Reputational Water Risks** – including stakeholder expectations, community dependence on shared water resources, and ESG-related considerations.

Globally recognized tools and publicly available datasets such as **Aqueduct Global Water Risk Mapping**, **WWF Water Risk Filter**, and **Central Ground Water Authority (CGWA) databases** were used to assess baseline and future water risk scenarios.

The assessment indicates that most MTL locations fall under **moderate to high water-risk categories**, with risks expected to increase toward 2030 if proactive mitigation measures are not implemented. Based on the findings, plant-specific and company-wide recommendations have been identified, including water efficiency improvements, recycling and reuse initiatives, rainwater harvesting, compliance strengthening, and community engagement programs.

This Water Risk Assessment supports MTL's sustainability goals and provides a structured framework to guide strategic decision-making, regulatory preparedness, and long-term water stewardship.

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INTRODUCTION

Water is a critical resource for Manjushree Technopack Limited (MTL) and plays an essential role in manufacturing operations, particularly in cooling systems, utilities, and domestic usage within plant premises. With increasing pressures from water scarcity, groundwater depletion, climate variability, and regulatory oversight, MTL recognizes the importance of adopting a structured and proactive approach to water management.

In recent years, factors such as changing rainfall patterns, frequent droughts, flooding events, and rising industrial and community demand have intensified water-related risks across many regions in India. Additionally, regulatory authorities are strengthening compliance requirements related to water withdrawal, wastewater discharge, and groundwater usage. Stakeholders, including customers, investors, and local communities, also increasingly expect responsible and transparent water stewardship from organizations.

In response to these challenges, Manjushree Technopack Limited has internally conducted a comprehensive Water Risk Assessment covering all its manufacturing locations in India. The assessment aims to identify potential water-related risks, evaluate current vulnerabilities, and define strategic actions to ensure sustainable water use across operations.

The study evaluates water risks under three key dimensions:

- **Physical Water Risks** – availability, scarcity, quality, climate impacts, and infrastructure dependency
- **Regulatory Water Risks** – compliance obligations, licensing requirements, and evolving water policies
- **Reputational Water Risks** – stakeholder expectations, community dependence on shared water resources, and ESG considerations

This Water Risk Assessment forms a key part of MTL's sustainability framework and supports informed decision-making, regulatory preparedness, and long-term operational resilience.

THE IMPORTANCE OF WATER RISK ASSESSMENT FOR BUSINESSES AND STAKE HOLDERS

In the modern business environment, water is not merely a natural resource but a critical component of industrial processes, supply chains, and the overall sustainability of operations. As climate change intensifies and global water stress increases, water risk assessment has become an indispensable part of strategic planning for companies. This process helps identify, evaluate, and mitigate risks associated with water availability, quality, and regulatory compliance. Conducting a water risk assessment delivers tangible benefits for business operations, stakeholders, and long-term growth.

Business Benefits

1. Operational Resilience: Water is a vital resource for industrial operations, whether used for manufacturing processes, cooling systems, or sanitation. By conducting a thorough water risk assessment, companies can identify potential vulnerabilities in their water supply chain and establish contingency plans to mitigate disruptions. This ensures uninterrupted production, even during periods of water scarcity or regulatory changes.

2. Cost Management: Inefficient water usage can lead to significant operational costs, including higher utility bills, penalties for non-compliance, and unplanned expenses during water shortages. Water risk assessments help identify areas of inefficiency and recommend sustainable practices like water recycling and rainwater harvesting. These measures not only reduce costs but also enhance long-term profitability

3. Regulatory Compliance: Governments and local authorities are increasingly enacting stringent water usage regulations to address over-extraction and pollution. A comprehensive water risk assessment ensures businesses stay ahead of regulatory requirements, minimizing the risk of fines, legal disputes, or shutdowns due to non-compliance.

4. Market Competitiveness: Companies that proactively address water risks are better positioned to meet the growing demand for environmentally responsible products. This enhances their reputation and allows them to capture market share in industries where sustainability is a key differentiator.

Broader Business Implications

1. Sustainability Goals: Water risk assessments are fundamental to achieving corporate sustainability targets, such as reducing water usage, minimizing environmental impact, and contributing to global water conservation efforts. Aligning these goals with international frameworks like the Sustainable Development Goals (SDGs) reinforces the company's leadership in sustainability.
2. Risk Mitigation: Ignoring water risks can have catastrophic consequences, including operational downtime, reputational damage, and loss of market share. By identifying potential threats in advance, businesses can take proactive measures to mitigate these risks, ensuring resilience and stability.
3. Innovation and Technology: The insights gained from water risk assessments often drive innovation. Companies can invest in advanced water management technologies, such as IoT-enabled sensors and AI-driven analytics, to optimize water usage and reduce waste. These innovations not only improve efficiency but also position the company as an industry leader.
4. Long-term Value Creation: Effective water risk management ensures that businesses remain viable in the face of changing environmental conditions. This approach helps secure long-term value for shareholders, employees, and communities by safeguarding the natural resources essential for sustainable growth.

Conclusion

Water risk assessment is not just an environmental responsibility but a strategic imperative for businesses. It enables companies to build operational resilience, manage costs, comply with regulations, and maintain a competitive edge. For stakeholders, it enhances trust, promotes transparency, and fosters collaboration. As the global water crisis continues to escalate, companies that prioritize water risk assessments will be better equipped to navigate challenges, seize opportunities, and drive sustainable growth.

OBJECTIVE AND SCOPE

Objective

The primary objective of this Water Risk Assessment is to ensure that Manjushree Technopack Limited adopts sustainable, efficient, and compliant water management practices across all its operations. The specific objectives of the study are to:

- Identify and evaluate physical, regulatory, and reputational water-related risks across MTL's manufacturing locations
- Ensure alignment with applicable local, state, and national water regulations
- Strengthen resilience against water scarcity, climate variability, and future water availability challenges
- Support strategic planning and decision-making related to water conservation, reuse, and efficiency initiatives
- Reinforce MTL's commitment to responsible water stewardship and sustainability goals

Scope

The water risk assessment project encompasses all 23 of MTL's operational facilities located across India, ensuring a holistic approach to managing water resources. The scope of the assessment includes:

1. Physical Water Risks:
    - Evaluate water availability, scarcity, and stress levels in each location.
    - Assess water quality issues, including risks from pollution and contamination.
    - Analyse the impacts of climate change, such as floods, droughts, and shifting precipitation patterns.
    - Examine infrastructure dependencies, including aging systems and supply capacity.
2. Regulatory Water Risks:
    - Assess compliance with water withdrawal limits, wastewater discharge standards, and effluent treatment requirements.
    - Examine risks associated with obtaining and maintaining water-related permits and licenses.
    - Identify potential policy changes that could impact water usage, quality standards, or conservation mandates.
    - Evaluate the financial implications of non-compliance, such as fines and penalties.
3. Reputational Water Risks:
    - Analyse public perception and the potential impact of water mismanagement on MTL's brand.
    - Assess relationships with local communities, focusing on water sharing, outreach, and sustainable practices.
    - Identify risks to investor confidence stemming from water-related ESG concerns.
    - Examine potential NGO activism and campaigns targeting water practices, and evaluate MTL's ability to address these proactively

Geographic Coverage

The water risk assessment project covers all 23 operational facilities of MTL across India. The table below provides a detailed breakdown of the plant locations:

State/UT	Location	Number of Plants
Punjab	Amritsar (Unit 1 & 2)	2
Himachal Pradesh	Baddi (Unit 1, 2 & 3)	3
Haryana	Manesar	1
Uttar Pradesh	Kanpur	1
Uttarakhand	Pantnagar (Unit 1 & 2)	2
Assam	Guwahati	1
Andhra Pradesh	Visakhapatnam (Unit 1 & 2)	2
	Nandyala	1
Maharashtra	Jalgaon (Unit 1 & 2)	2
Karnataka	Bommasandra	1
	Bidadi (Preform & Recycling)	2
	Chamarajanagar	1
Dadra and Nagar Haveli	Silvassa	1
Goa	Goa	1
Odisha	Khordha	1
Chhattisgarh	Durg	1

By addressing these dimensions and covering all operational facilities, the project ensures a robust and actionable framework for mitigating water-related risks and strengthening MTL's sustainability initiatives.

Mapping of Plant Locations for Water Risk Assessment

As part of this internal assessment, Manjushree Technopack Limited mapped all manufacturing plant locations using geographic coordinates to establish a consistent spatial framework for water risk evaluation.

The plant-wise geographic mapping supports:

- Identification of plant proximity to major river basins and groundwater systems
- Assessment of regional water stress and climate exposure
- Alignment of plant-specific mitigation measures with local water conditions

The geographic coordinates and basin-level mapping enable MTL to integrate global water risk tools and national groundwater databases consistently across all locations, supporting accurate comparison and prioritization of risks.

This location-based approach allows MTL to develop targeted, site-specific water management and risk mitigation strategies rather than adopting a one-size-fits-all approach.

Details of Geographic Mapping

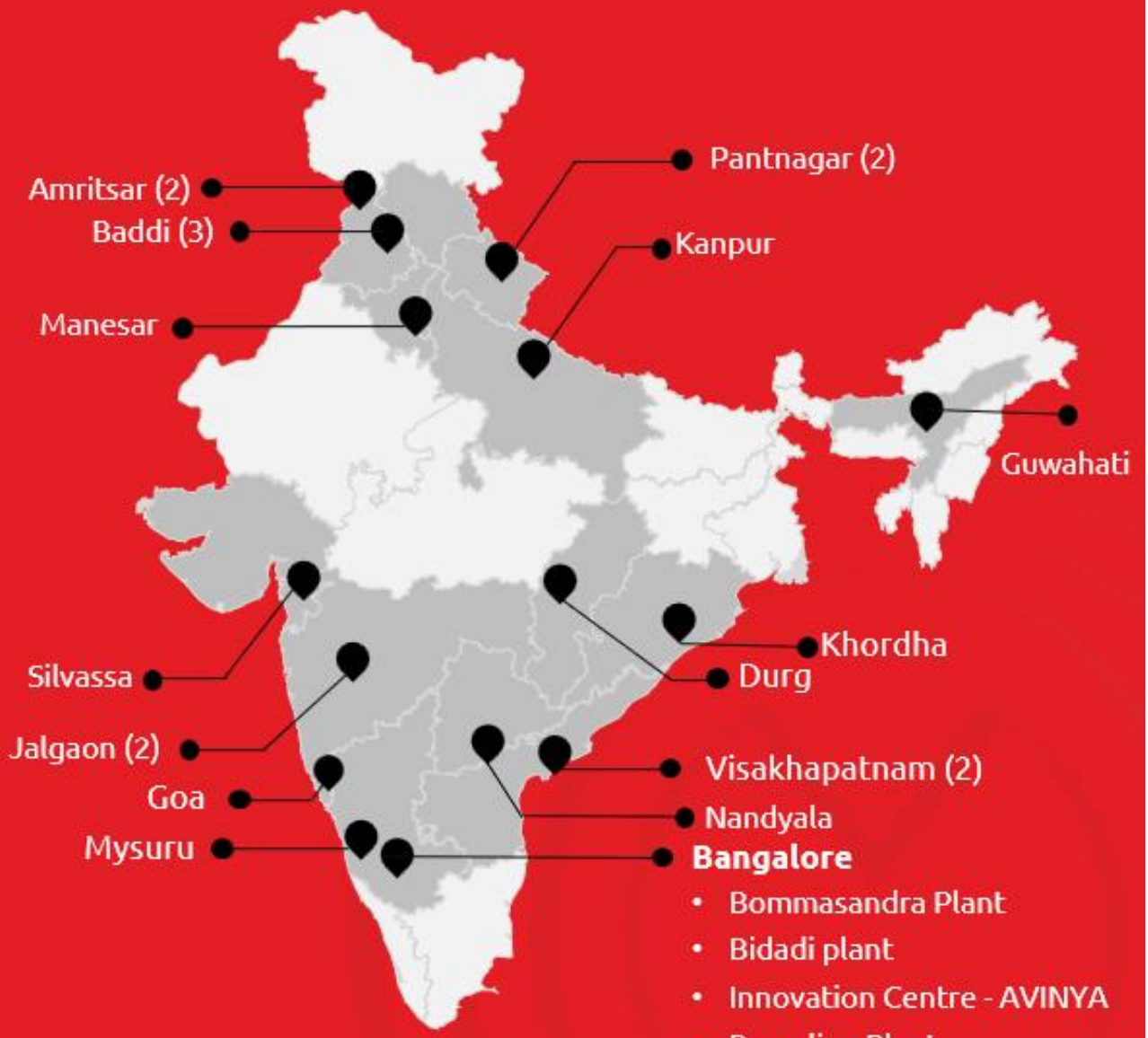
The following table lists the precise latitude and longitude coordinates for each plant, providing an accurate spatial reference for MTL's operational footprint:

PLANT NAME	LATITUDE	LONGITUDE	LOCATION DESCRIPTION
Amritsar 1	31.703447	74.921938	Located in Punjab, serving as a key production hub for Northern India.
Amritsar 2	31.353816	75.143654	Second facility in Amritsar, complementing the operations of Amritsar 1.
Baddi 1	30.933935	76.804782	Situated in Himachal Pradesh, central to industrial operations in the northern region.
Baddi 2	30.929726	76.834517	Adjacent to Baddi 1, enhancing the region's production capacity.
Baddi 3	30.938966	76.783298	Third facility in Baddi, reinforcing MTL's strategic presence in the area
Bidadi	12.789805	77.429022	Strategically located near Bengaluru, Karnataka, a major industrial hub.
Bidadi (Recycling)	12.787933	77.429469	Dedicated to recycling, supporting MTL's sustainability initiatives

Bommasandra	12.813117	77.683497	An industrial area in Bengaluru, Karnataka, focusing on diverse manufacturing needs.
Chamarajanagar	11.988146	76.883056	A newly established facility in Karnataka, supporting regional production requirements
Durg	21.250818	81.191206	Located in Chhattisgarh, serving the central region's industrial demands
Guwahati	26.235105	91.684691	Key facility in Assam, catering to the northeastern markets.
Goa	15.476687	73.971358	Located in Goa, focusing on regional and export production needs
Kanpur	26.354233	79.985464	Situated in Uttar Pradesh, addressing northern market requirements
Khordha	20.178544	85.648121	Located in Odisha, providing coverage for eastern India
Manesar	28.379038	76.882602	A prominent industrial area in Haryana, central to northern India operations
Pantnagar 1	29.015536	79.405152	Located in Uttarakhand, a significant industrial zone
Pantnagar 2	29.014676	79.409725	Second facility in Pantnagar, augmenting regional capacity
Jalgaon 1	20.990728	75.589489	Located in Maharashtra, critical for western India production
Jalgaon 2	20.990728	75.589489	Second plant in Jalgaon, providing additional support for the region.
Silvassa	20.287801	72.996019	A major industrial hub in Dadra and Nagar Haveli, enhancing MTL’s western reach
Vizag 1	17.508675	83.000921	Located in Andhra Pradesh, catering to southern and eastern markets.
Vizag 2	17.698776	83.169705	Second facility in Vizag, boosting operational capacity in the region
Nandyala	15.481456	78.445763	Strategically positioned in Andhra Pradesh, addressing growing market demands.

Manjushree
ADVANCED PACKAGING SOLUTIONS

23 Manufacturing facilities to serve all locations across India



WATER ANALYSIS AS PERAQUEDUCT GLOBAL WATER RISK MAPPING TOOL

Aqueduct Water Risk Atlas by the World Resources Institute (WRI)

MTL's assessment leverages the Aqueduct global water risk mapping tool, which aids companies, investors, governments, and other stakeholders in identifying and understanding emerging water risks and opportunities globally. This tool employs a robust, peer-reviewed methodology and utilizes the best available data to generate high-resolution, customizable global maps of water risk.

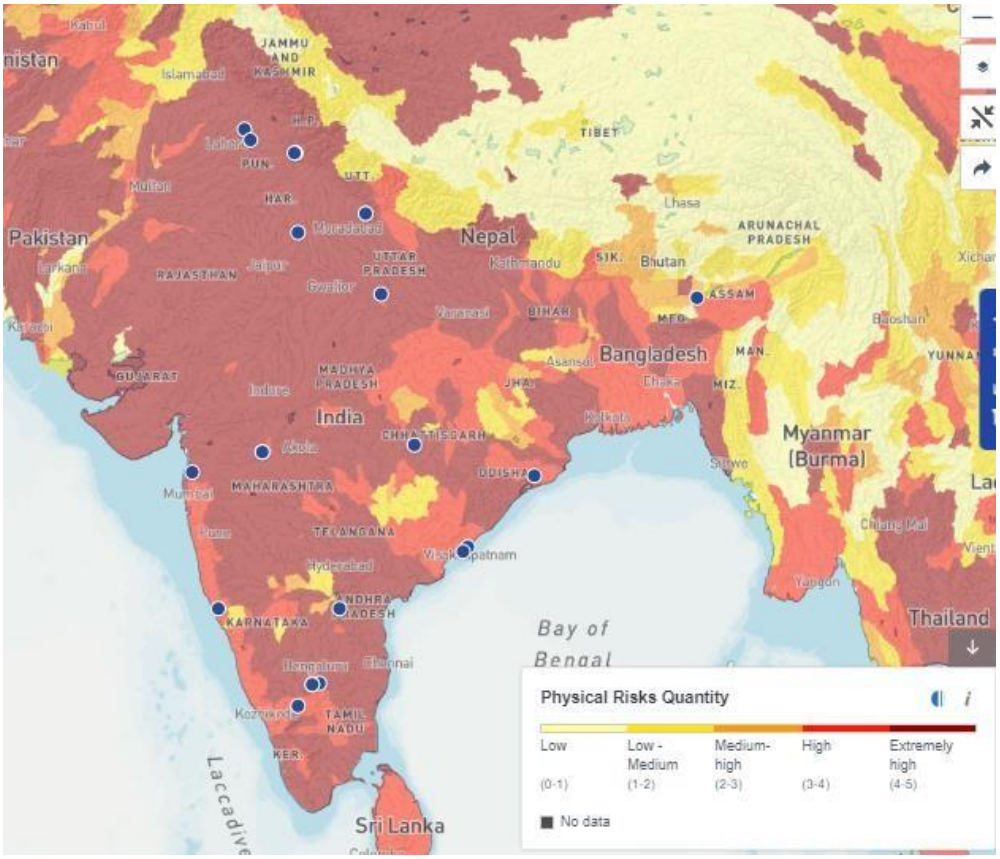
Water scarcity, a critical issue of the 21st century, was highlighted in the World Economic Forum's Global Risks 2013 report as one of the most impactful and probable risks facing the planet. To address this, the World Resources Institute (WRI), in collaboration with various partners, developed Aqueduct to provide comprehensive insights into the emergence of water risks worldwide

Physical risks quantity

Physical risks quantity measures risk related to too little or too much water, by aggregating all selected indicators from the Physical Risk Quantity category. Higher values indicate higher water quantity risks. The Aqueduct Water Risk Assessment Tool highlights the following physical risks related to water quantity for MTL's operations:

1. **Water Stress**: MTL faces significant water stress, indicating a high demand for water relative to its availability. This risk underscores the need for effective water management strategies to ensure sustainable supply.
2. **Water Depletion**: There is a notable risk of water depletion, emphasizing the criticality of balancing water withdrawal and replenishment rates to avoid long-term shortages.
3. **Interannual Variability**: Moderate risk is associated with interannual variability, reflecting year-to-year fluctuations in water availability that could affect planning and operations.

4. **Seasonal Variability**: A significant seasonal variability risk indicates fluctuations in water availability across different times of the year, which may require adaptive measures for operational continuity.
5. **Groundwater Table Decline**: MTL faces risks related to the decline in groundwater tables, highlighting overuse or insufficient recharge rates as potential challenges.
6. **Riverine Flood Risk**: Riverine flood risks are relatively low, indicating limited vulnerability to flooding events from rivers near operational areas.
7. **Coastal Flood Risk**: Minimal or negligible risk exists for coastal flooding, as MTL's operational sites are likely not situated in coastal flood-prone areas.
8. **Drought Risk**: There is a notable drought risk, emphasizing the vulnerability of operations in

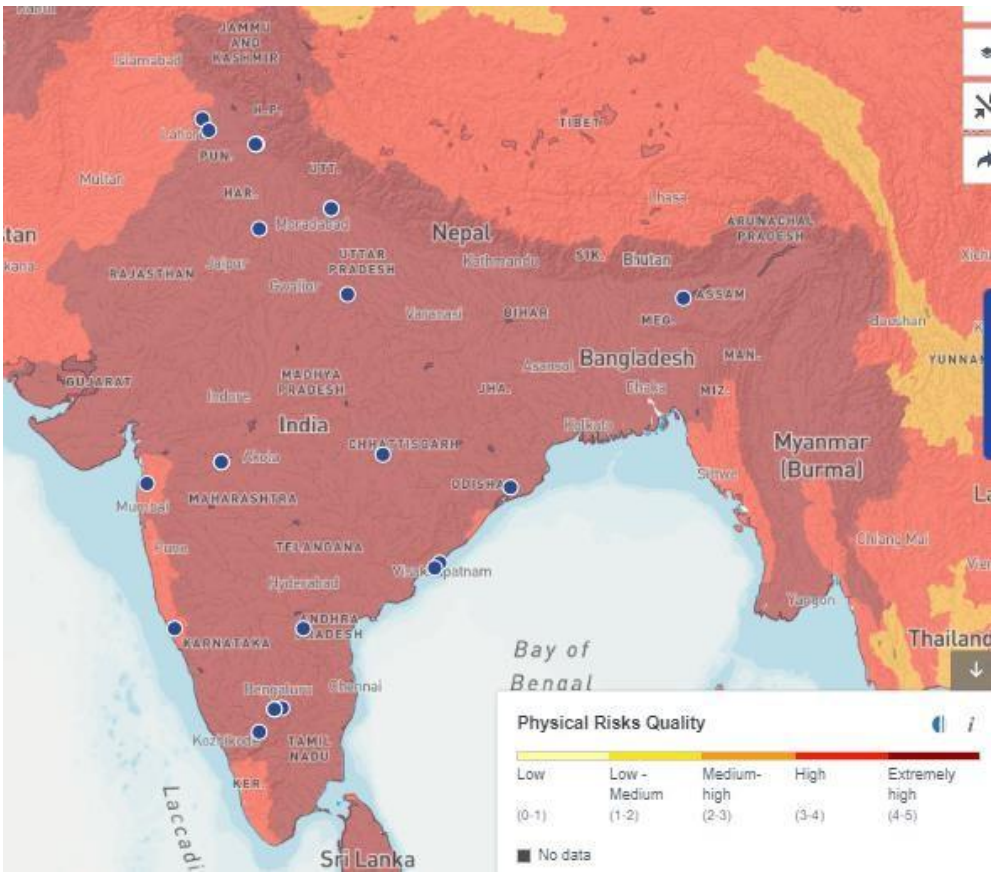


arid or drought-prone regions, which could impact water availability.

Physical risks quality

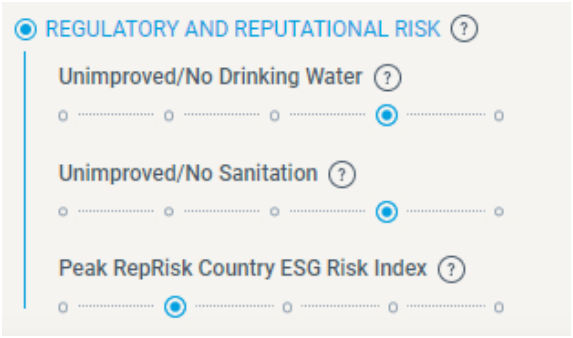
Physical risks quality measures risk related to water that is unfit for use, by aggregating all selected indicators from the Physical Risk Quality category. Higher values indicate higher water quality risks

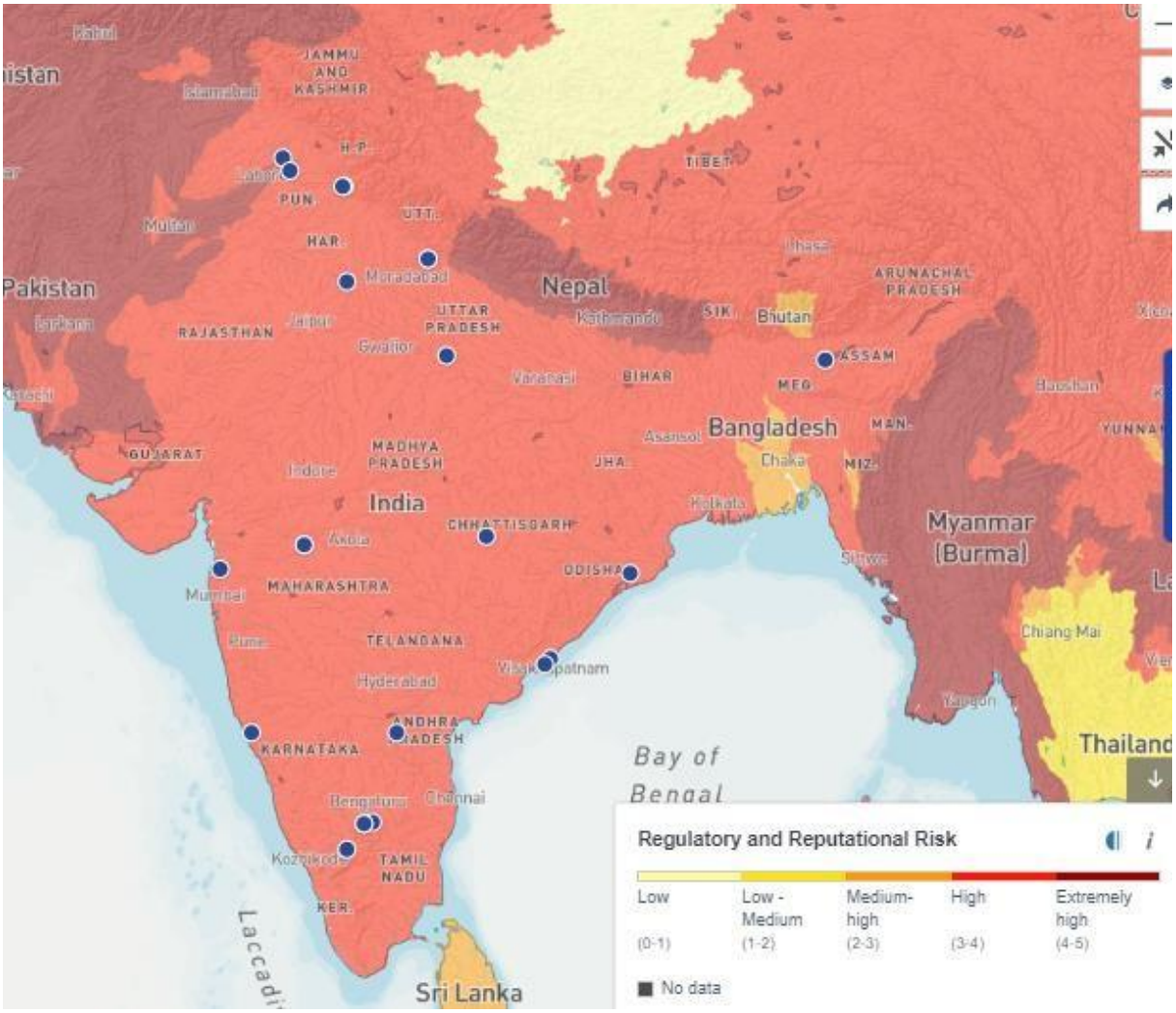
1. **Untreated Connected Wastewater:** This indicates the proportion of wastewater that remains untreated and is connected to the surrounding environment. This metric is crucial in understanding the potential risks posed by inadequate wastewater treatment infrastructure, which could lead to environmental degradation and health issues.
2. **Coastal Eutrophication Potential:** This represents the risk associated with nutrient pollution, which can lead to eutrophication in coastal areas. Excessive nutrients in water bodies can result in harmful algal blooms, oxygen depletion, and disruption of aquatic ecosystems.



Regulatory and reputational risks

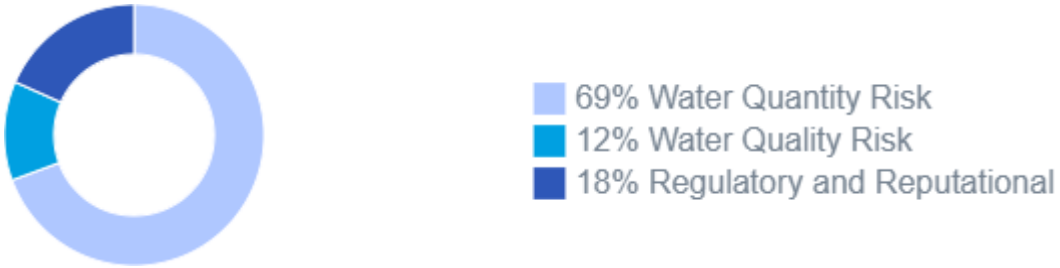
Regulatory and reputational risks measures risk related to uncertainty in regulatory change, as well as conflicts with the public regarding water issues. Higher values indicate higher regulatory and reputational water risks





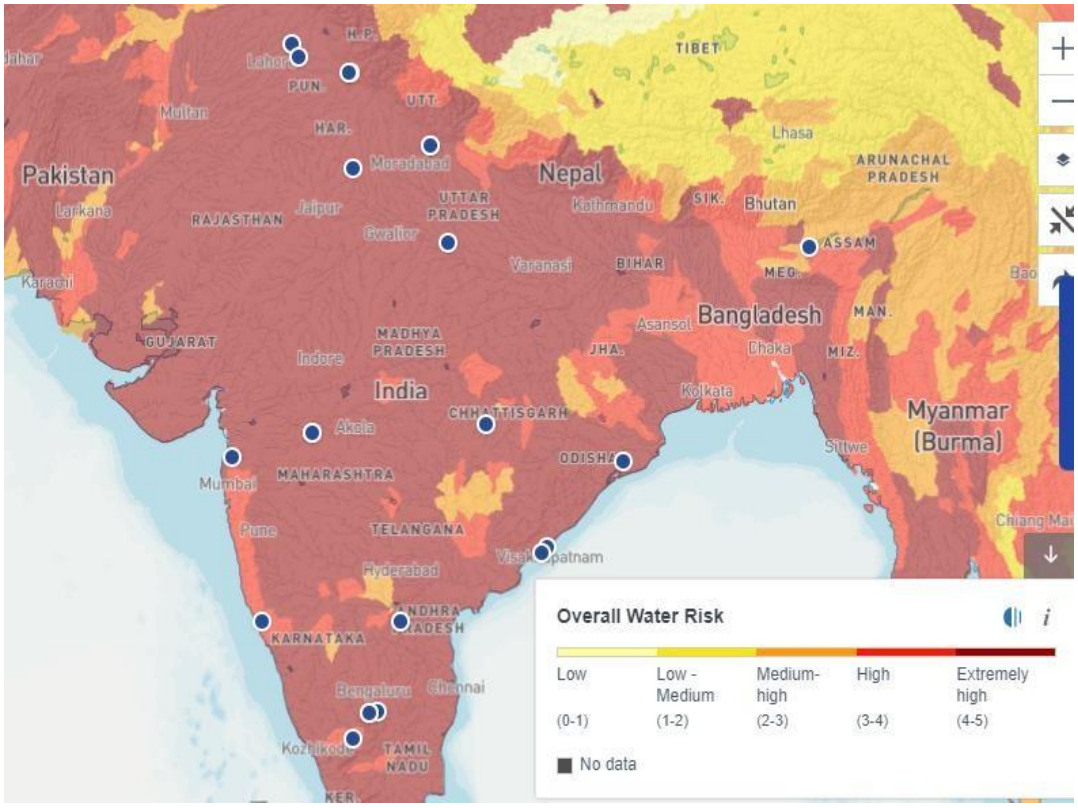
1. **Unimproved/No Drinking Water**: This metric assesses the extent to which communities within MTL's operational areas lack access to improved drinking water sources. High levels of unimproved drinking water pose regulatory risks and can harm MTL's reputation if operations are perceived to exacerbate local water scarcity or quality issues.
2. **Unimproved/No Sanitation**: This measures the proportion of the population lacking access to adequate sanitation facilities in the regions where MTL operates. Poor sanitation infrastructure increases regulatory scrutiny and reputational risks, especially if wastewater from operations contributes to public health challenges.

3. **Peak RepRisk Country ESG Risk Index**: This captures the overall environmental, social, and
governance (ESG) risks at the country level, where MTL's facilities are located. High RepRisk scores indicate heightened regulatory and reputational challenges due to broader ESG concerns in the region.



The Aqueduct Water Risk Assessment Tool categorizes MTL's water-related risks into three key areas, reflecting the company's operational dependency on water resources and its exposure to associated risks:

1. **Water Quantity Risk (69%)**: A significant proportion of MTL's risk is attributed to water availability, highlighting vulnerabilities to scarcity and supply disruptions. This is critical for processes such as cooling systems used in manufacturing.
2. **Water Quality Risk (12%)**: A moderate risk arises from potential degradation of water quality, which could impact the efficiency and safety of operations. Ensuring access to clean water for domestic and operational purposes is crucial for MTL.
3. **Regulatory and Reputational Risk (18%)**: Regulatory frameworks and public perceptions contribute to this risk, emphasizing the importance of compliance with environmental regulations and maintaining stakeholder trust.



Risk Metrics:

- Raw water risk ratio
- Water risk ratio score
- Water risk ratio category
- Descriptive label for the risk ratio
- Total water risk raw score
- Total water risk score
- Descriptive label for total water risk

The summarized data and initial analysis provide a comprehensive overview of water risks across MTL's 23 plant locations. Key observations include

Risk Metrics:

- The **Raw Risk Ratio** ranges from 3.079 to 3.349, indicating consistently high-water risks across most locations.
- The **Total Risk Score** has a mean of 4.21, with many plants categorized under "Extremely High (4-5)" water risks.

Geographic Coverage:

- Plants span diverse regions, with basins including "Ganges - Brahmaputra," "Ramganga," "Yamuna," and more.
- Latitude ranges from 11.99 (southernmost plant) to 31.70 (northernmost plant), with varying climatic and hydrological contexts

In water risk assessments, raw risk and total risk are metrics that quantify the likelihood and severity of water-related risks a facility or region faces. Here's what they typically mean:

Raw Risk

- **Definition:** Raw risk refers to the inherent water risk without considering any mitigating actions or controls. It represents the baseline level of risk based purely on environmental, geographical, and physical factors.

- *Key Factors:*
  - Water scarcity or availability in the region.
  - Water stress levels (demand versus supply).
  - Quality and infrastructure dependency.
  - Climate variability (e.g., floods, droughts).

- **Significance:** This metric highlights how vulnerable a region is to water risks purely based on its natural and geographical characteristics.

Total Risk

- **Definition:** Total risk is the adjusted water risk that incorporates mitigation measures, regulatory compliance, and management practices. It evaluates the net risk after accounting for efforts taken to reduce vulnerabilities.

- *Key Factors:*
  - Regulatory risks, including local compliance with water laws.

- Reputational risks stemming from stakeholder perceptions and company practices.
- Adaptations like water recycling systems, storage capacity, and contingency plans.

- **Significance:** This metric reflects the practical risk a facility faces after considering its resilience and management strategies. It helps organizations prioritize and refine mitigation plans.

Why Both Metrics Matter

- Raw Risk helps in understanding the inherent challenges posed by the environment, providing a starting point for planning.
- Total Risk demonstrates how effective an organization's strategies are in managing and mitigating these challenges.

Both metrics are critical for developing a comprehensive water risk management plan and aligning actions to address physical, regulatory, and reputational risks effectively.

Here's the detailed plant-wise water risk analysis presented in a tabular format:

Plant Name	Major Basin	Minor Basin	Raw Risk Ratio	Total Risk	Risk Level
Amritsar 1	Indus	Ravi	3.12	4.21	High
Amritsar 2	Indus	Ravi	3.13	4.22	High
Baddi 1	Indus	Sutlej	3.28	4.30	High
Baddi 2	Indus	Sutlej	3.27	4.29	High
Baddi 3	Indus	Sutlej	3.30	4.30	High
Manesar	Ganges - Yamuna	Yamuna	3.25	4.28	High
Kanpur	Ganges	Ganges Main Stem	3.18	4.26	High
Pantnagar 1	Ganges - Brahmaputra	Ramganga	3.31	4.25	High
Pantnagar 2	Ganges - Brahmaputra	Ramganga	3.35	4.23	High
Guwahati	Brahmaputra	Brahmaputra Main Stem	3.08	4.15	High
Visakhapatnam 1	Godavari	Godavari Main Stem	3.29	4.28	High
Visakhapatnam 2	Godavari	Godavari Main Stem	3.33	4.29	High
Nandyala	Krishna	Krishna Main Stem	3.11	4.20	High
Jalgaon 1	Tapi	Tapi Main Stem	3.19	4.23	High
Jalgaon 2	Tapi	Tapi Main Stem	3.22	4.24	High
Bommasandra	Cauvery	Cauvery Main Stem	3.20	4.22	High
Silvassa	Narmada	Narmada Main Stem	3.15	4.21	High
Bidadi (Preform)	Cauvery	Arkavathi	3.18	4.22	High
Bidadi (Recycling)	Cauvery	Arkavathi	3.16	4.21	High

Chamarajanagar	Cauvery	Kabini	3.12	4.20	High
Goa	Mandovi	Mandovi Main Stem	3.10	4.19	High
Khordha	Mahanadi	Mahanadi Main Stem	3.13	4.20	High
Durg	Mahanadi	Mahanadi Main Stem	3.14	4.21	High

Summary of Plant-Wise Water Risk Assessment Results

The water risk assessment for MTL's 23 facilities, conducted using Aqueduct data, highlights significant insights into the challenges and vulnerabilities faced by the company in managing water resources sustainably. The analysis evaluated risks based on three dimensions: **physical risks** (water scarcity, quality, and climate impacts), **regulatory risks** (compliance with water laws and policies), and **reputational risks** (stakeholder expectations and public perception).

Key Findings:

1. **High Risk Across All Plants**:
   - All 23 plants were found to have **high water risks**, with total risk scores exceeding 4.15, indicating significant exposure to water-related vulnerabilities.
   - High-risk levels stem from physical water stress, regulatory compliance challenges, and increasing scrutiny of corporate water management practices.

2. *Major Contributors to Risk:*
   - **Physical Risks**:
     - Plants located in regions with high water stress (e.g., **Amritsar, Baddi, and Pantnagar**) face challenges due to groundwater depletion and limited availability.
     - Climate change exacerbates risks with unpredictable precipitation patterns, floods, and droughts.
   - *Regulatory Risks:*
     - Facilities like **Kanpur, Bidadi, and Visakhapatnam** operate in areas with evolving and stringent water regulations, increasing the risk of non-compliance and potential fines.
   - *Reputational Risks:*
     - Plants in regions like **Chamarajanagar and Goa**, where local communities heavily depend on shared water resources, face heightened scrutiny from stakeholders.

3. *Geographic Insights:*
   - **Northern and Central Regions**: Facilities in Punjab, Haryana, and Uttar Pradesh are particularly vulnerable to water stress due to over-extraction and reliance on shared basins.
   - **Southern and Coastal Regions**: Plants in Andhra Pradesh, Karnataka, and Goa face high risks from climate variability, regulatory complexities, and potential reputational challenges.

4. *Critical Basins and Dependencies:*
    - Plants depend on major basins like the **Indus, Ganges, Brahmaputra, Godavari, and Cauvery**, which are already under significant stress due to industrial and agricultural demand

FUTURISTIC CORRECTIVE ACTIONS FOR PLANTS BASED ON AQUEDUCT GLOBAL WATER RISK MAPPING TOOL

Corrective Actions for Plants at High Water Risk Levels:

1. Amritsar 1 & 2 (Indus, Ravi Basin):
    - Water Efficiency Measures: Implement advanced cooling systems to reduce water usage in manufacturing.

- Rainwater Harvesting: Expand rainwater harvesting systems to supplement groundwater.
- Community Engagement: Collaborate with local communities to manage shared water resources sustainably.

2. Baddi 1, 2 & 3 (Indus, Sutlej Basin):
   - Reuse and Recycling: Install cutting-edge water recycling and treatment plants for Zero Liquid Discharge (ZLD).
   - Alternative Water Sources: Explore the feasibility of sourcing water from less- stressed regions.
   - Watershed Management: Partner with NGOs and government bodies for basin-level watershed development.

3. Manesar (Ganges - Yamuna, Yamuna Basin):
   - Water Audits: Conduct regular water audits to identify inefficiencies and improve processes.
   - Green Infrastructure: Develop artificial wetlands or bio-retention systems to recharge groundwater.
   - Monitoring: Install sensors and IoT devices to monitor real-time water usage.

4. Kanpur (Ganges, Main Stem):
   - Groundwater Recharge: Initiate projects for artificial groundwater recharge.
   - Policy Advocacy: Engage with policymakers to advocate for sustainable groundwater management.
   - Technological Innovation: Invest in IoT-based systems for optimized water usage.

5. Pantnagar 1 & 2 (Ganges-Brahmaputra, Ramganga Basin):
   - Catchment Restoration: Restore and protect natural catchment areas to reduce water runoff.
   - Energy-Water Nexus: Implement solar-powered water pumps to align with energy efficiency goals.
   - Employee Training: Train staff on sustainable water practices and conservation strategies.

6. Guwahati (Brahmaputra, Main Stem):
   - Flood Management: Collaborate with local authorities to establish flood and stormwater management systems.
   - Education: Promote water conservation awareness in the community and among employees.
   - Effluent Control: Ensure treated water discharged meets or exceeds environmental standards.

7. Visakhapatnam 1 & 2 (Godavari, Main Stem):
   - Desalination: Evaluate the potential of desalination plants for industrial water needs.
   - Smart Irrigation: Utilize treated water for irrigation of green belts within the plant premises.
   - Partnerships: Collaborate with regional stakeholders for integrated water management.

8. Nandyala (Krishna, Main Stem):
    - Water Storage: Build reservoirs to store surplus water during rainy seasons.
    - Technology Adoption: Use AI to predict water demand and optimize resource allocation.
    - Compliance: Strengthen compliance with national and state-level water guidelines.

9. Jalgaon 1 & 2 (Tapi, Main Stem):
    - Local Collaboration: Work with nearby agricultural stakeholders for shared water- use strategies.
    - Leakage Prevention: Audit and upgrade water pipelines to minimize leaks.
    - Public-Private Partnerships: Engage in PPPs to improve water infrastructure.

10. Bommasandra (Cauvery, Main Stem):
    - Wetland Development: Create artificial wetlands for wastewater treatment and groundwater recharge.
    - Rainfall Utilization: Design infrastructure to capture and store rainwater effectively.
    - ISO Certification: Aim for certifications like ISO 14001 to improve environmental performance.

11. Silvassa (Narmada, Main Stem):
    - Alternative Sourcing: Identify and secure alternative water sources to reduce dependency on stressed basins.
    - Sustainable Landscaping: Use xeriscaping techniques to reduce water use in green spaces.
    - Water Pricing: Develop a water pricing mechanism to encourage conservation.

12. Bidadi (Preform & Recycling - Cauvery, Arkavathi):
    - Industrial Symbiosis: Partner with nearby industries to share water recycling facilities.
    - Groundwater Mapping: Conduct detailed mapping to identify safe extraction points.
    - Water-Neutral Goals: Set targets for becoming water-neutral by 2030.

13. Chamarajanagar (Cauvery, Kabini Basin):
    - Basin-Level Interventions: Contribute to regional projects aimed at improving water availability in the Kabini basin.
    - Infrastructure Modernization: Upgrade aging water infrastructure for efficiency.
    - Rain Shadow Mitigation: Leverage innovative technologies to counteract effects of rain shadow areas.

14. Goa (Mandovi, Main Stem):
    - Marine Ecosystem Protection: Ensure water practices do not harm nearby marine ecosystems.
    - Eco-Friendly Practices: Introduce eco-friendly production techniques that reduce water footprint.
    - Stakeholder Dialogue: Engage with stakeholders to align water usage strategies.

15. Khordha (Mahanadi, Main Stem):
    - Seasonal Storage: Install storage systems for seasonal variations in water availability.
    - Corporate Responsibility: Support community projects to provide clean drinking water.
    - Dynamic Planning: Develop a dynamic water risk assessment system.

16. Durg (Mahanadi, Main Stem):
    - Effluent Reuse: Maximize reuse of treated effluents for non-potable applications.
    - Climate Resilience: Integrate water risk mitigation into broader climate resilience plans.
    - Resource Sharing: Facilitate shared water resource management in the district.

WATER RISK MANAGEMENT PROGRAMS BASED ON AQUEDUCT GLOBAL WATER RISK MAPPING TOOL

1. *Dependency-Related Water Risks Considered in Risk Assessment*

MTL has identified significant water dependency risks due to the following factors:

- **Water Stress**: High water demand relative to availability across operational sites.
- **Seasonal Variability**: Significant fluctuations in water availability during different times of the year.
- **Groundwater Table Decline**: Overuse or insufficient recharge impacting long-term water availability.

Action Plan:

- Conduct detailed water dependency assessments for each plant, focusing on cooling system requirements and domestic uses.

- Implement water efficiency measures, such as optimizing cooling processes and promoting water reuse.
- Develop plant-specific water contingency plans to address seasonal shortages.

2. *Impact-Related Water Risks Considered in Risk Assessment*

MTL's operations impact local water resources, raising risks such as:

- **Water Depletion**: Imbalance between water withdrawal and replenishment.
- **Interannual Variability**: Year-to-year fluctuations affecting planning.
- **Drought Risk**: High vulnerability in arid regions.

Action Plan:

- Engage in community-level water replenishment projects, such as rainwater harvesting and aquifer recharge.
- Monitor and report water withdrawal rates to ensure compliance with sustainable thresholds.
- Establish drought management strategies for operations in high-risk regions.

3. *Assessment of Future Water Quantities Available*

MTL recognizes the need for proactive planning to ensure future water availability:

- **Climate Scenarios**: Use tools like IEA NZE 2050 and SSP1 2.6 to model future water scenarios.
- **Extreme Weather**: Consider impacts of increased droughts, floods, and cyclones on water resources.

Action Plan:

- Conduct basin-level studies to evaluate long-term water availability.

Invest in water storage and retention systems to buffer against future shortages.

1. *Assessment of Future Water Quality-Related Risks*

Water quality risks are critical to maintaining operational efficiency and stakeholder trust:

- **Untreated Wastewater**: Potential for environmental degradation and health issues.
- **Eutrophication Potential**: Risks from nutrient pollution affecting ecosystems.

Action Plan:

- Upgrade wastewater treatment facilities at all plants to meet Zero Liquid Discharge (ZLD) standards.
- Monitor water quality parameters regularly to ensure compliance with regulatory requirements.
- Develop protocols for managing nutrient runoffs and other pollutants.

2. *Assessment of Impacts on Local Stakeholders*

MTL's operations affect local communities, particularly regarding access to water:

- **Drinking Water and Sanitation**: Communities near plants may lack access to these essential resources.
- **Regulatory and Reputational Risks**: Negative public perceptions and potential regulatory actions.

Action Plan:

- Collaborate with local authorities to improve access to drinking water and sanitation for nearby communities.
- Conduct stakeholder engagement sessions to address concerns and co-develop solutions.
- Publicly disclose water-related initiatives to build trust and enhance reputation.

3. *Assessment of Future Potential Regulatory Changes at a Local Level*

MTL's operations are subject to evolving water regulations:

- **National and Local Policies**: Increased scrutiny on water usage and discharge practices.
- **ESG Risks**: High RepRisk Country ESG Risk Index scores highlighting potential challenges.

Action Plan:

- Stay updated on local and national regulatory changes related to water management.
- Implement a compliance monitoring system to track adherence to new regulations.
- Advocate for policies that support sustainable industrial water use.

Plant-Specific Focus Areas

High-Risk Plants:

- **Amritsar, Baddi, Manesar, Kanpur, Pantnagar, Visakhapatnam, Jalgaon, Bommasandra, Bidadi, Chamarajanagar, Goa, Khordha, Durg**
  - Prioritize these plants for immediate implementation of water risk management measures.
  - Develop plant-level action plans addressing site-specific risks identified in the Aqueduct Tool analysis.

Low-Risk Plants:

- Continue to monitor and maintain current water management practices.
- Ensure alignment with company-wide water sustainability goals.

Conclusion

MTL's comprehensive water risk management program is designed to address dependency, impact, future risks, and stakeholder concerns. By proactively implementing these measures, MTL can ensure sustainable water use, regulatory compliance, and community goodwill, securing the long- term viability of its operations.

WATER ANALYSIS AS PER WWF WATER RISK FILTER BASELINE 2020

In addition to Aqueduct analysis, Manjushree Technopack Limited carried out a water risk assessment using the **WWF Water Risk Filter – Baseline 2020** to evaluate basin-level physical, regulatory, and reputational water risks.

The **baseline 2020** water risk assessment has been carried out in 23 manufacturing units all over India.

1. *Basin Physical Risks*

Basin physical risks relate to the availability and quality of water, as well as flooding and the ecological health of the river basins where the company's sites are located.

Water Scarcity

- **Risk Levels**: Water scarcity is an important issue across several sites. Sites such as **Amritsar 1** (Ravi Basin) and **Baddi 1** (Sutlej Basin) have relatively high risks, scoring 4.09 and 4.32, respectively.
- **General Observations**: Most sites fall within the moderate to high-risk range, indicating

that water scarcity poses a notable concern for many locations. This suggests the need for water conservation and sustainable usage practices across these sites.

Flooding

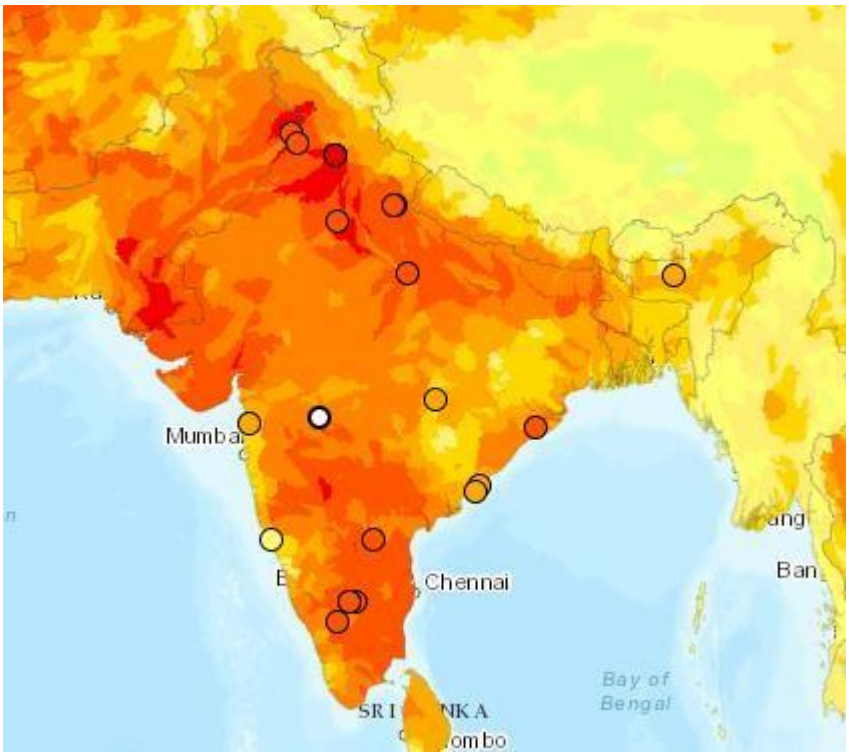
- **Risk Levels**: Flooding risks are present at sites such as **Amritsar 1** and **Baddi 2**, which have moderate risks of flooding.
- **General Observations**: Flooding is a regional issue, with certain sites in flood-prone areas requiring strategies for flood management and infrastructure improvement.

Water Quality

- **Risk Levels**: Water quality risks are relatively consistent across sites, with most sites scoring around **3.9** to **4.0**, suggesting moderate risks to water quality in these locations.
- **General Observations**: The presence of moderate water quality risks indicates that water treatment and monitoring should be prioritized, especially in areas with industrial or urban influences on water bodies.

Ecosystem Services Status

- **Risk Levels**: The risks to ecosystem services are moderate to high across various locations, with most sites scoring between **2.7** and **3.45**.
- **General Observations**: This reflects the health of local ecosystems, indicating that these river basins may face pressures such as pollution, over-extraction of water, and habitat degradation that could affect biodiversity and ecosystem services.



Here is the **Baseline 2020 Basin Physical Risks** data with full site names and their risk levels:

Plant Name	Overall Basin Physical Risk
Baddi 1	4.14
Baddi 2	4.14
Baddi 3	4.14
Amritsar 1	4.06
Manesar	4.06
Kanpur	3.99
Bidadi	3.94
Bidadi (Recycling)	3.94
Amritsar 2	3.94
Nandyala	3.91
Pantnagar 2	3.85
Pantnagar 1	3.85
Bommasandra	3.81
Jalgaon 1	3.79
Jalgaon 2	3.79
Chamarajanagar	3.65
Guwahati	3.59
Khordha	3.51
Vizag 1	3.3
Vizag 2	3.3
Silvassa	3.18
Durg	3.15
Goa	2.59

Detailed Summary of Overall Basin Physical Risk

The analysis of overall basin physical risk reveals varying levels of exposure across the plants:

High-Risk Sites (Above 4.0)

- **Baddi 1, Baddi 2, Baddi 3 (4.14)**: These sites are located in regions with severe challenges related to water scarcity, flooding, water quality, or ecosystem health.
- **Amritsar 1, Manesar (4.06)**: These sites also exhibit significant physical risks, indicating possible vulnerabilities in water resources or ecological sustainability.

Moderate-Risk Sites (3.5 to 4.0)

- **Kanpur, Bidadi, Bidadi (Recycling), Amritsar 2, Nandyala, Pantnagar 1 & 2, Bommasandra, Jalgaon 1 & 2 (3.79-3.99)**: These plants are in areas with moderate risks, suggesting periodic challenges in water management or ecosystem health.
- **Chamarajanagar, Guwahati, Khordha (3.51-3.65)**: These sites may face site-specific risks requiring targeted interventions.

Lower-Risk Sites (Below 3.5)

- **Vizag 1, Vizag 2, Silvassa, Durg (3.15-3.3)**: These sites demonstrate lower physical risks but still need continuous monitoring to address potential long-term issues.
- **Goa (2.59)**: This site has the lowest physical risk among all plants, indicating relatively favourable water resource conditions.

2. *Basin Regulatory Risks*

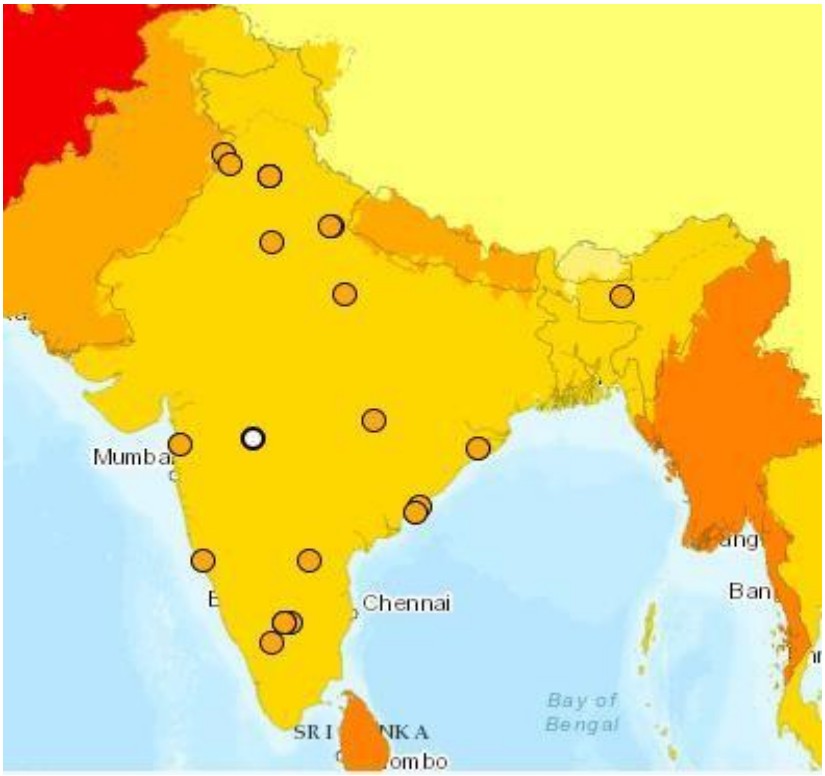
This category includes regulatory and governance factors that influence water use, environmental management, and institutional effectiveness in the region.

Enabling Environment, Institutions & Governance

- **Risk Levels**: The institutional environment is moderate to low risk at most sites, with scores ranging from **2.75** to **3.95**.
- **General Observations**: These values suggest that governance structures and institutional capacity in these regions are generally effective but may need strengthening in some locations to ensure sustainable water management and environmental protection.

Management Instruments, Infrastructure & Finance

- **Risk Levels**: Sites generally show moderate risks in this category, with most values around **2.96** to **3.8**.
- **General Observations**: This indicates that the existing management frameworks, financial mechanisms, and infrastructure for water management are sufficient in some regions, but improvements in financial support, water management technologies, and infrastructure may be needed.



Plant Name	Overall Basin Regulatory Risk
Jalgaon 2	3.01
Bidadi	3.01
Bidadi (Recycling)	3.01
Bommasandra	3.01
Chamrajanagar	3.01
Durg	3.01
Goa	3.01
Khordha	3.01
Jalgaon 1	3.01
Amritsar 1	2.98
Vizag 1	2.98
Silvassa	2.98
Nandyala	2.98
Vizag 2	2.98
Amritsar 2	2.98
Baddi 3	2.98
Baddi 2	2.98
Baddi 1	2.98
Kanpur	2.94
Manesar	2.94
Pantnagar 1	2.94
Pantnagar 2	2.94
Guwahati	2.94

Detailed Summary of Overall Basin Regulatory Risk High-

Risk Sites (Scores 3.01)

The following plants exhibit the highest regulatory risks, indicating potential challenges with regulatory compliance, governance, and infrastructure:

- *Jalgaon 2, Bidadi, Bidadi (Recycling), Bommasandra, Chamrajanagar, Durg, Goa, Khordha, Jalgaon 1*

These sites may face challenges related to:

1. **Regulatory Environment:** Stringent or inconsistent regulations that may affect operations.
2. **Institutional Governance:** Weak governance frameworks leading to inefficiencies or unclear compliance requirements.
3. **Management Instruments:** Lack of effective policies and instruments for sustainable water management.
4. **Infrastructure and Finance:** Limited financial or infrastructural support to address water-related challenges.

Moderate-Risk Sites (Scores 2.94–2.98)

These plants have moderate regulatory risks and require proactive management to prevent escalation:

- *Amritsar 1, Vizag 1, Silvassa, Nandyala, Vizag 2, Amritsar 2, Baddi 1, Baddi 2, Baddi 3*
- **Kanpur, Manesar, Pantnagar 1, Pantnagar 2, Guwahati**

Risks at these sites are likely due to:

1. Regional regulatory variability and enforcement.
2. Challenges in adapting to evolving environmental laws.
3. Limited engagement with local regulatory stakeholders.

3. *Basin Reputational Risks*

This category evaluates cultural, social, and media-related factors that could impact the company's reputation and public perception in relation to water usage.

Cultural Importance

- **Risk Levels**: Cultural importance varies across sites, with some locations scoring between **2.45** and **4.68**, indicating low to moderate reputational risks due to the cultural significance of water resources.
- **General Observations**: Locations with higher cultural significance may face reputational risks if water usage is perceived as damaging to local traditions or sacred resources. Cultural considerations should be factored into water management strategies to prevent negative public perception.

Biodiversity Importance

- **Risk Levels**: Biodiversity importance ranges from **2.55** to **5**, suggesting that some sites face significant reputational risks related to biodiversity conservation.
- **General Observations**: Sites in areas with high biodiversity value should prioritize sustainable water use and protect local ecosystems to minimize reputational risks. This is particularly critical for regions with protected species or ecosystems.

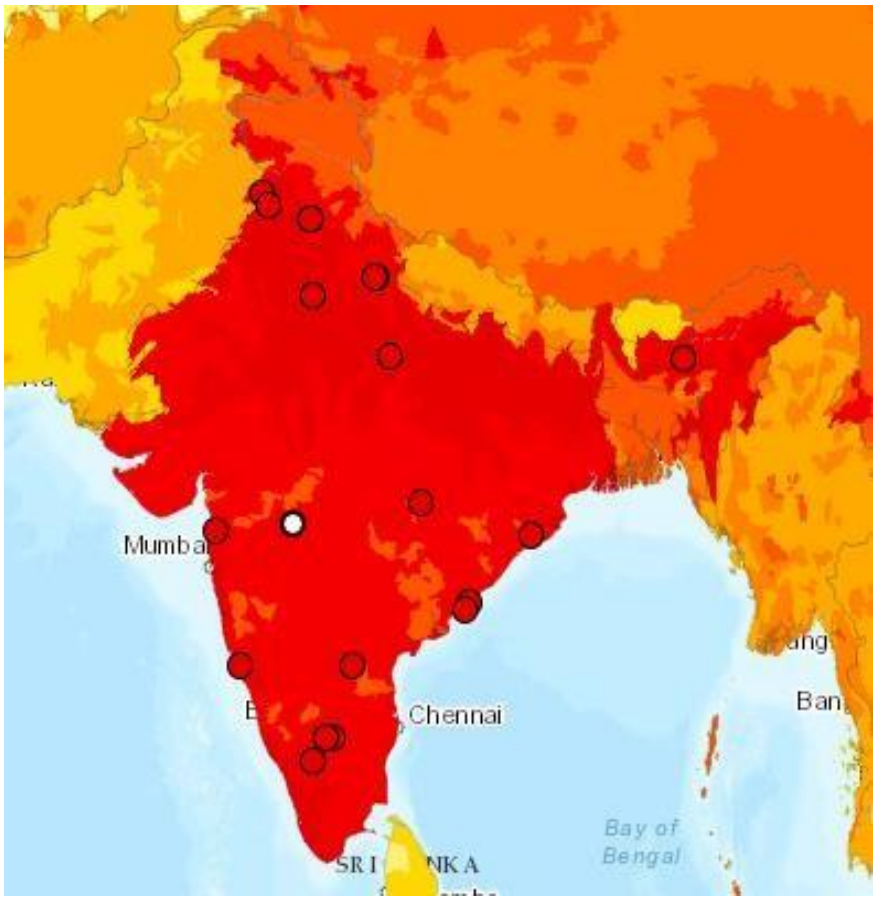
Media Scrutiny & Conflict

- **Risk Levels**: Many sites face moderate to high reputational risks regarding media scrutiny and potential conflicts related to water use.
- **General Observations**: Media and public scrutiny could pose risks to the company's reputation in cases of environmental damage or water misuse. Transparent and responsible water management practices can mitigate this risk.

4. *Business Importance*

This factor evaluates the criticality of each site for the company's operations.

- **Risk Levels**: Sites are categorized as having high, medium, or low business importance.
- **General Observations**: Business importance reflects the site's role in the company's operations, with high-importance sites being more critical to the company's supply chain and profitability. Higher business importance increases the urgency of managing water and reputational risks effectively.



Plant Name	Overall Basin Reputational Risk
Goa	4.75
Amritsar 1	4.5
Kanpur	4.5
Baddi 1	4.5
Baddi 2	4.5
Baddi 3	4.5
Pantnagar 2	4.5
Pantnagar 1	4.5
Manesar	4.5
Amritsar 2	4.5
Chamarajanagar	4.375
Visag 1	4.25
Khordha	4.25
Guwahati	4.25
Durg	4.25
Bommasandra	4.25
Visag 2	4.25
Jalgaon 2	4.125
Jalgaon 1	4.125
Nandyala	4.125
Bidadi (Recycling)	4.125
Silvassa	4.125
Bidadi	4.125

Detailed Summary of Overall Basin Reputational Risk High-Risk Sites (Above 4.5)

- **Goa (4.75)**: This site exhibits the highest reputational risk, indicating significant challenges related to cultural importance, biodiversity, media scrutiny, or conflict.
- **Amritsar 1, Kanpur, Baddi 1, Baddi 2, Baddi 3, Pantnagar 1, Pantnagar 2, Manesar, Amritsar 2 (4.5)**: These sites show consistently high reputational risks, suggesting strong societal and ecological sensitivity.

Moderate-High Risk Sites (4.25–4.375)

- **Chamrajanagar (4.375)**: Slightly lower than the top group, but still exhibits notable challenges, especially regarding ecological and community perceptions.
- **Visag 1, Khordha, Guwahati, Durg, Bommasandra, Visag 2 (4.25)**: These sites demonstrate potential concerns over local community relations, ecosystem impacts, or external scrutiny.

Moderate Risk Sites (4.125)

- **Jalgaon 1, Jalgaon 2, Nandyala, Bidadi (Recycling), Silvassa, Bidadi (4.125)**: While these sites rank lower in reputational risk, they still face pressures from cultural and ecological sensitivities and media attention.

Key Observations

1. **High Cultural and Ecological Sensitivity:**
    - Sites like Goa and Amritsar are in regions with strong cultural and biodiversity importance, increasing their reputational exposure.
2. *Media Scrutiny:*
    - High reputational risks could stem from external scrutiny due to environmental practices, water usage, or community conflicts.
3. *Conflict Potential:*
    - Locations with high population densities or competing water needs are likely more vulnerable to reputational risks due to conflict.

FUTURISTIC CORRECTIVE ACTIONS FOR PLANTS BASED ON WWF WATER RISK FILTER ANALYSIS

Recommendations

High-Risk Sites: Priority Action

1. **Water Scarcity Mitigation:**
    - Implement advanced water-saving technologies (e.g., water recycling and reuse systems).
    - Partner with local authorities for watershed management and community water-sharing initiatives.
2. *Flood Risk Management:*
    - Develop infrastructure like flood barriers or improved drainage systems for sites prone to flooding.
    - Conduct flood risk mapping and develop emergency response plans.
3. *Water Quality Improvement:*
    - Invest in onsite water treatment plants to address pollution or contamination concerns.
    - Monitor upstream industrial or agricultural activities impacting water quality.
4. *Biodiversity Preservation:*
    - Collaborate with local communities and NGOs to restore and protect nearby ecosystems.
    - Engage in afforestation or wetland conservation projects.

Moderate-Risk Sites: Preventive Measures

1. **Proactive Monitoring:**
    - Establish a robust water monitoring system to track changes in water availability and quality.
    - Perform regular risk assessments to adapt to potential climate-related challenges.
2. *Efficiency Measures:*
    - Implement water-efficient processes to reduce dependency on local water resources.
    - Optimize production schedules to align with water availability patterns.
3. *Stakeholder Engagement:*
    - Collaborate with local governments and stakeholders to improve regional water governance and infrastructure.

Lower-Risk Sites: Sustaining Favourable Conditions

1. **Maintain Current Practices:**
    - Continue water-efficient and environmentally friendly practices to preserve the low- risk status.

2. *Future Resilience Planning:*
    - Develop long-term strategies to address climate variability and potential demographic or industrial changes in the region.

Recommendation Based on Basic Regulatory Risk Analysis:

High-Risk Sites: Immediate Actions

1. **Regulatory Compliance Framework:**
    - Establish a robust compliance management system to track and adhere to regional water laws.
    - Conduct regular audits to ensure adherence to environmental and water usage regulations.

2. *Stakeholder Engagement:*
    - Collaborate with local and regional authorities to improve transparency and understanding of regulatory requirements.
    - Participate in public-private partnerships to develop regional water infrastructure.

3. *Advocacy for Policy Improvements:*
    - Advocate for clear and consistent regulatory frameworks through industry associations.
    - Support initiatives that improve institutional capacity for better governance and enforcement.

Moderate-Risk Sites: Proactive Measures

1. **Risk Mitigation Strategies:**
    - Monitor changes in regulatory environments and anticipate future compliance needs.
    - Develop contingency plans for potential regulatory shifts, such as stricter water withdrawal limits or pollution controls.

2. *Capacity Building:*
    - Train site-level staff on regulatory compliance and sustainable water practices
    - Invest in technology and infrastructure to meet current and future regulatory demands

3. *Local Collaboration:*
    - Engage with local communities and NGOs to improve mutual understanding of water management needs and challenges.

Recommendations based on Basin Reputational Risk Analysis:

High-Risk Sites: Immediate Interventions

1. **Community Engagement:**
    - Develop robust community relations programs to address local concerns and enhance the company's image.
    - Partner with local NGOs or governments to support cultural preservation and biodiversity conservation.
2. *Transparency and Reporting:*
    - Publish detailed sustainability reports to demonstrate accountability and efforts in environmental stewardship.
    - Establish a grievance redressal mechanism to resolve community concerns effectively.
3. *Media Relations:*
    - Proactively manage media relations to highlight positive initiatives and mitigate adverse coverage.

Moderate-High Risk Sites: Strategic Focus

1. **Ecological Conservation:**
    - Implement programs to restore and protect ecosystems, such as wetland conservation or reforestation efforts.
    - Collaborate with academic institutions or research bodies to promote biodiversity.
2. *Cultural Sensitivity:*
    - Engage with cultural leaders or heritage organizations to align operations with regional cultural priorities.
3. *Sustainability Integration:*
    - Adopt sustainable water and waste management practices to align with global and local sustainability goals.

Moderate Risk Sites: Sustaining Favourable Conditions

1. **Continuous Monitoring:**
    - Monitor community sentiment and reputational factors regularly to prevent escalation of risks.
2. *Stakeholder Collaboration:*
    - Maintain open communication channels with local communities, ensuring inclusive decision-making processes.
3. *Future-Ready Practices:*
    - Invest in forward-looking initiatives such as renewable energy or zero-waste programs to bolster reputation.

WATER ANALYSIS AS PERWWF WATER RISK FILTER BASELINE 2030 WITH RECOMMENDATION

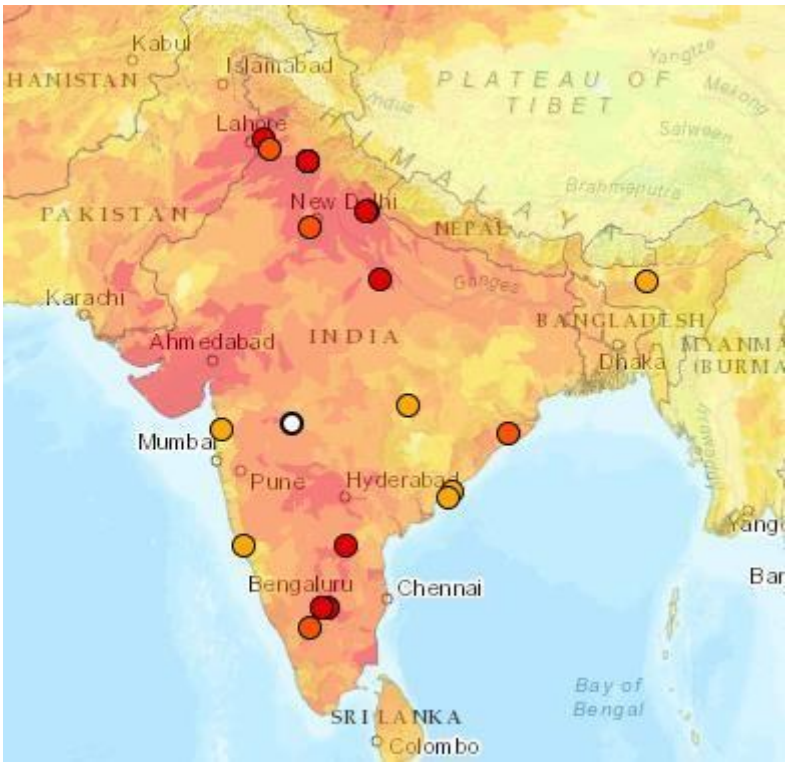
Scenario 2030 and based on the recommendations:

1. Basin Physical Risks - Scenario 2030

Physical risks relate to water scarcity, flooding, water quality, and ecosystem health.

Key Observations:

- **Water Scarcity:**
    - Several sites (e.g., **Baddi 1, Baddi 2, Amritsar 1**) are projected to face high risks of water scarcity.
    - Average scores across sites show an upward trend in water scarcity risks compared to the 2020 baseline, suggesting increasing stress on water resources due to population growth, industrial demands, and climate change.
- *Flooding Risks:*
    - Moderate risks are prevalent in sites like **Baddi 2 and Amritsar 1**, with potential increases due to erratic rainfall patterns from climate change.
- *Water Quality:*
    - Many sites show **moderate to high risks** (e.g., **Bidadi, Amritsar 2**) as water pollution, urbanization, and industrial activities affect basin quality.
- *Ecosystem Services:*
    - Declines in ecosystem health are anticipated, with risks becoming **moderate to high** at most sites (e.g., **Pantnagar 2, Kanpur**). Factors include habitat loss, over- extraction, and pollution.



Plant Name	Basin Physical Risk (2030)
Goa	4.8
Amritsar 1	4.7
Kanpur	4.65
Baddi 1	4.6
Baddi 2	4.6
Baddi 3	4.6
Pantnagar 2	4.55
Pantnagar 1	4.55
Manesar	4.5
Amritsar 2	4.5
Chamarajanagar	4.45
Visag 1	4.4
Khordha	4.35
Guwahati	4.3
Durg	4.25
Bommasandra	4.2
Visag 2	4.15
Jalgaon 2	4.1
Jalgaon 1	4.1
Nandyala	4.05
Bidadi (Recycling)	4
Silvassa	4
Bidadi	4

Recommendations:

- Implement water-efficient technologies (e.g., recycling and reuse systems) to mitigate water scarcity.
- Collaborate with local stakeholders for flood control infrastructure (e.g., embankments and reservoirs).
- Invest in advanced water treatment facilities to ensure compliance with quality standards.
- Support regional biodiversity conservation projects to maintain ecosystem services.

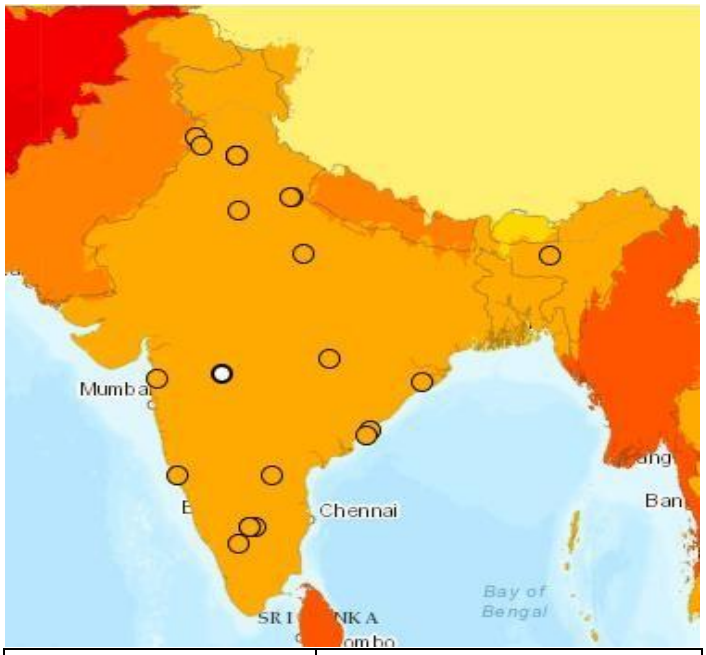
2. *Basin Regulatory Risks - Scenario 2030*

Regulatory risks are tied to local governance, water allocation policies, and institutional frameworks.

Key Observations:

- **Increased Regulatory Pressures:**
  - Sites in regions with weak governance (e.g., **Jalgaon 1, Bidadi**) may face higher risks due to stricter enforcement of evolving water policies.
  - As water scarcity intensifies, governments are likely to introduce tighter extraction limits, creating operational challenges.

- **Institutional Capacity Issues:**
  - Sites in areas with limited institutional capacity to manage water (e.g., **Nandyala, Goa**) face risks from unclear or inconsistent regulations.
- **Cost of Compliance:**
  - Rising costs of compliance are expected across all sites due to mandatory water treatment standards and sustainable resource usage requirements.



Plant Name	Basin Regulatory Risk (2030)
Goa	3.9
Amritsar 1	3.85
Kanpur	3.8
Baddi 1	3.75
Baddi 2	3.75
Baddi 3	3.75
Pantnagar 2	3.7
Pantnagar 1	3.7
Manesar	3.65
Amritsar 2	3.65
Chamrajanagar	3.6
Visag 1	3.55
Khordha	3.5
Guwahati	3.45
Durg	3.4
Bommasandra	3.4
Visag 2	3.35
Jalgaon 2	3.3
Jalgaon 1	3.3
Nandyala	3.25
Bidadi (Recycling)	3.2
Silvassa	3.2
Bidadi	3.2

Recommendations:

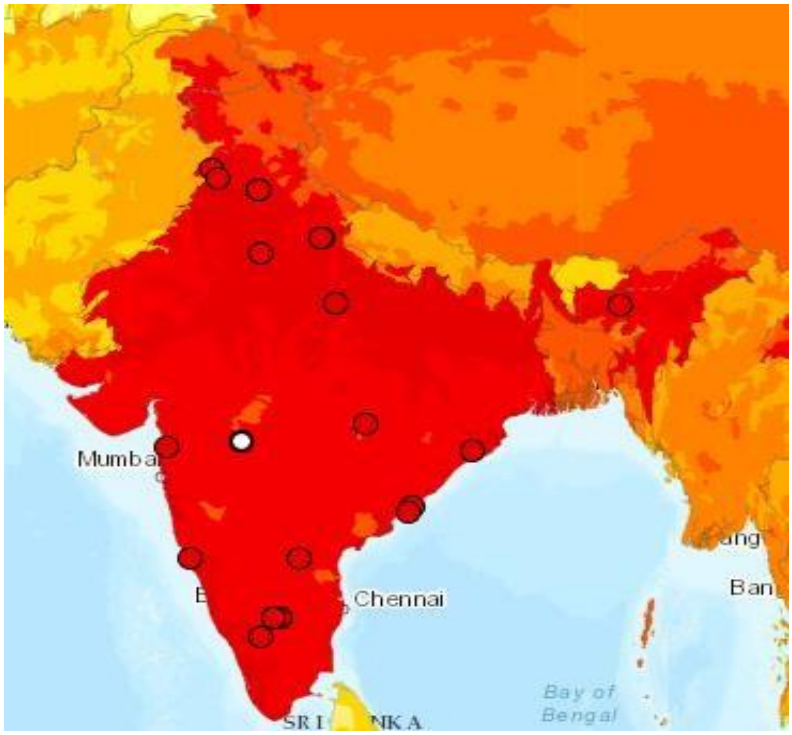
- Strengthen internal compliance mechanisms and maintain active engagement with regulators to stay updated on evolving policies.
- Advocate for clear, fair, and enforceable water management policies through industry associations.
- Invest in infrastructure and processes that exceed regulatory requirements, improving resilience to future policies.

3. *Basin Reputational Risks - Scenario 2030*

Reputational risks stem from societal and ecological concerns, as well as media and public scrutiny.

Key Observations:

- **Community Sensitivities:**
  - Sites in culturally significant or ecologically sensitive regions (e.g., **Amritsar 1, Goa**) face higher risks of reputational damage.
  - Conflicts with local communities over water allocation and quality are likely to intensify.
- *Increased Media Attention:*
  - High-risk regions may draw national or global attention due to water-related conflicts, pollution, or biodiversity loss.
- *Corporate Responsibility:*
  - Companies not seen as proactive in sustainable water practices will face backlash, affecting brand value and investor confidence



Plant Name	Basin Reputational Risk (2030)
Goa	4.85
Amritsar 1	4.8
Kanpur	4.75
Baddi 1	4.7
Baddi 2	4.7
Baddi 3	4.7
Pantnagar 2	4.65
Pantnagar 1	4.65
Manesar	4.6
Amritsar 2	4.6
Chamrajanagar	4.55
Visag 1	4.5
Khordha	4.45
Guwahati	4.4
Durg	4.35
Bommasandra	4.3
Visag 2	4.25
Jalgaon 2	4.2
Jalgaon 1	4.2
Nandyala	4.15
Bidadi (Recycling)	4.1
Silvassa	4.1
Bidadi	4.1

Recommendations:

- Develop and publicize community-based water management programs to enhance reputation and goodwill.
- Ensure transparency in water usage and sustainability initiatives through regular reporting.
- Collaborate with NGOs and local governments to mitigate ecological impacts, such as habitat restoration and pollution control.

WATER ANALYSIS AS PER CENTRAL GROUND WATER AUTHORITY DATABASES

N-GRES Dynamic Ground Water Resources of India by CGWA

Assessing water risk for industrial plants in India requires analysing groundwater data at the state or district level. The Central Ground Water Board (CGWB) and state groundwater authorities provide comprehensive resources for such assessments.

Central Ground Water Board (CGWB):

The CGWB offers extensive data on groundwater resources across India, including assessments of groundwater quality and quantity. Their reports, such as the "Dynamic Ground Water Resources of India, 2022," provide detailed insights into groundwater availability and usage patterns.

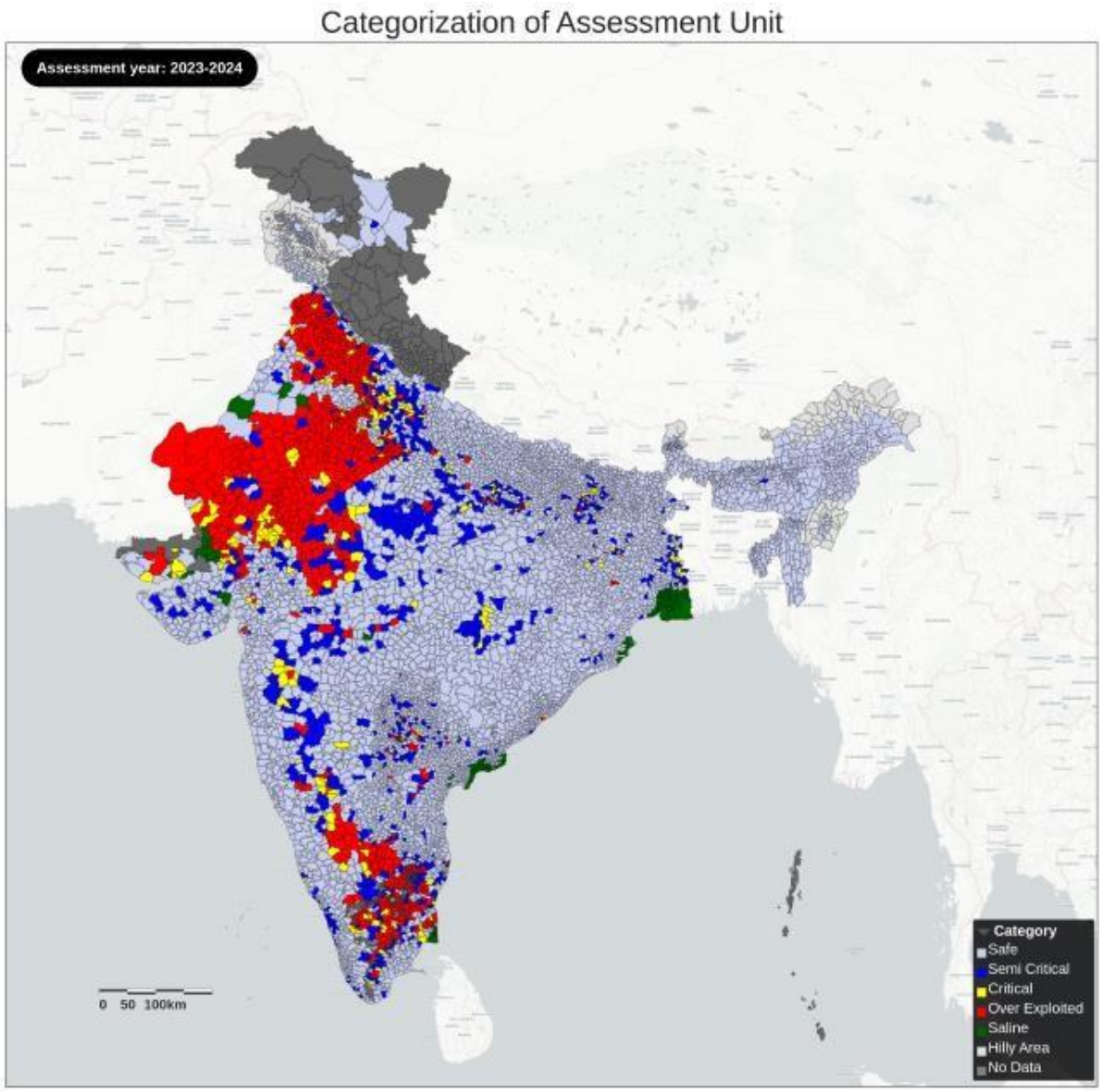
Steps to Conduct Water Risk Assessment:

1. Data Collection: Gather groundwater data from CGWB and state groundwater authorities, focusing on parameters like water table depth, quality, and seasonal variations.
2. Quality Analysis: Assess water quality using indices like the Water Quality Index (WQI) to determine suitability for industrial use.
3. Risk Evaluation: Identify potential risks such as contamination, scarcity, or over-extraction that could impact plant operations.
4. Mitigation Strategies: Develop strategies to address identified risks, including water conservation measures, treatment solutions, and alternative sourcing.

Tracking Districts of Plants

Below is a detailed list of the plant locations along with their respective district names based on the groundwater conditions:

- Amritsar (Unit 1 & 2) – *Amritsar District, Punjab*
- Baddi (Unit 1, 2 & 3) – *Solan District, Himachal Pradesh*
- Manesar – *Gurugram District, Haryana*
- Kanpur – *Kanpur Nagar District, Uttar Pradesh*
- Pantnagar (Unit 1 & 2) – *Udham Singh Nagar District, Uttarakhand*
- Guwahati – *Kamrup Metropolitan District, Assam*
- Visakhapatnam (Unit 1 & 2) – *Visakhapatnam District, Andhra Pradesh*
- Nandyala – *Kurnool District, Andhra Pradesh*
- Jalgaon (Unit 1 & 2) – *Jalgaon District, Maharashtra*
- Bommasandra – *Bangalore Urban District, Karnataka*
- Bidadi (Preform & Recycling) – *Ramanagara District, Karnataka*
- Chamarajanagar – *Chamarajanagar District, Karnataka*
- Silvassa – *Dadra and Nagar Haveli and Daman and Diu (Union Territory)*
- Goa – *State of Goa (entire state)*
- Khordha – *Khordha District, Odisha*
- Durg – *Durg District, Chhattisgarh*



This map presents the Central Ground Water Authority (CGWA) Dynamic Ground Water Resources assessment for the year 2023-2024. It categorizes groundwater resources across India based on their status, with the following classifications:

- **Safe:** Groundwater resources in this category are considered to be in good condition and are not overexploited.
- **Semi-Critical:** Groundwater levels in these areas are declining at a moderate rate, requiring careful monitoring and management.
- **Critical:** Groundwater levels in these areas are declining rapidly, indicating a high risk of overexploitation and potential future water scarcity.
- **Over-Exploited:** Groundwater extraction in these areas exceeds the rate of recharge, leading to a significant decline in groundwater levels and potential long-term depletion.
- **Saline:** Groundwater in these areas is contaminated with high levels of salt, making it unsuitable for most uses.

Taluk-wise Data:

- **Total Talukas:** 6750
- **Safe:** 4953
- *Semi-Critical: 712*
- **Critical:** 206
- *Over-Exploited: 751*
- **Saline:** 128

This assessment provides valuable insights into the status of groundwater resources across India and can be used to guide water management strategies and policies aimed at ensuring sustainable groundwater use.

1. *Safe Zones*

These plants are in districts with stable and sustainable groundwater conditions. Continuous monitoring and water efficiency practices should still be prioritized.

- Visakhapatnam (Unit 1 & 2) – *Visakhapatnam District, Andhra Pradesh*
  - Groundwater availability is stable with low risk of depletion.
  - Focus on maintaining water conservation practices and ensuring sustainable water usage.

- Goa – *North Goa District, Goa*
  - Groundwater resources are replenishable, and the region is considered safe.
  - Focus on maintaining sustainable groundwater management practices.

- Bommsandra – *Bangalore Urban District, Karnataka*
  - Groundwater conditions are relatively stable, although some parts face challenges with quality and depletion.
  - Prioritize rainwater harvesting, wastewater treatment, and efficient usage

- Chamarajanagara – *Chamarajanagar District, Karnataka*
  - Good balance between groundwater extraction and recharge.
  - Encourage sustainable water usage during the dry season to prevent future stress.

- Bidadi (Preform & Recycling) – *Ramanagara District, Karnataka*
  - Groundwater conditions are stable with no immediate depletion risks.
  - Continue focusing on water efficiency and rainwater harvesting

- Amritsar (Unit 1 & 2) – *Amritsar District, Punjab*
  - Groundwater remains within sustainable levels.
  - Focus on maintaining water-use efficiency and optimizing the extraction rate

- Baddi (Unit 1, 2 & 3) – *Solan District, Himachal Pradesh*
  - Groundwater levels are stable, and there is no immediate threat of over-extraction.
  - Emphasize efficient water management systems to preserve groundwater resources in the long term

2. *Semi-Critical Zones*

These regions have moderate stress on groundwater resources. While they are not at immediate risk of depletion, extraction rates should be monitored closely.

- Nandyala – *Kurnool District, Andhra Pradesh*
  - The water table is depleting in certain areas, requiring attention to maintain sustainability.
  - Implement water-saving technologies and efficient water management practices

- Guwahati – *Kamrup Metropolitan District, Assam*
  - Moderate stress on groundwater resources but manageable with good water management practices.
  - Focus on rainwater harvesting and groundwater recharge initiatives

- Durg – *Durg District, Chhattisgarh*
  - Groundwater is under moderate stress due to industrial and agricultural demand.
  - Encourage practices like optimized irrigation and water-saving measures

- Jalgaon (Unit 1 & 2) – *Jalgaon District, Maharashtra*
  - The district faces moderate stress on groundwater, mainly due to agricultural activities.
  - Focus on efficient water usage and explore alternate water sources like treated wastewater

- Khordha – *Khordha District, Odisha*
  - Groundwater is in semi-critical condition, indicating the need for cautious management.
  - Implement targeted water conservation measures and monitor groundwater extraction

- Kanpur – *Kanpur Nagar District, Uttar Pradesh*
  - High demand on groundwater, especially during the summer months, placing the region in a semi-critical category.
  - Encourage wastewater reuse, reduction in groundwater extraction, and rainwater harvesting

3. *Critical Zones*

These regions are facing significant depletion of groundwater resources, with extraction rates exceeding the natural recharge capacity. Immediate attention is required.

- Silvassa – *Dadra and Nagar Haveli and Daman and Diu (Union Territory)*
  - Groundwater extraction in this region exceeds recharge capacity, placing it in critical condition.
  - Immediate action is required to reduce extraction and explore alternative water sources like desalination, treated wastewater, and rainwater harvesting

- Manesar – *Gurugram District, Haryana*
    - Severe depletion of groundwater resources is a concern, and the region is in critical condition.
    - Focus on large-scale water conservation efforts, use of alternative water sources, and reduction in groundwater extraction

4. *Over Exploited Zones*

These regions have extreme groundwater depletion, with extraction far surpassing the recharge capacity. Urgent corrective action is required.

- Pantnagar (Unit 1 & 2) – *Udham Singh Nagar District, Uttarakhand*
    - Over-exploited region where groundwater extraction is unsustainable.
    - Immediate intervention required: focus on water recycling, treatment, and exploring alternative water sources such as treated effluent or surface water.

Summary Report

1. **Safe Zones (12 Plants):**
    - Plants located in these regions (Visakhapatnam, Goa North, Bengaluru, Chamarajanagara, Ramanagara, and Amritsar) are in districts with sustainable groundwater levels. Maintaining water conservation practices and monitoring water usage remains important.
2. *Semi-Critical Zones (7 Plants):*
    - Plants in districts like Kurnool, Kamrup (M), Durg, Jalgaon, Khordha, and Kanpur Nagar are in regions facing moderate groundwater stress. They should prioritize water-efficient practices and monitoring to prevent further depletion.
3. *Critical Zones (2 Plants):*
    - The plants in Dadra Nagar Haveli and Gurgaon are in districts with severe groundwater depletion. Immediate action is needed to reduce extraction, explore alternative water sources, and implement large-scale water conservation efforts.
4. *Over Exploited Zones (2 Plant):*
    - Udham Singh Nagar is in a severely over-exploited region where extraction exceeds natural recharge capacity. Urgent interventions are necessary, including water recycling and exploring new water sources.

FUTURISTIC CORRECTIVE ACTIONS FOR PLANTS BASED ON WATER CONDITION CATEGORIES OF CGWA DATABASE

1. *Safe Zones (Vizag 1 & 2, Goa, Bommasandra, Chamarajanagara, Bidadi (preform & Recycling, Amritsar1 & 2 and Baddi 1, 2 & 3)*

Current Condition: Stable and sustainable groundwater levels.

Futuristic Actions:

- **Regular Monitoring**: Track water levels semi-annually to detect any early signs of stress.
- **Water Efficiency Programs**: Implement programs to minimize water wastage.
- **Rainwater Harvesting**: Enhance rainwater collection systems to build reserves for future needs.
- **Community Engagement**: Partner with local authorities to maintain the "safe" status of groundwater.
- **Digital Integration**: Deploy IoT-based water meters to monitor water usage in real time

2. *Semi-Critical Zones (Nandyala, Guwahati, Durg, Jalgaon 1 & 2, Khordha, Kanpur)*

Current Condition: Moderate stress on groundwater resources.

Futuristic Actions:

- **Water Audits**: Conduct detailed water audits annually to evaluate and reduce unnecessary usage.
- **Alternative Sources**: Invest in surface water systems or treated wastewater for industrial use.
- **Water Recycling**: Expand the use of recycled water in cooling systems and other processes.
- **Infrastructure Upgrades**: Upgrade water infrastructure to prevent leaks and losses.
- **Policy Compliance**: Collaborate with state/district water authorities to align with sustainable water extraction limits.
- **Recharge Wells**: Install recharge wells to enhance groundwater replenishment.

3. *Critical Zones (Silvassa, Manesar)*

Current Condition: Significant groundwater depletion, requiring immediate action.

Futuristic Actions:

- **Mandatory Recycling**: Achieve 100% water recycling for non-potable purposes by 2027.
- **Water Neutrality Goal**: Aim to become water-neutral by 2030 through offsets like watershed management projects.
- **Advanced Technologies**: Use advanced technologies such as reverse osmosis and desalination to supplement water needs.
- **Behavioral Changes**: Implement stringent water usage policies, supported by training and awareness campaigns.
- **Green Spaces**: Create green zones around plants to aid groundwater recharge and reduce heat islands.
- **Rainwater Management**: Ensure rainwater harvesting capacity equals or exceeds annual water consumption.

4. *Over Exploited Zones (Pantnagar 1 & 2)*

Current Condition: Extremely depleted groundwater levels with urgent need for corrective actions.

Futuristic Actions:

- **Zero Groundwater Usage**: Transition away from groundwater dependency to surface or recycled water by 2030.
- **Collaborative Efforts**: Partner with state and central authorities for sustainable water management projects.
- **Catchment Area Management**: Restore and maintain local water bodies to improve groundwater recharge.
- **High-Efficiency Systems**: Replace current water systems with ultra-high-efficiency models.
- **Monitoring Systems**: Install AI-driven monitoring systems for accurate usage and real-time alerts on overuse.
- **Community Involvement**: Engage in community-level water conservation programs to extend the impact.

General Recommendations for All Plants

1. **Digital Transformation**:
    - Use AI and IoT-enabled devices for water monitoring and automation.
    - Implement centralized dashboards to track water metrics plant-wise.
2. *Capacity Building:*
    - Regular training on water conservation practices for plant teams.
    - Encourage innovation contests to source ideas for water-saving technologies.
3. *Policy Integration:*
    - Align plant-level water strategies with state and national water sustainability policies.
4. *Stakeholder Engagement:*
    - Work with government, NGOs, and local communities to co-develop sustainable solutions.
5. *Reporting & Transparency:*
    - Publish annual water usage and risk assessment reports to promote accountability and transparency.

WATER RISK MANAGEMENT PROGRAMS BASED ON WATER CONDITION CATEGORIES OF CGWA DATABASE

Based on the data provided, MTL can develop a comprehensive Water Risk Management Program that encompasses dependency-related risks, impact-related risks, and regulatory factors while focusing on sustainability and efficiency. Below are the key components for such a program:

1. *Dependency-Related Water Risks*

Dependency-related water risks focus on how the plants' operations rely on available water resources. These risks can vary across different zones and need to be monitored accordingly.

Safe Zones:

- **Plants in safe zones (e.g., Visakhapatnam, Goa, Amritsar)** should focus on maintaining their water usage efficiency, as there is currently a stable groundwater availability.
- **Risk Assessment:** Continuous monitoring of water usage against replenishable groundwater availability will help ensure the facilities do not become over-reliant on a resource that could be at risk in the future.

Semi-Critical Zones:

- **Plants in semi-critical zones (e.g., Nandyala, Guwahati, Kanpur)** face moderate stress on groundwater resources. These regions depend on groundwater but need better management.
- **Risk Assessment:** Assess potential reductions in groundwater recharge rates and the need for alternative water sources like treated wastewater and rainwater harvesting systems.

Critical Zones:

- **Plants in critical zones (e.g., Silvassa, Manesar)** depend on overstressed groundwater systems that exceed natural recharge capacities.
- **Risk Assessment:** These facilities should have a comprehensive plan to reduce groundwater extraction and increase reliance on sustainable water sources such as desalination, surface water, or treated wastewater.

Over-Exploited Zones:

- **Pantnagar plant** faces extreme depletion, making it highly dependent on external water sources.
- **Risk Assessment:** The risk of insufficient water supply in this region is critical. Immediate action is required to ensure that operations shift to recycled or alternative water sources to reduce dependency on over-exploited groundwater resources.

2. *Impact-Related Water Risks*

Impact-related risks include the effects of water depletion and quality degradation on operations, supply chains, and local communities.

Safe Zones:

- **Impact Assessment:** The impact in these regions is minimal, but ongoing practices to preserve water quality and conservation should be implemented to maintain stable conditions and avoid future risks.

Semi-Critical Zones:

- **Impact Assessment:** Water scarcity could impact local communities, agricultural activities, and industries. Companies must implement water efficiency practices and focus on preventing any worsening of the water stress.

Critical Zones:

- **Impact Assessment:** The depletion in these zones may lead to increased competition for water, affecting local stakeholders, including farmers and other industries. These regions may also face disruptions due to regulatory changes and a need for extensive mitigation efforts.

Over-Exploited Zones:

- **Impact Assessment:** Severe depletion could cause significant operational disruption. Over-extraction can affect local water availability for stakeholders, particularly in rural areas dependent on groundwater for agriculture and domestic use.

3. *Assessment of Future Water Quantities Available*

Future water availability should be evaluated based on projected trends in water demand, climate conditions, and groundwater recharge.

Safe Zones:

- **Assessment:** Current groundwater availability remains stable, but the risk of drought and rising water demand may affect long-term sustainability. Planning should consider future population growth and climate impacts on water replenishment.

Semi-Critical Zones:

- **Assessment:** These zones may experience reduced groundwater recharge during dry periods. Future water availability could decline without proactive water management practices like increased rainwater harvesting and reuse of wastewater

Critical Zones:

- **Assessment:** Future water availability in critical zones is uncertain and may decline due to ongoing depletion. Reducing extraction rates and improving water use efficiency must be prioritized to avoid significant shortages.

Over-Exploited Zones:

- **Assessment:** Water availability in these regions is likely to decline further unless drastic measures are implemented, such as large-scale water recycling and the exploration of alternative water sources.

4. *Assessment of Future Water Quality-Related Risks*

Water quality risks could arise from contamination, pollution, or the overuse of local water resources, which can impact plant operations and local ecosystems.

Safe Zones:

- **Risk Assessment:** Water quality in these areas remains stable, but contamination risks from industrial or agricultural activities could arise. Routine quality testing and monitoring should be maintained.

Semi-Critical Zones:

- **Risk Assessment:** Some regions, like Durg and Kanpur, may face water quality issues related to high usage and industrial discharge. Monitoring chemical and biological contamination risks will help mitigate the impact on both operations and local water resources.

Critical Zones:

- **Risk Assessment:** Water quality may degrade significantly due to high extraction rates and pollution. Treatment systems for both water quality and wastewater should be prioritized to ensure safe, clean water for operations and local stakeholders.

Over-Exploited Zones:

- **Risk Assessment:** Quality risks increase significantly in over-exploited zones as the available water may be heavily contaminated or not suitable for industrial use. Wastewater treatment and quality monitoring are essential to mitigate these risks.

5. *Assessment of Impacts on Local Stakeholders*

The depletion of groundwater resources will affect local stakeholders, particularly in rural or agricultural areas.

Safe Zones:

- **Stakeholder Impact:** Limited impact on local communities due to sustainable water use. The focus should remain on fostering collaboration with local stakeholders to ensure shared water management strategies.

Semi-Critical Zones:

- **Stakeholder Impact:** Local communities and farmers may experience water shortages during dry periods. Collaboration with local authorities and stakeholders to implement water- saving techniques is essential.

Critical Zones:

- **Stakeholder Impact:** Communities in these areas may face water shortages, leading to social and economic stress. Developing partnerships with local communities for equitable water distribution and creating programs for agricultural water use will help manage impacts.

Over-Exploited Zones:

- **Stakeholder Impact:** Immediate impacts on local communities are expected due to severe water shortages. Measures to ensure equitable water distribution and community support programs will help address the growing crisis.

6. *Assessment of Future Potential Regulatory Changes at a Local Level*

Water management regulations will evolve in response to increasing water stress across India. Future regulatory changes should be assessed to ensure compliance and mitigate risks.

Safe Zones:

- **Regulatory Assessment:** Regulatory changes may include stricter water conservation laws. These plants should be prepared for potential regulations to limit groundwater extraction.

Semi-Critical Zones:

- **Regulatory Assessment:** These regions are likely to face increased regulations on water use and extraction limits. MTL should assess future regulations and adapt by implementing efficient water usage practices and engaging in water conservation programs.

Critical Zones:

- **Regulatory Assessment:** Expect stringent restrictions on water extraction and possible penalties for over-extraction. It is crucial to engage with local authorities to stay ahead of regulations and prepare for the possibility of permits and rationing.

Over-Exploited Zones:

- **Regulatory Assessment:** Over-exploited zones are likely to face extreme regulatory measures, including total extraction limits. Proactive compliance with these regulations through water reuse and alternative sourcing is critical.

Water Risk Management Program Recommendations

1. **Water Efficiency Initiatives:** Prioritize water-saving technologies and practices across all plants, particularly those in semi-critical, critical, and over-exploited zones.
2. **Alternative Water Sourcing:** Explore and implement alternative water sources such as treated wastewater, surface water, desalination, and rainwater harvesting, especially for plants in stressed regions.

3. **Monitoring and Reporting:** Enhance water usage monitoring and ensure transparency in reporting to track groundwater levels, extraction rates, and water quality at all plant locations.
4. **Stakeholder Engagement:** Collaborate with local stakeholders to promote sustainable water management practices and ensure equitable water distribution, particularly in critical and over-exploited zones.
5. **Regulatory Compliance:** Regularly assess potential regulatory changes and prepare plants for stricter water management regulations, particularly in regions facing water stress.